How do satellite services contribute to the establishment of a sustainable model of urban mobility in Europe?

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I. INTRODUCTION

The challenges that cities currently face to achieve sustainable mobility and urban development are numerous, and include developing reliable transport information systems to make public transport more attractive, integrating different transport modes, ensuring accessibility for all and improving citizens' quality of life by reducing pollution and noise.

This paper aims at underlining, through concrete examples, how European cities make the most of satellite information and services, and satellite navigation in particular, to achieve sustainable urban mobility and create viable alternatives to owning a private vehicle. Without being exhaustive, the operational examples described below also show how the integration of satellite information and services in urban mobility strategies benefits other policy areas of increasing importance, like health and social inclusion.

The paper's specific objectives are to: (a) stress the importance of facilitating the exchange of good practice between confirmed and potential end-users, crucial to the development of future urban sustainability; (b) demonstrate how professional end-users in local authorities harness the benefits of operational satellite applications to respond to challenges of demographic and climate change, in line with current EU policies; and (c) show current good practices in and suggest future avenues for better integrating the needs arising from different policy areas (such as health and social inclusion) into urban mobility policies and satellite service development, in line with the EU's ambition to implement a space strategy that benefits its citizens [10].

II. URBAN SUSTAINABILITY: THE CHALLENGES FOR LOCAL AUTHORITIES IN EUROPE

In Europe, around 75% of the population lives in urban areas [13], a proportion set to further increase. Towns and cities are indeed the drivers of the European economy, representing just under 85% of the EU's GDP, attracting investment and creating employment [1]. To make the most of such dynamic environments while ensuring sustainability, the major challenge for Europe's urban areas is to find the balance between population density and quality of life in a healthy urban environment [14].

While many local authorities across Europe have begun to implement sustainability measures in resource management and infrastructure, urban transport is responsible for about 40% of all CO_2 emissions of road transport and up to 70% of other pollutants from road transport [3], causing damage to the economy, to the environment and to the citizens' health. It is estimated that the economic, social and environmental impacts of increasing traffic in urban areas have an annual cost of almost €100bn [1].

To address these challenges, policy makers at EU and local levels have developed approaches that outline solutions and integrate the potential contribution of innovative technologies.

III. THE ROLE OF URBAN MOBILITY TO ACHIEVE URBAN SUSTAINABILITY IN EU POLICIES AND INITIATIVES

The Urban Agenda of Europe [7] [8] places cities at the centre of several policies, aiming at making the most of urbanisation. A series of initiatives has been launched within this framework, such as the Green Capital Award and the Covenant of Mayors, aiming at promoting and recognising the efforts of cities implementing innovative solutions to tackle urban environmental challenges and to increase the quality of life.

In recent years, noting the key role of urban mobility, the EU has developed policy initiatives to address the challenges of urbanisation. The 2009 Action Plan on Urban Mobility states that "urban areas face today the challenge of

making transport sustainable in environmental (CO_2, air pollution, noise) and competitiveness (congestion) terms while at the same time addressing social concerns. These range from the need to respond to health problems and demographic trends, fostering economic and social cohesion, to taking into account the needs of persons with reduced mobility, families and children"[1].

In line with the Europe 2020 Strategy [9], and the move towards a resource-efficient, low-carbon economy [11], the White Paper on the roadmap towards a competitive and resource-efficient transport system [12] proposes measures for local authorities and policy makers, that implicitly recognise the beneficial contribution the use of satellite information and services can make towards sustainable and inclusive urban mobility:

- fostering "integrated transport management and information systems, facilitating smart mobility services, traffic management for improved use of infrastructure and vehicles, and real-time information systems to track and trace freight and to manage freight flows; passenger/travel information, booking and payment systems" [2];
- the development of "a plan for investment in new navigation, traffic monitoring and communication services to allow for the integration of information flows, management systems and mobility services" [3]; and
- developing "public procurement strategies to ensure rapid up take of new technologies" [4].

However, as the operational examples detailed in the next chapter show, local authorities themselves have already started to put in place cutting-edge initiatives using satellite information and services to shape future urban mobility.

IV. CITIES AND THEIR USE OF SATELLITE APPLICATIONS TO SHAPE SUSTAINABLE URBAN MOBILITY

Citizens' demands of urban mobility are high, expecting improved levels of service and better value for money. Satellite applications emerge as increasingly available and useful tools to optimise internal management and to provide passengers with an efficient information system enabling them to plan their journeys and shift among different transport modes easily. Their use is crucial also to meet the demands of passengers with reduced mobility and special needs, and to decrease the negative impacts of traffic on health and the environment.

