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MANAGEMENT. ARE PORTUGUESE
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*** CEMPRE - CENTRO DE ESTUDOS MACROECONÓMICOS E
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Abstract:

Urban mobility has become an international problem and several countries have joined together in different consortia, signing international agreements and developing projects with a view to establishing new standards for current mobility levels and the development of the transport systems of the future. Although such worldwide increasing effort regarding sustainable mobility issue, namely by the most proactive European cities, it is not yet clear why measures towards sustainable mobility are not implemented by the generality of local authorities. The main goal of this paper is to identify the different sustainable mobility strategies and the corresponding perceptions by local public authorities. Such local governance aspects have yet to be dealt with appropriately and in a credible way. This shortcoming is particularly acute in Portugal where sustainable urban mobility management is still highly underdeveloped and very few studies have been dedicated to the matter. We provide new evidence on the perceptions and strategies of the Portuguese local public authorities regarding sustainable urban mobility management. Through a survey to all Portuguese municipalities we provide brand new evidence on their perceptions and strategies regarding sustainable urban mobility management. Estimates based on econometric regressions indicate that the most mobility-conscious municipalities are, on average, those that are richer, more cultural and educated, possess alternative transport parks and routes, have larger and more human capital intensive mobility departments. Results show that more than simply participating in urban regeneration programs it is necessary a more committed attitude, namely that municipalities' urban plans explicitly mention mobility issues and indicators. All the models estimated clearly evidence a higher awareness of North municipalities towards sustainable mobility issues.

Keywords: Sustainability; mobility management; regions; human capital

JEL-Classification: Q01; Q56; R11; J24

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1. Introduction

Cities are home to more people than ever before. In 1900, only a tenth of the world population lived in cities. In the 21st century, in contrast, half of the world population lives in urban areas (O'Meara, 1999).

Urban development has produced a phenomenon of intense and rapid concentration of people and activities in urban centres (Portugal, 2004), particularly marked by the development of large metropolises with highly distinctive evolutionary dynamics (Costa, 2003). Thus every world region suffers from car-choked urban areas. Transportation, especially road traffic, is now the fastest-growing contributor to the decline in quality of life and environmental degradation. Nowadays, large cities have achieved expansion through processes which are closely associated to noise, pollution, traffic, insecurity, and chaotic urbanism (Monteiro et al., 2004).

The geographer John Adams has argued that mobility societies have become increasingly more polarised, more dispersed, more anonymous, less child-friendly, less culturally distinctive, more crime-ridden and less democratic (Fahimuddin, 2002).

Thus, it is vital that new sustainable principles and guidelines be implemented. In this context, and in order to countervail the current urban situation, it is important to apply sustainable policies to urban planning. In effect, these policies have to be economically feasible, socially acceptable and friendly to the environment.

Within urban planning, urban mobility management is one of the most important features in achieving sustainability (Scaringella, 2001). Spatial mobility is now more than ever at the heart of human activity. The Greek philosopher Heraclitus once summarised his view on the world in two words, *panta rei*, meaning “everything is in motion” (Banister, 2000). In our opinion, this statement still engages the current modern world.

The emergence of this social and environment issue associated to mobility management can be found at the core of the different projects presented by entities such as the European Union (Euro-Cases, 1998). The matter has also been studied from different yet interrelated perspectives, namely the World Commission Urban 21 (Gilbert, 2000), the European concerns and strategies to diminish the green house effect (Rodenburg et al., 2002), and concerns regarding the interface between transports and the Kyoto protocol (Hook, 1998).

Although measures to integrate transportation and development strategies (e.g., sustainable mobility management and traffic management) have been introduced in recent decades, their implementation at the local level has not yet been adequately studied.

It is important to stress that these integration efforts at the local level are gaining increasing support from architects, who emphasise the importance of regional planning, for instance in creating streets and paths that pedestrians and cyclists are able to use (Cera, 2003). However, noticeable limitations in these projects may be pointed out as the majority have not been really integrated, that is, built around existing public transportation networks, so that citizens cease to use their cars to get to most places (Sheehan, 2001).

