SMART TECHNOLOGIES IN THE TRANSPORT SECTOR

FOCUS ON THE ATLANTIC AREA
BATTERIE Introduction

BATTERIE is an EU Atlantic Area project established in January 2012. Its purpose is to improve the cooperation and links between various transport services within the Atlantic Area region and to promote the application of smart technologies and usage of alternative fuels.

The BATTERIE (Better Accessible Transport to Encourage Robust Intermodal Enterprise) project was created as a response to the EU Atlantic Area priorities. As part of the priority 3.1 “Improve accessibility and internal links – Promote interoperability and continuity of existing transport networks, and sea/road/rail/air intermodality” it focuses on transportation and aims to improve the coordination of and interconnectivity between transport services supplied by various operators. It also recognises and gives due regard to National and EU transport, energy and related economic policies, with particular reference to the objectives set out in the Lisbon and Gothenburg Agendas.

The BATTERIE project started on 1st January 2012 and will run for three years. It is held in cooperation with eleven full partners and two associate partners of the Atlantic Area Region, i.e. the UK, Ireland, Scotland, France, Spain and Portugal.

The main objective of BATTERIE is to establish the impact of applied smart technologies (e.g. E-Journey Planning) and alternative fuels and to design scenarios and models of changes to policy, behaviour and transnational strategies in order to help optimise transnational trips for passengers.

Other activities include screening and modelling the availability, future development, costs and environmental impact of using smart technologies and alternative fuels and establishing pilot networks and demonstration of best practice in this sector.
Executive Summary

The development of smart technologies is particularly relevant in the transport sector because of the need to efficiently manage different modes of transport. Information and communication technologies are already being used to generate the potential for more effective and efficient mobility.

This report looks at intelligent technologies that are currently implemented as well as future trends and the most important projects that are developing in different regions and countries in the Atlantic Area.

Summary of conclusions:

- The majority of smart technologies developed are related to **ticketing**. There are single tickets which can be used in some regions or cities for multiple operators, multiple routes and different types of transport.
- **Route planners** are becoming more common but there is limited availability of interregional planners.
- Most of the Smart technologies applied in the Transport sector are implemented in major cities and not so much in rural areas.
- Smart cities are also facilitating **new mobility services** for citizens, such as car sharing and carpooling, transport management systems, electric vehicle charging points and public bicycle use.
- Intelligent Transport Systems are maturing and creating clear **benefits** in terms of transport efficiency, sustainability, safety and security, while contributing to economic growth and competitiveness.

Main recommendations:

- More **effective coordination** is required between the different territories and modes of transport. This lack of coordination has not ensured geographical continuity of the services provided by the Smart Technologies throughout the European Union. Governments and stakeholders must be involved in this coordination to ensure geographical continuity.
- **Standardisation and interoperability** between the different systems of intelligent transport are key issues that need to be addressed. While regulatory actions have been made at European level and in Member States, more work is required.
- **Innovation** plays an important role in the development of Smart Technologies. Local administrations must promote the introduction and implementation of these Smart Technologies through efficient public-private cooperation.
- In order to achieve the development of ITS in Europe, **private and public stakeholders** – automotive and telecom industries, service providers, users, transport, public authorities – need to cooperate and share a joint commitment on deployment of harmonised, interoperable ITS services. This will seamlessly benefit the whole of Europe and all users.
- Interregional network role, network performance, return on investments and minimising congestion effects on productivity will be priority performance measures.
Contents

1. Introduction ................................................................................................................................... 5
2. State of the Art .............................................................................................................................. 7
  2.1 Why smart technologies? .............................................................................................................. 7
  2.2 Smart technologies and Intelligent Transport Systems ............................................................... 10
    2.2.1 Intelligent transport technologies ........................................................................................ 11
    2.2.2 Intelligent Transport Applications ...................................................................................... 13
  2.3 NFC technology for transport ...................................................................................................... 15
3. Projects ........................................................................................................................................ 18
  3.1 Use of smart technologies in the regions involved in the Batterie Project ................................... 18
  3.2 Projects in other regions .............................................................................................................. 30
4. Conclusions and recommendations .............................................................................................. 34
5. Bibliography ................................................................................................................................. 36

Glossary

EV: Electric Vehicle
ICT: Information and Communication Technologies
Intermodality: integrates two or more transport modes on the same journey.
Interoperability: ability of a system to work with or use the parts of another system by exchanging or making use of information.
ITS: Intelligent Transport System
toe: Tone of Oil Equivalent

This report was created by:

FAEN
1. Introduction

The White Paper - Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system – states “Transport is fundamental to our economy and society. Mobility is vital for the internal market and for the quality of life of citizens as they enjoy their freedom to travel. Transport enables economic growth and job creation: it must be sustainable in the light of the new challenges we face. Transport is global, so effective action requires strong international cooperation”.

There is a need for optimisation of existing transport infrastructures in areas with greater traffic density through promoting solutions that enhance their capacity. This can be achieved by investing in Smart technologies that have to be technically and economically viable.

The cities have special importance in this analysis. The emerging concept of sustainability promotes a growing interest in and desire to implement more sustainable transport systems applicable within an urban environment where the majority of the population is concentrated.

Intelligent Transport Systems as well as the communication between vehicles (V2V - Vehicle to Vehicle) and with the urban infrastructure (V2I - Vehicle to infrastructure) can substantially improve urban management of transport and mobility.

Major strategies include integrating transport and land use, managing motorisation, promoting public transport as an alternative to private transport, pricing and financing, and adopting and promoting environmentally friendly technologies. These strategies follow the three basic policy sets: transport system development, supply measures, demand management and environment-friendly initiatives. The objective aims to ensure a proper balance between the transportation and resource needs of the current and future generations, which is the prime objective of sustainable transport.

While transport authorities require policies to promote and ensure sustainability, the policies often need technologies for implementation and effectiveness. Technologies are used to reduce greenhouse gas emissions and increase efficiency of transport operations, whilst the policies are there to reduce traffic volume and resource usage. Transport authorities and agencies develop policies and use smart or intelligent technologies to implement and make the policies effective which together focuses on the development of sustainable transport systems. Development of the policies is also influenced by advancements in technologies and vice versa.

Cities with unsustainable transport systems need to learn from those with more sustainable ones. This can be achieved through the study of successful sustainable policies and smart technologies already being implemented in other cities. As policies and technologies vary greatly depending on
regional characteristics (economic development, political systems and cultural developments) it may be more appropriate for a city to learn from the other cities in their region/continent.

This report analyses smart technologies along with various projects in different territories including different solutions. Similarities and differences between countries and regions, particularly in the Atlantic Arc, in relation to the introduction of intelligent transport systems will also be analysed.

Finally, recommendations for decision-makers in the field of transport with the aim of promoting the introduction of these systems will be made.
2. State of the Art

This chapter focuses on the general benefits of smart technologies including common smart technologies implemented in different territories/cities.