A. Promoting integrated policies: operational examples from London and Prague

GPS is a key component of the Automatic Vehicle Location of the London Bus Fleet [16], enabling traffic managers to locate each vehicle of the bus fleet in real-time, and providing passengers with up-to-the-minute information on arrival and departure times (also via smartphone applications). The GPS receivers installed on the buses were also used to evaluate the impact of new bicycle paths on bus journey times [17]; the information gathered by the vehicles was analysed to optimise routes and times of bus lines, together with the development of the new cycling infrastructure. Both initiatives successfully aim to make alternative modes of transport safer and more attractive.

In this example, the real-time tracking enabled by satellite navigation contributed to the harmonisation of two transport modes, bikes and buses. On a larger scale, softwares using satellite information permit to evaluate how to combine several transport modes in cities. The *intermodal mobility systems* based on satellite navigation enable efficient and integrated coordination among several transport networks, often managed by different operators, hence optimising connections among several transport alternatives and reducing waiting times.

Prague [5], the city that will soon host the headquarters of the European GNSS Agency, boasts one of the highest rates of public transport usage in the world. In 1993, the city created the Regional Organiser of Prague Integrated Transport (ROPID), to coordinate public transport in Prague and part of the Middle Bohemia Region. To respond to the increasing motorcar traffic levels and enable the combined use of private and public modes of transport, ROPID developed a system collecting information on all means of public transport in the city. An interactive map, downloadable on smartphones, gives access to real-time information on routes and timings of an integrated transport system including 900 tram cars, three major metro lines, a funicular, six ferries and a widespread bus service. The map also includes geolocalised information on rush hour and other traffic events, visibility, and main sites of interest, thus also facilitating mobility for tourists.

These cases show, on the one hand, that major European cities are aware of the value of Intelligent Transport Systems to improve urban mobility and, on the other hand, that satellite information and services -and satellite navigation in particular- can serve as a precious tool when developing and managing such systems. By supporting public transport operators in terms of management and monitoring, satellite navigation can enter the everyday life of the urban population to address issues that interest them directly (e.g. the waiting time at a bus stop).

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[1] Commission of the European Communities, 2009. *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Action Plan on Urban Mobility* {SEC(2009) 1211} {SEC(2009) 1212}, p. 2.

[2] European Commission, 2011. *White Paper, Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system*, {SEC(2011) 359 final} {SEC(2011) 358 final} {SEC(2011) 391 final} COM(2011) 144 final, p. 24.

[3] Ibidem, p. 25.

[4] Ibidem.

B. *Focusing on health: the initiatives of Rome, Pavia, Stockholm and the London Borough of Lewisham*

"Persons with disabilities have the right of access to urban transport on equal terms with the rest of the population but in reality access is often insufficient and sometimes non-existent"[5], states the Action Plan on Urban Mobility to call for the development of inclusive transport systems in European urban areas. Hence, as European cities become increasingly familiar with geolocalisation, they also experiment innovative uses of satellite navigation to address issues related to accessibility.

In Rome [15], the city administration uses satellite navigation to manage a fleet of more than 100 vehicles (minibuses), providing flexible transport services on-demand for mobility impaired passengers in the Rome Metropolitan Area. The system coordinates passenger requests and plans travel using minimum cost routes and matching the kind of disability with the proper type of vehicles. The system allows for the satisfaction of 100% of requests, but also helps to save money and to reduce the workload of the personnel in charge of managing the system.

In Pavia [6], a small town in the north of Italy, the local administration sponsored the initiative of a local NGO to create a mobile application to guide people with reduced mobility through the historical city centre. The application enables users also to report on mistakes in the localisation of barriers and to include the location of new obstacles and infrastructure in an interactive map. In the north of Europe, Stockholm [4] set itself the goal of becoming the world's most accessible capital city for visually and mobility impaired persons. The public transport operator developed a solution, based on satellite navigation, to provide route planning assistance and itinerary guidance for the elderly and citizens with disabilities. The e-Adept solution enables persons with reduced mobility to plan their walking routes, receive precise navigation guidance and call for help in case of emergencies.

Urban mobility also includes non-pollutant means of transport, such as walking. Studies have shown that walking rates are inversely related to obesity and cardiovascular problems. Walking is hence to be promoted and facilitated to improve the health of urban citizens and decrease the costs associated with obesity and other diseases. In the case of the Lewisham Borough Council in Greater London [6], the administration developed a web-based route planner using satellite navigation to generate walking itineraries in the city. Walkit.com proved to be so successful, as to persuade over 90% of users to walk at least once rather than taking a bus, taxi, car or tube. Additionally, the route planner takes into account air quality information generated by AirText, an air quality information service for London, based on satellite imagery.

Such examples prove that satellite information and services not only allow for the implementation of sophisticated transport information systems, but also provide valuable information for public authorities working in other policy areas, such as health, environmental protection and social inclusion. Satellite data are hence likely to integrate more and more the strategies adopted by cities to achieve a truly sustainable urban mobility.