Policies to promote urban development around public transportation and other alternative transports and remove incentives to sprawl are far easier to recommend than to put in practice (O'Meara, 1999). In fact, achieving a state of sustainable mobility means assigning more responsibility to the local authorities and to civil society and new challenges for the organisation and management of transport systems (Scaringella, 2001).

With this view in mind, the analysis of the different current mobility management strategies represents a necessary tool in promoting the information and knowledge which are essential to our understanding of new specifications within urban organisation.

The main goal of paper is to identify the different sustainable mobility strategies and the corresponding perceptions of local public authorities. Such local governance aspects have yet to be dealt with appropriately and in a credible way. This shortcoming is particularly acute in Portugal where sustainable urban mobility management is still highly underdeveloped and very few studies have been dedicated to the matter. To this end, we provide new evidence on the perceptions and strategies of the Portuguese local public authorities regarding sustainable urban mobility, based on a direct survey of all (308) Portuguese municipalities. We seek to describe the best practices and the inherent factors that contribute or restrain the development of mobility plans.

The paper is structure as follows. In the next section it is shown the definition and a theoretical analysis of the relationship between sustainable development and mobility management. The state of art of the sustainable measures for mobility management in Portuguese municipalities is presented in Section 3. In the Section 4 the methodology and results of the analysis of Portuguese

local public authorities' perceptions and strategies regarding sustainable urban mobility is presented. Finally, in Conclusions we systematize the papers' main results.

2. Relationship between sustainable development and mobility management

Environmental issues are today more than ever one of the major concerns of our society. The high deterioration of quality of life conditions in big cities has contributed to a global environmental policy named sustainable development (Monteiro et al., 2004).

Sustainable development is an ambiguous and slippery concept. It has been interpreted in many different ways. Sometimes it is used to emphasise the importance of continued and steady economic growth (Nordhaus, 1991, 1992). In other circumstances it is restricted to an ecological target (Wilson, 1988). Although the concept of sustainable is largely discussed on theoretical grounds, its implementation has been hard to achieve given the high controversy that surrounds it. On account of all the different interpretations of the concept, there is a need to be quite explicit every time it is used.

In 1987 the World Commission on Environment and Development led the United Nations (UNDEC - United Nations Conference on Environment and Development) to publish the document "Our Common Future", also known as the Brundtland report (UN, 1997). According to the report, sustainable development is "development which meets the needs of the present without compromising the ability of future generations to meet their own needs" (Taylor, 1998: 1). Moreover, it concludes that preserving the environment, addressing global inequities and fighting poverty, could stimulate economic growth by promoting sustainable development since the "attempt to maintain social and ecological stability through old approaches to development and environmental protection will increase instability" (Runyan et al., 2002: 33).

From the definition of sustainable development in the Brundtland report it is clear that this concept does not only imply its economic impact on the environment. In fact, economic feasibility, the environment and the welfare of the society constitute the basic triangle (cf. Figure 1) that supports sustainable development. This justifies why the European Union elected Sustainable Development as a priority political action (Euro-Cases, 1998). The aim is to promote quality of life, and the well-ordered access to natural resources in such a way that permanent damage can be prevented. The environment surrounding urban development it is no longer a hostile space that has to be controlled to become a cultural representation of society.