2.1 Why smart technologies?

The increase in the volume of road transportation in the European Union can be associated with the growth of the European economy and the increase on mobility requirements of citizens. The result of this increase is congestion of road infrastructure, increased energy consumption, and related environmental and social problems. Strategies for solving road transport problems have been focused on the expansion of the existing road transport infrastructure, however a more effective way to resolve the transport issue will be achieved by the introduction of innovation and Smart technologies. These will optimise and improve the efficiency of the existing transport infrastructure in conjunction with the development of new more advanced infrastructures. Intelligent Transport Systems (ITS) are advanced applications to provide innovative services relating to different modes of transport and traffic management and enable various users to be better informed and make safer, more coordinated and ‘smarter’ use of transport networks. The ITS is based on Smart Technologies that provide communication and other information (also known as ICT) to better monitor, control and manage the complex road transport network.

The use of ITS provides “intelligence” to the infrastructure and the vehicles driven by it. Benefits include:

- Reduction of environmental problems by reducing pollution
- Increased road safety by prevention of conflicts.
- Increased comfort of users and transportation efficiency.
- Utilisation of maximum capacity of the infrastructure thereby optimising the management.
- Detection of anomalies and incidents on the road.

Previously, ITS systems were installed in expensive vehicles built using the latest technology, such as the electronic control of stability, anti-skid brakes, collision early warning systems and adaptive cruise control. Similarly, on road infrastructures ITS was used for electronic toll collection, the use of cameras to automatically monitor speed, intersections and congestion.

At the present time the situation is changing rapidly as ITS solutions become more advanced and allow vehicles and infrastructure to communicate. This aims to prevent accidents, minimise delays caused by traffic by decreasing congestion and suggesting alternative routes, and/or parking available
for drivers. Modern ITS solutions provide the means for more efficient, effective, and intelligent transportation systems.

ITS integrate telecommunications, electronics and information technologies within transport engineering. This facilitates the more efficient management, planning, design and operation of complete transport systems. The application of information and communication technologies within the road transport sector can bring a significant increase in efficiency of the existing infrastructures and improves environmental performance. This in turn provides a reduction in energy costs and an increased safety and security for all the road transport systems, particularly for dangerous goods, private, public and freight mobility.

Future developments on ITS should focus on the application of information and communication technologies for other modes of transport, aiming to ensure higher levels of integration between road transport and other modes of transport. Priority action is required on the development standards and requirements to be applied in ITS systems, including:

- Multimodal travel information services
- Real-time traffic information services
- Data and procedures for the supply, where possible, of free road safety related minimum universal traffic information
- Harmonised supply of an interoperable eCall; (eCall is a safety solution which sends information to emergency centres)
- Information and reservations services for safe and secure parking places for trucks and commercial vehicles

The adoption of specifications, standards and the selection and deployment of ITS applications and services should comply with the following principles.

- Effective – make contribution towards solving the challenges affecting road transportation in Europe (reducing congestion, lowering of emissions, improving energy efficiency, attaining higher levels of safety and security including vulnerable road users)
- Cost-efficient – optimise the ratio of costs in relation to output with regard to meeting objectives
- Proportionate – provide different levels of achievable service quality and deployment, taking into account the local, regional, national and European specificities
- Support continuity of services – ensure services across the Union, in particular on the trans-European network, and where possible at its external border are compatible. Continuity of services should be ensured at a level adapted to the characteristics of the transport networks linking countries with countries, regions with regions and cities with rural areas
- Deliver interoperability – ensure that systems have the capacity to exchange data and to share information and knowledge to enable effective ITS service delivery
- Support backward compatibility – ensure the capability for ITS systems to work with existing systems that share a common purpose
- Respect existing national infrastructure and network characteristics – take into account the inherent differences in the transport network characteristics, in particular in the sizes of the traffic volumes and in road weather conditions
- Promote equality of access – do not impede or discriminate against access to ITS applications and services by vulnerable road users
- Support maturity – demonstrate the robustness of innovative ITS systems, through a sufficient level of technical development and operational exploitation
- Facilitate inter-modality – take into account the coordination of various modes of transport when deploying ITS
### 2.2 Smart technologies and Intelligent Transport Systems

In a context where technological progress reaches all sectors, transport is no exception. The introduction of intelligent transport systems (ITS) focuses on the improvement of road safety, mobility, protection of the environment, the rationalisation of energy, economic efficiency and greater interaction of users.

A wide range of strategies have been proposed by many researchers and implemented in many places, mainly in cities in recent years. Some of the most important ones are included in table 1 below:

**TABLE 1**

<table>
<thead>
<tr>
<th>Categories of Smart Transport Technology</th>
<th>Smart Technologies</th>
<th>Potential influences on Sustainability</th>
</tr>
</thead>
</table>
| Control Systems (manages traffic flow and safety at intersections) | Traffic signal system  
Transit priority signal  
Pedestrian signal  
Elderly pedestrian signal  
Intelligent road studs | Higher system efficiency  
Reduced fuel consumption and emission (less congestion)  
Enhanced safety of motorists and pedestrians  
Increased choice of modes (promoting public transport) |
| Monitoring and Enforcement Systems (monitors traffic flow continuously to ensure proper enforcement of rules) | Intersection surveillance system  
Speed cameras  
Red light cameras  
Incident detection and management system  
Bus lane enforcement system | Enhanced safety (smart surveillance)  
Smoother traffic flow (less violation of rules, less incidents, less clearance time after incidents)  
Higher choice of modes (promoting bus services) |
| Information and planning system (present transport information dynamically and provision of interactive tool for managing transport activity) | Traffic news broadcasting  
Traffic flow and travel time  
Accidents and incidents  
Park guidance. Dynamic information (signs, motorist’s speed)  
Public transport information sharing  
Interactive service map (next-bus arrival time)  
Travel planner  
On-board passenger services  
Taxi booking system | Reduction of fuel consumption and emissions (less congestion, less travel time)  
Increases accessibility (smart taxi booking, public transport information availability)  
Higher efficiency (availability of advisory information on travel planning and parking) and economy |
| Revenue Management Systems (processes fast and accurate transactions) | Integrated public transport fare payment system  
Parking charge payment system  
Electronic toll collection system | Smoother traffic flow (fast transaction)  
Integrated and affordable public transport  
Less waste (no paper-based ticketing) |
2.2.1 Intelligent transport technologies

Intelligent transport systems vary depending on technologies applied. There are basic management systems such as car navigation, traffic signal control systems, container management systems, variable message signs, automatic number plate recognition or speed cameras. Other applications include security CCTV systems and more advanced applications that integrate live data and feedback from a number of other sources, such as parking guidance and information systems, weather information.

- Wireless communications

Various forms of wireless communications technologies are used for intelligent transportation systems and different technologies can be used depending on the range required for communications. Radio modem communication on UHF and VHF frequencies are widely used for short and long range communication within ITS. For Long-range communications infrastructure networks such as WiMAX (IEEE 802.16), Global System for Mobile Communications (GSM), or 3G are used. Long-range communications using these methods are well established, but, unlike the short-range protocols, these methods require extensive and very expensive infrastructure deployment.