C. *Creating green alternatives for urban mobility: the experiences of Vilnius and Paris*

Biking is becoming more and more usual in several European cities, now offering bicycle rent and share schemes to residents and visitors. Such systems aim at providing an alternative to motorised transport modes, at reducing the level of pollutants released by vehicles circulating in urban areas and at promoting healthy life styles.

Satellite navigation is often a component of rent and share schemes, since it allows to monitor the whereabouts of the fleet and to locate the bicycles in real-time in case of theft or abandon. This happens in Vilnius [5], where a recently-created rent and share scheme offers electric bikes to citizens and tourists in the city centre and in the old town. Such electric bikes are equipped with a built-in GPS system that enable service managers to localise each bike of the fleet on a digital map. The information collected through satellite navigation (as the itineraries covered, the number of kilometres driven, the duration of the journeys and the maximum and average speeds) serve as a base to understand cyclists' behaviour and to perform traffic analysis that will be used to better harmonise the service.

Innovative projects have been launched to provide more concrete alternatives also to those needing a motor vehicle to move around in cities. An excellent example of such initiatives is Autolib' [5], a project recently implemented in the Greater Paris Region. Considering that, in Paris alone, there are 330 cars for every 1,000 inhabitants, running on average for a mere 4km per day, in 2011 Paris and other municipalities in Île-de-France launched an electric car-for-rent public transport network for short distances. Stations and charging points have been built, allowing to return the vehicles at any station of the network. The satellite component is in this case fundamental to guarantee the efficiency of the service: the built-in satnav equipment allows service managers to monitor the position of the vehicles constantly, to ensure that they do not trespass the limits of the Île-de-France Region and to localise customers in case of emergency. With the support of satellite navigation, service subscribers can, online or through a mobile application, identify the closest available cars and

[5] Commission of the European Communities, 2009. *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Action Plan on Urban Mobility* {SEC(2009) 1211} {SEC(2009) 1212}, p. 6.

recharging stations and book parking spaces. Not only does this service provide a solution for the city's residents needing a car sporadically, it also serves the needs of commuters and families, who now have an affordable alternative to owning a private car. Moreover, the extension of the service is expected to lead, in the long term, to an estimated annual reduction of nearly 300,000t of CO_2 in the region.

If local authorities foster the switch to electric vehicles, they can significantly reduce noise, greenhouse emissions and dependence on fossil fuels in Europe. According to the European Commission's President Barroso, this kind of initiative "is part of the solution to the crisis", giving an example of "how to resuscitate traditional industrial sectors and lead them to new challenges, such as urban mobility"[6].

V. CONCLUSIONS

In the previous chapter, operational examples have been given of how:

- local authorities are fostering the use of public transport to diminish CO_2 emissions, by increasing the quality, density and frequency of service and by experimenting non fossil fuel vehicles;
- to respond to the needs of the hearing and visually-impaired or of persons with reduced mobility, they are increasing the accuracy and reliability of transport times;
- walking and cycling are facilitated by route planners and Iphone applications;
- public sharing schemes are creating alternatives to owning a private vehicle, while fostering a cultural change towards a more sustainable and cohesive society.

These experiences also provide valuable insights for satellite service development. End-users already demonstrate the potentially far reaching benefits that cutting edge initiatives using satellite applications for urban mobility can have for related policy areas, like health and social inclusion. With the objective of moving towards urban sustainability, satellite service development needs to make the most of these potential synergies by working with user-practitioners to identify possible connections with policies in other areas, and by involving these stakeholders in user-driven development approaches.

Moreover, not only do such initiatives increase the quality of life of citizens, they also represent operational examples of the urban mobility model the European Union wants to achieve. In fact, the exchange and replication of successful experiences of the use of satellite applications to improve urban mobility contributes to promoting closer links between cities, both at the regional, national and international levels. Such exchange of experiences can foster the establishment of sustainable models for urban mobility that will constitute a recognisable feature of European cities and an asset in shaping European identity.
As the Action Plan on Urban Mobility underlines, "EU-wide dissemination and replication of these (innovative) approaches can enable public authorities to achieve more, better and at lower cost"[7].

Satellite service developers and providers have the opportunity to work with Eurisy in identifying end-user success stories, in contributing to their dissemination, and thus continue to develop an expanding user-oriented market for satellite information and services.

[6] Hiriko*, President Barroso presents the electric vehicle HIRIKO as "an answer to the crisis", 29-01-2012. Consulted in May 2012:* http://pressroom.hiriko.com/2012/01/29/president-barroso-presents-the-electric-vehicle-hiriko-as-an-answer-to-the-crisis%E2%80%9D/ Last accessed <31/05/2012>.

[7] Commission of the European Communities, 2009. *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Action Plan on Urban Mobility* {SEC(2009) 1211} {SEC(2009) 1212}, p. 4.

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