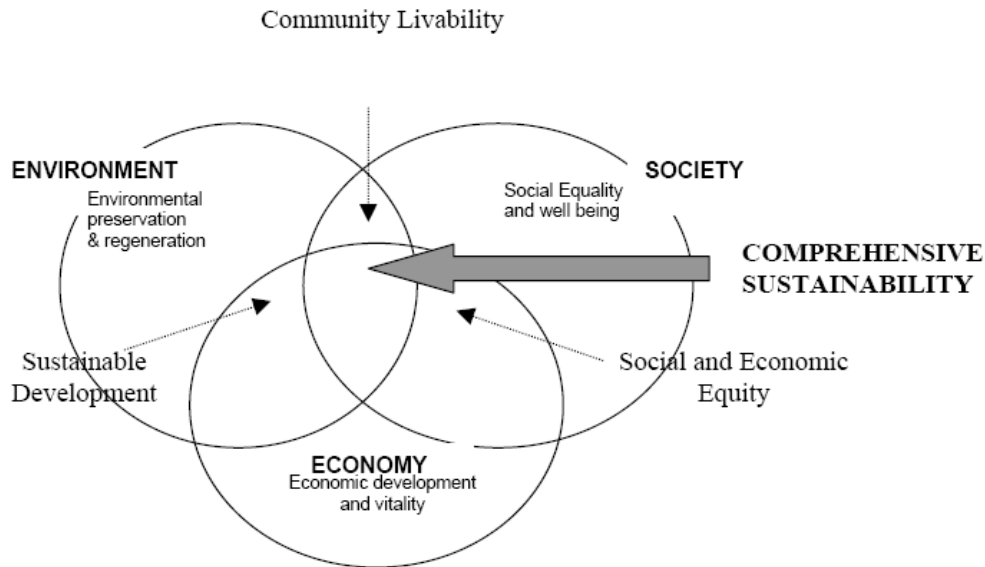


Figure 1: The three key features of sustainable development

Source: CST (2002: 3)

Sustainable development must therefore be more than merely “protecting” the environment; it requires economic and social change to reduce the need for environmental protection.

It was clear from the outset that sustainable development has global, national and local dimensions and that all three should be targeted. Thus cities provide enormous, untapped opportunities to solve environmental challenges, and local governments can and must pioneer new approaches to sustainable development and urban management.

Regarding mobility, throughout the 20th century it was possible to observe several exponential growths, such as the increase of population, urban area development and the rise of transportation demand; although the population is now achieving a balance, transportation demand has achieved an unbearable magnitude (Fahimuddin, 2002).

According to the OECD (1999) the negative effects of the transport sector on the environment are growing faster than the negative effects caused by any other economic sector. The escalation of mobility patterns has led authorities to address issues like urban sprawl and separation of the population from activities and urban services, the adoption of non-environmental transportation, the inefficiency of public transportation, noise, pollution and traffic (Giorgi, 2003).

Transport infrastructures consume about 15-40% of land in urban areas. Road traffic, which is the most intensive mode of traffic, occupies 93% of the total land used for transport in the European

Union, while railways are responsible for 4% of the land take, and airports for less than 1% (Herala, 2003).

Current trends in transport indicate that the system is moving away from sustainability. High economic growth rates and rising urban income have led to high levels of motor vehicle ownership, particularly the automobile (Chin, 2000). Private vehicles currently represent more of a social status rather than a mobility need, and it can be very difficult to convince people to abandon this commodity especially in cities where public transportation is deficient.

However, there is a relationship between the structure of cities and the traffic flows in them. Several researches have highlighted the fact that travel patterns and therefore fuel consumption and pollutant emissions are strongly related to land use and the degree of “compactness” of towns (Herala, 2003).

In rich countries, such as the US, Canada and Australia, the urban area is growing at much higher rates when compared to population growth (Gilbert, 2000), and as expected, small urban centres typical of Australia and the US, as with almost all peripheral cities, result in a much higher demand for transport dominated by cars (Scheurer, 2001). In contrast, the higher densities are to be found in Asia and in Europe, where they are associated with a lower demand for transport and the higher importance of public and non-motorised transport.

Still, it is not easy to characterise urban mobility patterns, as it is a multifaceted phenomenon, which is related to factors such as the cities’ internal organisation, the proximity of other urban areas and the relationships and functionalities of each city. The National Academy of Science even states that large urban patterns were entirely shaped by the car, emerging after the construction of main roads.