- Computer technologies

Recent advances in vehicle electronics have led to a move toward more capable computer processors on vehicles for Real-Time Operating Systems. The new embedded system platforms allow for more sophisticated software applications to be implemented, including model-based process control, artificial intelligence, and ubiquitous computing.

- Floating car data

"Floating car" or "probe" data collection is a set of relatively low-cost methods for obtaining travel time and speed data for vehicles travelling along streets, highways, freeways, and other transportation routes. Several methods can be used to obtain data: Triangulation Method mobile phones periodically transmit their presence information to the mobile phone network. As a car moves, so does the signal of any mobile phones that are inside the vehicle. By measuring and analysing network data using the triangulation method data can be converted into traffic flow information. As in metropolitan areas the distance between antennas is shorter, accuracy increases. An advantage of this method is that no infrastructure needs to be built. However, in practice, the triangulation method can be
complicated especially in areas where the same mobile phone towers serve two or more parallel routes. By the early 2010s, the popularity of the triangulation method was declining. Vehicle re-identification methods require sets of detectors mounted along the road. In this technique travel times and speed are calculated by comparing the time at which a specific device is detected by pairs of sensors. This can be done using the RFID serial numbers from Electronic Toll Collection (ETC) transponders. An increasing number of vehicles are equipped with in-vehicle GPS (satellite navigation) systems that have two-way communication with a traffic data provider. Position readings from these vehicles are used to compute vehicle speeds. Modern methods may not use dedicated hardware but instead Smartphone based solutions using so called Telematics 2.0 approaches.

Floating car data technology provides advantages over other methods of traffic measurement:

- Less expensive than sensors or cameras
- More coverage (potentially including all locations and streets)
- Faster to set up and less maintenance
- Works in all weather conditions, including heavy rain

**Sensing technologies**

Sensing systems for ITS are vehicle and infrastructure-based networked systems, i.e., Intelligent vehicle technologies. Vehicle-sensing systems include deployment of infrastructure-to-vehicle and vehicle-to-infrastructure electronic beacons for identification communications and may also employ video automatic number plate recognition or vehicle magnetic signature detection technologies at desired intervals to increase sustained monitoring of vehicles operating in critical zones.

**Inductive loop detection**

Inductive loops can be placed in a roadbed to detect vehicles as they pass through the loop's magnetic field. Detectors can estimate the speed, length, and weight of vehicles and the distance between them. Loops can be placed in a single lane or across multiple lanes, and they work with very slow or stopped vehicles as well as vehicles moving at high-speed.
Video vehicle detection

Traffic flow measurement and automatic incident detection using video cameras is another form of vehicle detection. Video from cameras is fed into processors that analyse the changing characteristics of the video image as vehicles pass. The cameras are typically mounted on poles or structures above or adjacent to the roadway. Most video detection systems require some initial configuration to "teach" the processor the baseline background image. A single video detection processor can detect traffic simultaneously from one to eight cameras. Some systems can also provide additional outputs including gap, headway, stopped-vehicle detection, and wrong-way vehicle alarms.

Bluetooth detection

Bluetooth road sensors are able to detect Bluetooth MAC addresses from Bluetooth devices in passing vehicles. If these sensors are interconnected they are able to calculate travel time and provide data for origin/destination matrices. Some significant advantages:

- Inexpensive per measurement point.
- Inexpensive on physical installation compared to other technologies
- No roadside maintenance needed
- Quick and easy configuration and calibration of complete solution

2.2.2 Intelligent Transport Applications

Emergency vehicle notification systems

The in-vehicle eCall is an emergency call generated either manually by the vehicle occupants or automatically via activation of in-vehicle sensors after an accident. When activated, the in-vehicle eCall device will establish an emergency call carrying both voice and data directly to the nearest emergency point. The minimum set of data contains information about the incident, including time, precise location, the direction the vehicle was traveling, and vehicle identification. The EC funded project SafeTRIP is developing an open ITS system that will improve road safety and provide a resilient communication through the use of S-band satellite communication. This platform will allow for greater coverage of the Emergency Call Service within the EU.
**Automatic road enforcement**

A traffic enforcement camera system, consisting of a camera and a vehicle-monitoring device, is used to detect and identify vehicles breaking a speed limit or some other road legal requirement and automatically ticket offenders based on the license plate number. Traffic tickets are sent by mail. Applications include:

- Speed cameras that identify vehicles traveling over the legal speed limit. Many such devices use radar to detect a vehicle’s speed or electromagnetic loops buried in each lane of the road.
- Red light cameras that detect vehicles that cross a stop line or designated stopping place while a red traffic light is showing.
- Bus lane cameras that identify vehicles traveling in lanes reserved for buses.
- Double white line cameras that identify vehicles crossing these lines.
- High-occupancy vehicle lane cameras that identify vehicles violating HOV requirements.

**Variable speed limits**

Some states have begun experimenting with variable speed limits that change with road congestion or poor conditions.

**Collision avoidance systems**

Japan has installed sensors on its highways to notify motorists that a car has stalled ahead.

**Dynamic traffic light sequence Using**

RFID for dynamic traffic light sequences can emulate the judgment of a traffic police officer on duty, by considering the number of vehicles in each column and the routing properties.
2.3 NFC technology for transport

NFC (Near Field Communication) technology is a communication technology for short-range radio, which operates under the standard RFID (Radio Frequency Identification). It is compatible with the ISO 14443 standard that ensures contactless cards operate. It works at a frequency of free use, which avoids need a specific authorisation or license and has a transfer rate high, allowing agile communications.

It was created as a result of an agreement between Sony and Philips to create a technology with a compatible protocol. NFC communication is based on:

- A device that supports NFC technology, for example a mobile phone.
- Other devices that support NFC technology or alternatively a tag in which information is stored.

There are different alternatives, but for transport card emulation, we will have an ISO 14443 reader that reads information from an NFC device emulating a smart card.

It has some special features that facilitate its use in transportation applications:

- It is a very short-range communication, 10 cm maximum. This means that there is the possibility of inadvertent communication between two pieces of equipment, but in order for the communication to work there the NFC device must be held right next to the reader.

- Establishment of communication time is low, on the order of 50 ms. This is critical in the transport sector, where current smart cards transactions are made in times of 300 ms and never greater than 500 ms.

- Connections are reliable compared to other communications such as Bluetooth or Wi-Fi and robust against interference.

- Compatibility with the ISO 14443 standard which is the standard for similar transport cards throughout Europe.
Table 2 below summarises the comparison between the NFC device and other communication technologies in relation to its adaptation for public transportation use.

<table>
<thead>
<tr>
<th></th>
<th>NFC</th>
<th>Bluetooth</th>
<th>WIFI</th>
<th>GPRS/3G</th>
<th>Comments on NFC by public transport sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation distance</td>
<td>0,1 m</td>
<td>10-100 m</td>
<td>300m-40km</td>
<td>1km-35km</td>
<td>Activated manually</td>
</tr>
<tr>
<td>Transmission speed</td>
<td>848 kbit/s</td>
<td>2Mbit/s</td>
<td>54mbit/s</td>
<td>14 Mbit/s</td>
<td>Acceptable speed</td>
</tr>
<tr>
<td>Time of establishment of connection</td>
<td>20 ms</td>
<td>6 s</td>
<td>2 s</td>
<td>1 s</td>
<td>Extremely fast</td>
</tr>
<tr>
<td>Connection reliable</td>
<td>Extremely high</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
<td>Extremely reliable</td>
</tr>
<tr>
<td>Robustness against interferences</td>
<td>Extremely high</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
<td>Very robust</td>
</tr>
<tr>
<td>Compatibility with transport infrastructures</td>
<td>Almost Total</td>
<td>Null</td>
<td>Null</td>
<td>Null</td>
<td>Compatible with transport infrastructures</td>
</tr>
<tr>
<td>Times of transaction compliance</td>
<td>Total</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Acceptable transaction times</td>
</tr>
</tbody>
</table>

Despite the existing infrastructure and installations, it is clear that the incorporation of the NFC to public transport services requires a mutual adaptation of technologies and procedures.

NFC is based on standard ISO 14443, the same that is set for most of transport cards. This explains the compatibility between NFC and contactless transport readers. Tests demonstrate that compatibility between both factors is not yet finalised. In many cases issues can be resolved with minor modifications of firmware/hardware, but in others the problem is in the mobile terminal. It is expected that future models will have solved this problem as radio communications upgrade.

As regards software, NFC technology should not only be a new means of payment to replace the smart card. Rather, the mobile will become the tool through which we can access a series of applications within transportation, part of whose capabilities are based on NFC technology.
Elements to be developed in the next future:

- Development of further applications in addition to ticketing applications already available. The widespread use of mobile phones and in particular the use of smartphones by most of the population means that it is perfect platform for use within the public transport sector.

- Simultaneous charging of several types of travel within a single mobile without penalising the validation time.

- Define the business model. Who participates, who installs the infrastructure and who provides a budget.

- Establish new channels of communication with the final user, providing new services closer to their interests, having identified the type of the ticket, etc. Advertising changes in schedules, changes in rates and troubleshooting.
3. Projects

In this chapter there are some projects where IST or Smart Technologies are used to reduce problems of traffic jams or improve the sustainability of the transport.

3.1 Use of smart technologies in the regions involved in the Batterie Project

Portugal

Smart technologies are applied in various single ticket solutions within the major cities. The main issues have to do with the lack of coordination of the Metropolitan Authorities, namely, in the two major metropolitan areas of Porto and Lisbon. As a result, a common transport policy does not exist within major metropolitan areas and often conflicting decisions are taken in regards to timetables and routes. Some good practices examples are listed below:

Integrated public transport route planner for the Lisbon Region:

Website that calculates routes and provides information on the different transportation that you can use for the trip (buses, trams, trains, ferries, aircrafts) as well as schedules and ticket costs.
Single electronic ticket for public various transport modes in Lisbon:

These cards were specially designed for less frequent customers, allowing the charging that best suits your needs. They can also be used in addition to custom Lisboa Viva card, also multimodal, intended for Customers who normally use passes.

7 Colinas and Viva Viagem cards have a chip and an antenna that work with contactless validators, giving you access to Carris network and other transport operators members.

This card can be charged with fares of the same type and may be charged with new fares, if required. However, if you want to recharge your card with a different type of fare you must previously use all the fares charged before.

These cards are valid for one year. By the end of this period, you can get a new card at any point of sale. However, if you still have fares in the card, you may use them or transfer them to another card.

7 Colinas and Viva Viagem cards cost €0.50 and you may get them, charge or recharge your card on Carris or other transport operators’ points of sale.

Put the card about 5 inches from the black circle of the validator, it will beep and light: if the title is valid it will emit a short beep and green light; if it is not valid, the beep will be longer and the light will be red.

You can check which and how many tickets you have on your cards anywhere at Carris sales network. In each use at Carris transports, this information is provided in validators installed in buses, trams and lifts.

7 Colinas and Lisboa Viva cards can be charged with the following types of transport titles:

- Valid only for Carris: One zone ticket
- Valid for Carris and Metro: 24 hours ticket Carris/Metro Network
- Valid for Carris, Metro and Transtejo/Soflusa: Zapping

Single electronic ticket for public various transport modes in Lisbon (frequent users):

The Lisboa Viva card offers additional advantages negotiated between Transport Operators in Lisbon and various entities of public interest. This card can be acquired in every point of sale in the CARRIS network or at any transport operator in Lisbon, with a 10 day delivery deadline and presents different validity periods, changing between 4 to 6 years after its release, depending on the customer type.

Charging at an ATM: This option is available only for electronic passes (without stamp) and is valid just for “recharging” passes, which means that the pass should have already been charged at a point of sale before.

The only passes that can be charged at ATM’s are those valid at Carris, Metro, Transtejo, Transportes Colectivos do Barreiro, CP, own operator tickets or combining operators.
The validation process is very simple: you have to pass the card near the black circle of the validator, which will emit a sound and a light sign.

- If the title is valid, it will emit a short sound and a green light will appear.
- If it is not valid, it will emit a long sound and a red light will appear.

Estimated time of arrival for buses in Lisbon. Users receive SMS or web info for a specific bus route regarding the estimated time of arrival:

Different systems that provide information to passengers:

- Panels SAEIP: Electronic panels at bus stops with information on bus arrival time (minutes).
- SMS Carris: System of text messaging that give information by mobile phone about bus schedules and the passage of the same at each stop.
- E-mail Carris: It is possible to obtain information about stops using one’s personal email account or by entering the Carris website and entering the stop for which information is required.

Asturias (Spain)

Examples of smart applied technologies in the region are listed below:

CTA Asturias activities. The transport consortium of Asturias (CTA) is a public entity of the Principality of Asturias which is responsible for the coordination and management of transport, and as such are developing concerted policies of management for their passenger transport in the region.

CTA has been very active in the promotion of the use of public transportation which culminated with the signing of agreements with the various companies operating by road and rail, as well as the participating municipalities. These agreements will allow travellers who have a CTA card to move either in urban, intercity bus or train, according to their needs and at the same price, regardless of the means of transport used.

These cards are for regular travellers and as such give more favourable fare rates, favouring the regular users of public transport in the Principality of Asturias, which has been divided into 30 areas of transport.

The Billete Único is a smart card with a format similar to a credit card and is used for travel on any line of public passenger transport by road or rail if origin and destination locations are within the Principality of Asturias (ES). Through a mobile application, it’s possible to know how many trips you have available and you can make a new recharge when you need and wherever you are.
Asturias has all their transport services included in a route planning tool in public transport, Google Transit. This is the first autonomous region in Spain that has built its public transport network in this powerful tool developed by Google. Transit allows a person to know the supply of public transport to get from a source to a destination, with schedules, routes and companies providing the service. It describes the total time shift or walk to the bus terminal, waiting, transfers and travel time around the Principality of Asturias.