Transport growth and urban mobility problems in large metropolises started worrying the authorities as far back as the 1960s, at a time when on average there was one car for every two inhabitants (TRB, 2001).

In the US, traffic operators are facing meaningful changes in the attraction and retention of users. However, private roadway transportation still has a very important function in the transport system of most of the US towns (TRB, 2001).

Traffic problems however are more important in Canada’s strategies when compared to the US’s,

as Canada spent efforts and resources to ensure that public services should be comfortable and reliable. Nonetheless, an enormous number of factors have an influence on the different approaches of these two neighbouring countries, such as different taxes on motorised vehicles and on fuel or the efforts made to control urban development to preserve the history of towns.

The European Union (EU), through its policies to eliminate physical borders and to promote the single market, has given a significant boost to the growth of transports, facing, nevertheless, the same problems and issues of urban mobility as the countries mentioned earlier. In fact, the daily distance made on average by a person, between 1975 and 1995, has doubled and presently 75% of the daily trips are done by car (Rodenburg et al., 2002). Yet, a fifth of all the kilometres made correspond to daily trips of less than 15 km and around 7500 km of roads are blocked daily by traffic jams (CE, 2003). Traffic congestion is growing in all urban areas and has a measurable impact on an economy. Congestion cost in 2003 reached, on average, 2% of the GDP or 120 billion just in Europe (15 countries) (UITP, 2003). On the other hand, and adding to this scenario, we can also mention that railway transport has suffered a 22% decline, in spite of the differences among several State Members (EC, 2003).

The expansion of urban regions increases the number of trips made by their residents. Table 1 presents land transport types in the 15 European Countries and their evolution between 1970 and 2000. The constant growth in the demand for mobility is proved by the increase in the number of cars in this period of time. In 2000, 177 million cars were registered in EU15, an impressive increase of 215% in three decades.

Table 1: Type and evolution of land transportation in the EU15, 1970-2000

	Transport types	1970	1980	1990	1995	1996	1999	2000	a.a.g.r.
Roadway	Passenger cars (millions)	82.48	103.21	143.27	180.00	169.03	173.76	177.30	2.6%
	Buses, Coaches (1000)	331	444	484	486	510	525	535	1.6%
	Freight vehicles ⁽¹⁾ (1000)	7 480	10 842	17 399	19 795	21 998	22 855	23 671	3.9%
Railway	Locomotives and Railcars (units)	49 969	46 639	<i>44 524</i>	<i>40 042</i>	<i>38 787</i>	<i>38 330</i>	<i>38 280</i>	-0.8%
	Passenger transportation (Units) ⁽²⁾	97 581	95 735	84 386	79 046	<i>76 507</i>	<i>77 130</i>	<i>76 185</i>	-0.8%
	Freight wagons (units)	1509	1218	888	827	522	517	*	-3.6%

⁽¹⁾ Lorries and trucks ⁽²⁾ Coaches, rail cars and trailers; estimates in *italic*; * No information available; a.a.g.r. – annual average growth rate.
Source: EC (2003: 35)

So we can understand why transportation, by itself, represents around 10% of the European Gross

Domestic Product (GDP). It is an industry that is worth around 1 trillion Euros per year and employs more than ten million (CE, 2003).

Not surprisingly, between 1970 and 2000, the highest annual average growth in registered cars occurs in countries such as Greece, Portugal and Spain, whereas the lowest averages occur in Sweden and Denmark (EC, 2003).

In developing countries this expansion is more in keeping with population growth, but the increase in the corresponding trips may be considered large (Gilbert, 2000). We could assume that, in developing countries, one of the major challenges of present-day urban planning is to control the increase of traffic in urban areas. Different practices have also already been documented as is the case for Singapore (e.g. Chin, 2000) or for Bangladesh (e.g. Fahimuddin, 2002).

To combat these new urban pathologies, in a period where the development applied to cities has an enormous impact on the stability and quality of urban life, it is necessary to reflect on urban development using an integrated policy – sustainable development – which is economically feasible, socially acceptable and friendly to the environment.