App for smartphones showing lines and bus stops of the city of Gijon. Bus-Gijón
It includes these features:
- Displays the nearest links your current position
- Shows the position, distance and time of arrival of the buses that go to any bus stop.
- Calculate the most convenient line available to move from one direction to another.
- Includes a complete list of lines, bus stops and routes.
- Favourite bus stops list.

LABCITYCAR. This project operates within the city of Gijón (Asturias). The project leader is ADN Mobile Solutions and FAEN is a driving force. LabCityCar is a Living Lab project based on the sustainable mobility of private cars. It comprises a set of actions that begin with the analysis of the impact of the mobility of these vehicles in the different zones of the city and the ideas for improving their impact with benefits for the citizens and therefore for Gijón.

In this project, the citizens are the main source of information thanks to their active participation, and in this way each one becomes a “citizen-researcher”.

Gijon has included within its plans as a Smart City the key points Mobility and Environment, totally in keeping with the project LabCityCar. The PAES (Pact of the City Mayors) contemplates actions of LabCityCar in efficient driving and environment.

In order to have an important impact on the city, it was not enough only to take into account the private vehicles of the citizens, it was necessary to incorporate other types of vehicles such as public transport buses or refuse collection lorries. For this reason the city bus company Bus Gijón EMTUSA actively joined the project with their respective vehicles.

In order to complete the data collected on driving, new sensors for measuring noise and air contamination have been included, thanks to the incorporation of companies who specialise in acoustics and environmental sensors.
LabCityCar is a combined private and public initiative, where the citizens, municipal bus and refuse companies and other private firms collaborate, constituting a true LivingLab, with the support of the Gijon City council.

The objectives of the project are:

- Conduct a study of long-range sustainable mobility (6 months) and 200 drivers throughout the city of Gijón. Statistics that will be obtained by examining:
  - Car use: Draw conclusions from car use
  - Types of drivers: driver behaviour
- Acquire mobility indicators in the city
- Patterns on schedules and routes and traffic jams.
- Ecological Footprint: Indicators of ecological footprint of the city with data from the fleet of cars.
- Sustainable mobility indicators:
  - Efficiency and safety tips
  - Define and validate and/or reward drivers based on their efficiency and safety.
- Involvement of the Administration.

**Basque Country (Spain)**

The Basque Transport Authority (BTA) is the entity in charge of promoting smart technologies to the transport infrastructure in the Basque Country. Some of the initiatives delivered are:

- Ticket Harmonisation. Probably, the most ambitious initiative carried out in the last year has been the introduction of ticket harmonisation. The ticket harmonisation project is medium high per county but non-existent at inter-county level. The three counties are developing the "unique transport tickets" for each of them but this is not compatible between them. Bizkaia has unique tickets for buses, tram, metro and Renfe (for regional trips). Gipuzkoa has unique tickets for bus and Renfe (regional trips) and Araba has a unified ticket for bus, tram and Renfe (regional trips). All three companies require the integration of FEVE. In all cases, the unique transport ticket uses the NFC (Near Field Communication) technology to allow access and payment to the different subscribed means of transport.
• Public Information Timetable Display (PIT). In all the three counties an average of 60% of the bus stations and all tram, train and metro stations have a PIT that offers in real time the time left for the next arrival at the station. This service has been implemented by a localisation system installed in all buses, trains, trams and metro units spread across the territory. This system came into force more than 10 years ago, Bilbao being one of the pilot cities where the system was first tested in Spain.

• Parking Occupancy Information System. In all the main entrances to the three major cities in the Basque Country there are parking occupancy displays, showing the occupancy of different private and public parking spread in the city in real time. Moreover, this information is now online and can be assessed through Internet.

• Co-cities Mobility App. This application has been available from June 2013 for Android users for Bilbao City and five other cities in Europe (Florence, Munich, Prague, Reading and Vienna). This app offers the opportunity to use your mobile phone to access, through a single application, aggregated information on traffic conditions, parking availability and bus network positioning with data coming from city sensor systems but also from the users feedback. With the addition of the data provided by the public, it is possible to integrate in one place, all the information provided by all stakeholders involved in the processes of mobility to react to changing traffic conditions and take steps to improve mobility in urban areas.

Finally, several ICT tools exist intended for transport professionals for consultation and information related to transport:

• Transport Information System
  The instrument of information management of the Euskadi Transport Observatory.
  The objective is to create and maintain an informative, solid and useful statistical database to have a true understanding of the reality of the scale and development of different modes of transport for both passengers and goods; as well as assist in the establishment of appropriate policies in the field of transport.

• Cost simulator for goods road transportation.
  This is a cost simulation tool for goods transport sector professionals (Goods transport associations, courier services, etc.) that, once introduced, offers economic operating characteristics of the vehicle, a series of economic indicators and data about the goods transport activity as well comparisons to the “average” in the sector.

• Cost simulator for passengers transportation
This is a cost simulation tool for passengers and transport professionals (coach fleets, on demand passengers carriers, etc.) that, once introduced, offers economic operating characteristics of a vehicle, a series of economic indicators and data about the passengers transport activity as well as comparisons to the “average” in the sector.

Navarra (Spain)

In relation to smart applied technologies the public urban bus network has implemented a computer tool to inform passengers about the time schedule. Also, there is a new app for paying the parking ticket through the smartphone. That way, you don’t have to run to place a new ticket if the first is over, you can extend it easily from your smartphone wherever you are. Moreover, there has been an electric bus, a hybrid bus and several biodiesel urban buses operative in the region of Pamplona.

As regards electric cars, an electric car-sharing service is now working within Pamplona and a taxi service company is implementing the use of an electric car in their fleet. In addition, since 2007, a municipal bicycle sharing system has been in operation with 100 bikes located in 5 parking lots. The cities of Pamplona and Vitoria are participating in the European Project ICT4EVEU where a common card will be developed by 2014, so that drivers will be able to charge their electric vehicles in either of the two cities.

- Activities from the City Council of Pamplona
  - Smart car parks – Around 4,000 parking spaces are available, half of them include a guidance system. Informative screens are available at certain points in the street showing the number of free spaces. Moreover, a smartphone application has been developed which indicates the cheaper car park according to your parking time, including free spaces, map location, etc.
  - Car pooling service – More than 1,500 people have been registered in the car pooling service launched by the city council on their website. Around 300 users share their journeys everyday, which means a reduction of 200 vehicles in the street.
  - Electric vehicles – Until now, 5 public charging points are installed and more than 50 EVs are circulating, either from companies, public or private. Users can benefit from free parking in regulated spaces. In 2014 a common charging card is expected to be developed for the cities of Pamplona and Vitoria, within a 100 km distance.
  - Car sharing service – Since June 2012, 4 bases with 8 ‘Think City’ EVs have been in operation, with 130 registered users and around 7,300 km travelled. The service is operated through a website where users can reserve the vehicle.
  - Public transport (bus) – Screens showing the waiting times for every line has been installed in 70 bus shelters. Also, a smartphone application has been developed showing this
information for every point of the urban bus service, as well as the details of every line, with maps, etc.

- Tarjeta ciudadana (Citizen card) – This card is operated by the city council and integrates different services supplied by them, like the bike sharing service, the public EV charging points, the car sharing service, public transport, public libraries and public sports clubs.

- Activities from the Regional Government of Navarre
  - Regarding smart technologies, a plan is expected to start soon regarding the modernisation of the regional public transport network, obtaining information of the vehicles location and service utilisation. The payment means is out with the scope at the moment. There is also a journey planning tool under development which is expected to be finished by the end of 2013.

**France**

Regarding a strategy for the implementation of ITS, several information systems have been developed and implemented at local and national level in France. Often these systems are islands of knowledge, restricted to specific regions without interaction between them. This situation limits overall citizens’ mobility namely when planning trips beyond a region. It is also costly for transport regulators who continuously need to have updated information.

At local and national levels, many ITS systems are deployed in cities and on motorways because the understanding of these mobility patterns and network movements is very important for traffic managers, public authorities and ITS service providers.

Universal information and smart ticketing may provide better solutions for citizens and visitors. In France, vulnerable road users, such as pedestrians, cyclists, motorcyclists, have enjoyed a lot of attention regarding ITS development. In some regions, innovative and sustainable mobility apps inform travelers about existing transport alternatives with the purpose to enable multi-modal trips based on the user preferences in terms of time, cost and carbon footprint. The main goal is to make traffic flow more smoothly, safely and low emissions. One can enjoy also travel time, work zone, and excessive speed warning applications.

Some examples of French Projects:

- SCORE@F: Experimental cooperative road system in France deployed in Ile-de-France. The system facilitates communication between vehicles and road infrastructure units (V2I) and between vehicles (V2V). For more information: [http://www.scoref.fr](http://www.scoref.fr)
- Optimod Lyon: Optimod'Lyon had an ambition to collect, centralize and process all the data on urban mobility on a single platform and to create innovative services that will facilitate travel and life users; For more information: http://www.optimodlyon.com
- ZenBUS: Each user can see the position of the bus in real time; for more information: http://zenbus.zoomzoomzen.com/zenbus/isy

**Northern Ireland**

In regard to many of the traffic and control measures available, the Northern Irish road system is fairly advanced, however investment must be made available for monitoring and revenue systems. The overwhelming majority of public transport in Northern Ireland is run by a company called Translink, who provide an online journey planner which covers rail and bus networks throughout NI. The company also makes good use of social media and during a difficult period in 2010/11 when the website crashed, real-time Twitter updates kept the system running.

Translink was one of the first UK companies to implement smartcard ticketing in May 2002 and it operates one of the biggest schemes in the UK with over 350,000 smartcards in regular use. Smartcard use now represents over 24 million Translink journeys (30% of total) which is the highest take-up in the UK after London. Single ticket offers (I-Link) are available to integrate travel on rail and bus networks but in general, although there is a large amount of amalgamation of bus and rail travel, a total integration of the system is yet to be fully realised. The journey in Northern Ireland is still very much about working on a ‘per journey basis’ rather than thinking about it as one continuous ‘transit.’ While there is currently no reward scheme in place for card holders, Translink has unveiled plans for a new debit card payment system, linked to an account. This may mean cheaper fares based on frequency or time of journey and could mean better integration across the system. Belfast is certainly the centre of smart technologies in Northern Ireland, but while not in danger of becoming a technological ‘island,’ some systems and timetables need to be improved around the country.

**South West of Ireland**

The private car remains the most popular choice of transport for travel to work, across the South West region. Parts of the South West region which exhibit the lowest levels of public transport usage are the most car dependent and are generally those with the more dispersed settlement patterns and limited availability of public transport options.
As would be expected, public transport and green modes of transport such as walking and cycling are highest in the more urban areas within the region given the general close proximity of workplaces and wider offering of public transport available. The figure below presents the modes of transport for the South West Region. Information is taken from the 2011 Census, CSO - Place of Work, School or College - Census of Anonymised Records (POWSCAR).

An example of good practice regarding smart technologies in intermodality within the South West Region is the ‘Black Ash Park & Ride.’ It is used by city-commuters who park their car there and then continue their journey in the bus lanes using the onsite buses. It allows employees coming into the city of Cork to avoid traffic congestion and enjoy a stress-free, eco-friendly travel-mode. It also allows visitors and shoppers to travel straight into the retail heart of the city, without the hassle of searching for time-limited on-street parking spaces or incurring the expense of using an off-street car park. It’s also the most frequent bus service in the city. The cost of the service is €5 per day including bus fare. Monthly and yearly tickets are also available.

The National Transport Authority has commenced the implementation of an online passenger information system known as the National Intermodal Journey Planner (Journey Planner). The Journey Planner will provide information for all journeys in Ireland including journeys on foot and by all modes of contracted and licensed public transport services. It will also include information on fares and, where available, ferries to the islands and taxis. The Journey Planner will provide door-to-door information for all journeys in Ireland including journeys on foot and by all modes of public transport. It will feature information for all contracted and licensed public transport services and it will also include information on fares, where available, ferries to the islands and taxis. Real Time Information (RTPI) has been provided in Dublin and Cork. RTPI will be provided on a phased basis to other parts of
Ireland. This allows for mobile phone and internet access of up to the minute information, allowing customers to time their walk to the bus stop more efficiently.

Avego are a company based in Cork city who have developed an app for car pooling and have done a lot of research in this area. Avego’s app known as ‘Carma’ essentially enables you to run your car like a bus. The routes you drive are made available to other users, who can search for rides between any stops along those routes. The app is very easy to use and provides audio notifications to prompt you about upcoming stops and riders – so you never need to physically interact with the app while you drive.

Here’s how it works:

- A driver turns on the app and selects the route they are going to drive.
- Someone searches for a ride along the same route, by using the app or their online user account.
- Avego automatically matches the driver with the rider, calculates the maximum fee to be charged to the rider, and offers the ride to both users.
- When both users have confirmed the ride, they are directed to a convenient pick-up location near the rider. The rider is provided with reliable real-time passenger information (RTPI) – so they know exactly when the car is due to arrive.
- During the journey, the rider can sit back, relax and monitor the progress of the journey, accessing reliable real-time arrival information and a map view of their progress.
- At the end of the journey, Carma automatically charges the passenger a fair and predetermined price for the journey, based on a per-mile default rate, and manages the payment to the driver. Both users rate each other between 1 and 5 stars. If either user rates the other with 1 star, they will never be matched together again.

Due to the dispersed settlement pattern and resulting dependence on the private car for commuting in the South West Region, it is considered that carpooling initiatives have the potential to play a significant role in encouraging more sustainable means of transport. Therefore smart technologies which assist networking between commuters in order to encourage carpools will potentially play an important role within the region.