At the beginning of the 21st century the European Commission adopted the Sixth Environmental Action Programme (6th EAP) for a 10-year period. One of the objectives of this programme is to provide best practices and transport management policies in order to curb the excessive demand for mobility (CEC, 2001).

In 2003 two new directives were issued designed to boost the transport sector's move towards a more sustainable management. The first law aimed at making the Member States comply with the use of biofuel or other renewable fuels in transports. The second law was directed at the transport of goods by rail, aimed at facilitating an increase in the liberalisation of the sector in what concerns the transport of freight (Silva, 2003).

But if for citizens the association of urban development with sustainability is already present in principle and in discourse, carrying through means hard work and is full of challenges. Any honest assessment of the last 10 years leads to the conclusion that the world has made little progress in addressing the major problems that the Rio Summit set out to tackle (Brown et al., 2001).

The application of this concept to daily life requires both government and private administration measures, but it also means that there has to be an international consensus on the matter. The key component of sustainable development is changing human attitudes to preventive environmental actions (Monteiro et al., 2004). An innovative view of sustainable transportation requires an intermodal system both in passenger and freight transportation. To create this intermodal approach it is necessary to overcome several obstacles and there must be appropriate policy and decision-making systems that incorporate genuine public participation (Szyliowicz, 2003). This approach also has economic benefits, for instance, public transportation brings employment as it creates 2-3 times more jobs than private transportation (UITP, 2003).

The application of innovative and efficient technologies can also offer new opportunities to reach a more balanced development in the transport sector. However, to some researchers only the combination of environmental policies and a change in societal behaviour can accomplish the sustainable use and management of mobility (Scaringella, 2001). Creating a better future requires acting now for a more balanced present, and governments and businesses in all sectors need to be committed to policies and programmes that improve current mobility trends and patterns.

Urban mobility has become an international problem and several countries gather in consortia to sign international agreements and developed projects with the aim of changing current mobility patterns, and guiding the transportation sector to a better future.

The OECD and the EU have developed principles of sustainable transport and sustainable traffic to tackle the growth of traffic in the last few years. Different strategies centred on sustainable mobility and environmentally-friendly transportation have been presented in different countries but so far limited success as been recorded (Gudmundsson, 2003). With the introduction of the 5th Framework Programme (FP), in 1998, the European Union launched several projects, all intending to reduce the number of circulating cars and, consequently, to reduce the greenhouse-effect (Herala, 2003).

EU policies frequently have some bearing on local authorities. In fact, around 80% of European cities receive financing from European entities (NOVEM, 2001). The sustainability of urban mobility was adopted by different associations, such as POLIS (Cities and Regions Networking for Innovative Transports Solutions), for example, and was applied in countless projects developed by different EU institutions.

Table 2 presents an overview of some of the activities developed in the EU in the framework of transport and sustainability during the last two decades.

Table 2: Overview of the most important documents and projects in the EU's frameworks targeting sustainable mobility

Name	Dates	Description
POLIS	1989 - ...	European Institute aimed at the development of innovative policies and technologies in the area of sustainable mobility
Community Treaty	1992	Treaty that integrates transport management policy in UE
5 th Environmental Action Programme	1992-1999	Directed solutions for environmental problems towards sustainability
Agenda 21	1992 - ...	Presentation of urban policies targeting sustainable development
“In Town Without My Car!”	1998 - ...	Campaign aimed at debating and providing information on problems of present-day mobility, promoted by the European Programme “Car Free City Day”
5 th Framework Programme	1998-2000	EU support to projects in the area of sustainable development
Most	1998-2002	Project aiming to introduce mobility management in transport policies, promoted by the 5 th FP
Eltis	2000 - ...	Information Portal developed in the Voyager project promoted by the 5 th FP
Civitas	2000 - ...	Project that develops innovative strategies for mobility sustainability promoted by the 5 th FP
6 th Environmental Action Programme	2001-2010	Issued information on the best practices for mobility management
Tapestry	2001-2003	Project aiming to promote communication, publicity and awareness campaigns to stimulate the use of sustainable mobility in travel within the EU