Scotland

In Scotland, an example of a larger scale integration, the Journey Solutions Partnership, which is run by all major bus and rail companies, has developed the PLUSBUS initiative, with support from the Scottish Executive. The scheme enables people to buy rail tickets that also allow all day bus travel within the relevant local PLUSBUS zone. The initiative is a good example of through ticketing. The zones cover most parts of mainland Scotland. Tickets can be bought for both the start and end legs of
journeys from all participating rail stations. PLUSBUS tickets are also available throughout Wales and also in England, although there are areas within England where it is not possible to get a PLUSBUS ticket e.g. Liverpool and Leeds. It is interesting how the difficult point of revenue sharing is solved. The cost of PLUS-BUS tickets are set at a certain level, agreed by all bus operators. Upon purchase of the ticket at a train station (ATOC set up the ticketing process), the details of what ticket has been purchased are entered into a national database located at York Station. Once every four weeks, this database then distributes the revenue to the relevant bus operators (or occasionally passenger transport executives, PTEs). This system is called the Rail Settlement Process. Despite these positive examples it has to be stressed that the UK provides in many cases unfavourable conditions for cooperation in ticketing through the implementation of competition laws (see barriers section). There is also good intermodality in the Highlands and Islands area where communities depend heavily upon internet and phone technologies to plan for their routes and journeys with ferries, buses, trains and planes all required to perform a single journey.

There are many tools being applied in Scotland but the most well-known one is the journey planner Traveline. It is a national Scottish public transport information service. They provide detailed information about the schedules for all buses, buses, ferries, trains, metro Glasgow and Scotland national flights.

Also there is the concession card system. Concessionary travel gives free or discounted trips on public transport to the people that need it most. If the user is between 16 and 18, over 60, or has a disability he/she could be eligible for free or subsidised travel to get around Scotland and his local area.

The National Entitlement Card and Young Scot National Entitlement Card gives free or discounted access to most types of public transport.

There is also a car sharing initiative where it is possible to find different links to Web pages in order to find people to share cars.

There is also the Journey information with different aspects:

- Up to date traffic information to users of the highway and Scotland road network.
- Updated timetable information to reach your destination by public transport more quickly.
- Information on travel door to door for transport and travel drive around Britain.

There is an initiative for changing people’s perceptions and behaviour and providing parking concessions for people with severe restricted mobility. The Blue Badge scheme provides parking concessions for people with severely restricted mobility who have difficulty using public transport.
Local authorities are responsible for administering the scheme and issuing Blue Badges to eligible applicants. Transport Scotland is responsible for the legislation which sets out the framework for the scheme and provides support to local authorities to help them deliver the scheme.

3.2 Projects in other regions

Electromaps\(^1\) allows you to see the closest charging points for electric vehicles to your location, mainly in Spain and Portugal, although you can find charging points in the USA. This application comprises a list of charging points by proximity or the possibility to display them on a map. You are able to check the details of each charging point including the address, the price of reloading, the price of parking, etc ... There are also photos associated with each charging point. Google Maps Navigation opens directly to guide you to a point if you wish. It is possible to discuss and add photos to existing charging points.

carpooling.es\(^2\) is a car sharing platform where you are able to travel within Spain and Europe more economically, greener and more fun! Drivers simply offer empty seats on their journeys and passengers can reserve them just like booking a bus or a train ticket. You agree to share a fair portion of the fuel costs beforehand, so everybody saves money. Carpooling is the best way to travel cheaply and make new friends. You use the journey planner to search for lifts near you, or look at some examples of the lifts offered from cities like Salamanca or Valencia.

SmartCity Málaga\(^3\). The most striking aspect of the project for Malaga has been the use of an electric car and installing a charging point in a parking space on the promenade of Mercy. That vehicle is used routinely by technicians and checked for power consumption and autonomy. However, the main challenge is the research on the technology V2G (Vehicle to Grid) which focuses on whether you can do the reverse, for example energy pouring from the car to the point of recharge. It may be that the owner knows that they will not use the car for a few days and if the car is fully charged it is possible to

\(^1\) http://www.electromaps.com/
\(^2\) http://www.carpooling.es/
\(^3\) http://www.endesa.com/en/aboutEndesa/businessLines/principalesproyectos/Malaga_SmartCity
return some of that energy and collect money for it. This is not regulated by law and is now only a future possibility. This project will validate that technology to see if it is a feasible option.

**PriceProject PRICE-GDE**. Demand Management aims to develop a consumption monitoring system for customers to enable the implementation of the Intelligent Management of the electric demand. The main objective is to obtain a more responsible and efficient use by end users. Therefore, proper communication between the system operator, distributors and retailers for intelligent action on end consumer demand is one of the main challenges of this project. In addition, PRICE will be an important milestone not only for the energy sector regarding national and European level, but also an opportunity for internationalisation, as is clear from market growth experienced in recent years in USA, China, Australia, and emerging countries. Overall worldwide market growth is expected to reach $171.4 billion at the end of this project, compared with $69.3 billion in 2009.

Price partners conducted the first deployment of smart grids in the community of Madrid and the province of Guadalajara, particularly in the Henares Corridor, where Gas Natural Fenosa and Iberdrola, the two companies leading this initiative, serving more than 500,000 people.

**Bidelek Sareak**: This is an initiative of the Basque Energy Entity and Iberdrola to provide smart grids by installing smart meters (remote management, monitoring and automation) to urban areas of Bilbao, Portugalete and Lea Artibai with the aim of achieving a more efficient and secure electricity supply network. The main aim of the project is:

- Integration of distributed generation
- Integration of electric vehicles
- Development and commissioning of applications
- Integration of electric vehicles
- Installation of 100 charging points, in: private garages, public garages, malls

**Proyecto 22@Urban Lab Barcelona**. One of the goals of the municipal Urban 22@Barcelona Project is consolidating Barcelona’s role as an innovative city. In this framework, a concrete course of actions is to promote the use of the city as urban laboratory. The 22@Urban Lab, stands the 22@Barcelona as a space to test for innovative solutions to companies wishing to implement tests in any field: urbanism, education, mobility, etc.

---

4 http://www.priceproject.es/en/gde-outputs
6 http://www.22barcelona.com/content/blogcategory/50/281/
It is a sustainable mobility project. Deployment of charging infrastructure electric vehicles and two motorcycles urban Guard electric propulsion, traffic lights adapted for the blind at all crossings of 22@Barcelona, remote control to activate the traffic light sound and reduce the constant noise of traffic lights. It also includes an automatic volume control, which will emit acoustic signals based on the external environmental noise.

The system emits different types of sounds: beep for orientation, beep for step and final beep step. Both step beep and the final step, have sound outputs from the pole starting and destination simultaneously, allowing the user to accurately locate the path of the beam.

The traffic control cameras are connected by optical fibre to the central road to control traffic in real time, to increase or reduce the frequency of green, depending on the needs of the moment.

Several types of bike lanes have been tested in the 22@district in order to identify which of the pilots are contributing to improve circulation and cyclist safety without hindering traffic function normally.

**OutSmart (Smart Santander)**\(^7\). The goal of OUTSMART is to contribute to the Future Internet (FI) by aiming at the development of five innovation ecosystems.

These ecosystems facilitate the creation of a large variety of pilot services and technologies that contribute to optimised supply and access to services and resources in urban areas. This will contribute to a more sustainable utility provision and, through increased efficiency, lower strain on resources and on the environment.

A particular challenge is the provisioning of adequate support to control and exploit realistic mobility of both Internet of Things devices and real world entities during experimentation.

Around 2,000 heterogeneous devices have to be deployed and set up, the goal of this stage is to extend the deployment of the infrastructure, aiming at supporting outdoors parking control service, including monitoring of available places for disabled people as well as dedicated load/unload areas. The provision of such a service implies deployment of three types of elements:

- Ferromagnetic sensors under the pavement. Signal repeaters placed in public street lamps which allow gathering data from the sensors as well as communicating in a multi-hop approach with peer devices.

- Gateways placed in a limited number of areas and needed to interconnect clusters of sensors and repeaters to the Internet. In general they are embedded PCs in which the data gathered from sensors and repeaters are stored.

Smart City Valladolid y Palencia. Valladolid and Palencia are located in the Region of Castilla y León (Spain). They are nearby cities, linked by an important road and rail communication axis.

The Smart City VyP initiative reaches the “Smart City” concept from a very original point of view: it takes into account not only one, but two cities with different features but very close one to the other. What is being achieved is to add a new problem to the “Smart City” concept: the transport between the two cities. There are a lot of people who travels every day between both cities to work or study, and there is also an important urban and interurban freight transport axis.

Smart City VyP involves public administrations, multiple companies, research centres, universities, associations and everyone who wants to improve an initiative whose objective is to promote the union of Valladolid-Palencia as main beneficiary and promoter of innovative actions in different technological fields:

- Following a social, economical and environmental sustainable development model
- Obtaining profit for citizens
- Obtaining profit for the economical and entrepreneurial area
- Implementing showcase projects and dissemination actions
- Producing resources and obtaining external funds able to obtain an impact on the cities through new infrastructures, activities for enterprises and centres, marketing of the cities, etc.

http://www.smartcity-vyp.com/
4. Conclusions and recommendations

Conclusions

Intelligent Transport Systems are maturing and creating clear benefits in terms of transport efficiency, sustainability, safety and security. This contributes to economic growth and competitiveness, building travel and traffic information services for multimodal transport of people and goods. It’s important to create direct activities to support the reduction of private vehicle use, while meeting objectives for accessibility, social equity, environmental quality and economic growth.

In general terms there appears to be no coordination between the different territories (countries, regions and cities) in terms of mobility. Steps must be taken towards coordinated transport which can improve the performance of existing technologies which must be rolled out to include other regions.

Most of the solutions already implemented are within cities and, in fewer cases, within regions, focusing mainly on the concept of “smart cities”. This unfortunately results in the existence of technological islands, highly developed but not connected with the surrounding territory, hindering any integrated transport policy.

The Smart cities are also working in the field of mobility introducing new services for citizens including car sharing, management systems, electric vehicle charging and public bicycle use. Some devices are also used to analyse the individual behaviour of drivers of private vehicles, adding the data and developing more suitable mobility plans depending on the specific needs of the population whether urban or metropolitan.

The majority of smart technologies developed are connected with ticketing and route planners. There are single tickets that can be used in some regions or cities for multiple lines of the same type or different types of transport. Route planners are commonly used for one mode of transport only (road, train, and plane) and there is limited availability of planners with the ability to combine different transports modes. However this is moving ahead with the implementation of planners that are able to use and select different modes of transport by selecting the criteria more interesting (most cost effective, shortest route, etc.)
Recommendations

- **Main effective coordination is required** between the different territories and modes of transport. This lack of coordination has not ensured geographical continuity of the services provided by the Smart Technologies in the entire territory of the European Union. The Governments and the stakeholders have to be involved in this coordination.

- **Standardisation and interoperability** between the different systems of intelligent transport are key issues to be addressed. While regulatory actions have been made at European level and in Member States, more work is required. Administrations and stakeholders should look into new ways of **sharing data** and remove all remaining obstacles in the compatibility and interoperability of multimodal traffic and travel services in order to define common specifications. All stakeholders should aim to achieve the introduction of innovative services for transportation of both goods and people through gradual introduction. This will support the implementation of integrated transportation and land use planning. **Planning** is an essential tool in the Smart Mobility Framework.

- **Innovation** set an important role in the development of Smart Technologies. Local administrations have to promote the introduction and implementation of these Smart Technologies through efficient public-private cooperation.

- In order to achieve the objective of a quick deployment of the ITS in Europe, **private and public stakeholders** - automotive and telecom industries, service providers, users, transport operators, public authorities - need to cooperate and share a joint commitment on deployment of harmonised, interoperable ITS services. That should seamlessly cover the whole of Europe and all users.

- **Priority performance measures** should include interregional network role, network performance, return on investments, and minimising congestion effects on productivity.
5. Bibliography

Smart Transportation Systems Intelligent Transportation Technologies in the Age of Smart Cities: Traffic Management, Smart Charging, Public Transit, and Vehicle-to-Vehicle Systems


Políticas europeas sobre vehículos y combustibles alternativos Salón vehículos y combustibles alternativos Valladolid, 5 October 2012 Carlos García Barquero European Commission

USING SMART TECHNOLOGIES TO REVITALIZE DEMAND RESPONSIVE TRANSIT. Roger F. Teal


Status and outlook for biofuels, other alternative fuels and new vehicles. Nils-Olof Nylund, Päivi Aakko-Saksa & Kai Sipilä


Smart Mobility 2010: A Call to Action for the New Decade. RANDELL H. IWASAKI. Director, California Department of Transportation (Caltrans)

Smart Mobility: A Survey of Current Practice and Related Research Requested by Christine Ratekin, Caltrans Division of Transportation Planning April 25, 2012

Mapa Tecnológico “Ciudades Inteligentes”. Observatorio Tecnológico de la Energía miércoles, 18 de abril de 2012

Recarga inteligente de vehículos eléctricos. CIRCUTOR
PARTICIPANTS IN THE BATTERIE PROJECT:

FULL PARTNERS

- Action Renewables Ltd, UK
- South West College, UK
- Pure Energy Centre, UK
- EASN – European Automotive Strategy Network, Belgium
- SWRA - South West Regional Authority, Ireland
- Inteli, Portugal
- OesteCIM – Oeste Comunidad Intermunicipal, Portugal
- Esigelec, France
- CENER – Centro Nacional de Energías Renovables, Spain
- Denokinn, EU
- FAEN – Fundación Asturiana de La Energía, Spain

BATTERIE is funded by Atlantic Area, and part funded by the Department for the Environment and the Department for Regional Development in Northern Ireland.

ASSOCIATE PARTNERS

- ESB – Electricity Supply Board, Ireland
- Oxford Brookes University, UK

DO YOU WANT MORE INFORMATION?

Please, visit our website: http://batterie.eu.com or contact us at:
BATTERIE c/o Action Renewables
Block C, Unit 1
Boucher Business Studios, Glenmachan Place
Belfast, BT12 6QH
United Kingdom
Tel: 028 9072 7760
Email: info@batterie.eu.com