Note: ...= in force

Outside the EU, Canada has also developed some projects in the area of sustainable development. The Sustainable Transport Fund created by the government of Canada, which became formally known as the MOST project (Moving on Sustainable Transportation), has as one of its major goals to provide Canada with information and tools aimed at the implementation of a better sustainable transport policy, stimulating the development of innovative measures that constantly seek to quantify the advances made in development.¹ The MOST Programme was created by Canada's Transport Department and has developed more than 50 projects since 1999. Its areas of action include urban planning projects, projects focusing on public traffic, active transports, car

¹ At <http://www.tc.gc.ca>, accessed on 2005-01-23.

pooling, improved technologies, improved fuel and better mobility practices. Canada's strategy for 2004-2006 is structured into seven steps (TC, 2004): encouraging Canadians to opt for less polluting transports; promoting innovation and the development of skills; improving the systems' efficiency and optimising means of transport choices; stimulating the country to develop more efficient vehicles, with better fuel and better infrastructures; promoting the performance of public transport; improving government and transport sector decision-making; and improving transport operators' management.

It is acknowledgeable nowadays that environment and urban development became two inseparable issues. Nevertheless, the application of the sustainability concept to the reality requires a series of measures from both public and private entities and also an international consensus concerning this matter.

Creating and implementing strategies for urban sustainable development is an activity that mainly concerns local governments, cities and regions. This is because each region has its own particular characteristics and needs, and these require tailored policy responses that can best be designed locally.

A wide range of policy measures has recently been proposed to cope with the high social cost of geographic mobility, such as information campaigns, user charges, emissions standards, mobility constrains, new forms of land-use and physical planning and new transport technologies. The main goal in most urban areas is also to stimulate public transportation and reduce car use (Banister et al., 2000).

The local dimension of the transport sector problem has already been acknowledged in several countries and by multinational entities such as the United Nations (UN) and the European Union.

Analysing the strategies for sustainability used by three benchmarking cities - the Metropolitan area of Curitiba, Rotterdam (part of Randstad) and the Metropolitan area of London -, we come to the conclusion that they were all different, even though they shared a common goal – to provide the population with an alternative to private transport that, together with factors of spatial planning and social cohesion, would make the city a more “competitive” one. Table 3 shows the main action guidelines and the resemblances and differences found in the different cites under study.

Table 3: Mobility management strategies adopted in three benchmarking cities

Measures/City	Curitiba	London	Rotterdam
Financing	Transport system was initially financed by the municipality. Nowadays it is a self-sufficient system	Greater London Authority	Central government, Rotterdam Municipality and European Union programmes
Priority of public transport	Bus network divided into different categories for different needs	Giving the bus the same usefulness as the underground	Interconnection between different public means of transport
Educating the population	Education on the needs of city sustainability, including mobility, starts at school. 75% of the population travels by public transport	New interactive forms of information on schedules and delays in buses and underground. Interactive information on road traffic	New interactive forms of information on schedules and delays in public transport. Interactive information on road traffic
Alternative transport	Bicycle lanes	Well-established underground and motorcycle travel, with programmes promoting their use	Bicycle lanes
Actions began	1974	2000	2000
Strategy	Integrating a first class bus network with a well-defined structural axis which channels population growth	New common and integrated TfL management to improve all public transport services	Intermodality between different public and non-polluting means of transport
Innovation	Creation of bus lanes between peripheral areas and between the periphery and the centre. Different buses with different types of services	Road tolls during rush hours in city centre	Creation of a special lane for freight transport between the city centre and the port.

The experiences of the selected cities show that the strategy adopted with a view to sustainable mobility must consider several factors, especially social ones, which depend on the population's culture and habits, which vary according to each society, and strategies should be adapted to their needs and possibilities.

Thus, we can conclude that there is no single strategy with defined measures for sustainable mobility, but a range of experiences that can be adapted to the reality at hand. The strategy behind the success of these actions is the implementation of horizontal measures such as population education, information management and traffic control boosting participation and responsibility on the part of the population and an integrated management of all public transport services.

A common measure to all the cities studied is the effort to improve and modernise the

attractiveness of public transport, especially of public road transports, such as the bus, where infrastructure already exists and there is no need for big investments. Frequently, this measure is associated with the promotion of alternative transports, such as bicycles or car pooling, in order to create intermodality and inter-connectivity between different transports.

Although several projects clearly point out the direct connection between mobility modes, energy consumption and the rate of urban sprawl, an agreement has yet to be reached on the best strategy for urban spatial organisation and mobility management, and what their relationship should be with the allocation of urban activities.

Until the mid-1990s transport planning was in progression, but with no clear theoretical groundings (Banister, 1994). Everyone was aware of the problems created by the increased demand for transportation and most efforts were directed at finding methods of analysis with practical, usually quantitative, output. More recently, several studies have attempted to understand the relationship between land use, urban form and urban travel, and seek to provide empirical evidence on these aspects (Cera, 2003). Some authors (e.g., Kitamura et al., 1997) suggest that attitudes affect travel patterns more strongly and perhaps more directly than land use factors. In this context, the local authorities have an important role in presenting information-based policies.

To the best of our knowledge, a study has yet to be conducted that identifies the different sustainable mobility strategies in a comprehensive and representative group of cities in the same country. In fact, most of the studies (e.g., Sheehan, 2001; Sequinel, 2002; Marshall, 2000) focus on a selected benchmarking group of different cities in different countries. Moreover, and more importantly, none of these studies provide a thorough and quantitative account of the perceptions of local public authorities with regard to the issue of sustainable mobility.

In this study, we seek to fill these gaps by identifying the different sustainable mobility strategies and the corresponding perceptions of the Portuguese local public authorities, especially the Portuguese municipalities.

3. Sustainable mobility measures in Portugal

3.1. Some historical facts

The transport sector in Portugal (similarly to other countries) is one of the economic sectors which has revealed some of the major environmental pressures. The increasing number of cars, the lack of a social transport policy, and flaws in territorial management are matters of concern that contribute to settlement patterns and lifestyles which endanger the objectives of sustainable development that the country has made a commitment to achieve (MCOTA, 2002).

The economic cycle observed in Portugal, between 1990 and 2000, led to a considerable increase of the number of vehicles in circulation. In fact, the motorisation rate almost doubled in this period (Gonçalves, 2003).

Despite the commitment to the Kyoto Protocol, Greenhouse Gas (GHG) emissions in the transport sector rose 67% between 1990 and 1999, contributing with about a quarter of the national GHG emissions (Quental et al., 2004). Additionally, when analysing the variation in energy consumption between 1990 and 2000, roadway transportation has consumed the largest energy quota, reaching around 90% of the sector's total (MCOTA, 2002).

The use of improved technologies and fuel has caused greater efficiency in energy consumption and a decrease in some pollutant emissions. Nevertheless, air quality in most of the larger cities remains below the desirable level (MCOTA, 1999).

The study “Drivers Awareness of Energy and Environment Issues”,² carried out in 1999/2000 with the support of the EU programme, set out to characterise Portuguese drivers. When questioned about the main reason for the degradation of the country's environment, road traffic was pointed out by 31% of the respondents. The solutions for this problem, according to those interviewed, should include “investment in infrastructure”, considered to be the most efficient instrument in solving the transport problem (thus revealing a more traditional way of thinking), the high level of responses favouring instruments such as “investment in public transport”, “awareness campaigns” and “attitudinal changes from drivers”, reveals that at least awareness of the problem is already significant.

² At <http://www.eu-tapestry.org> accessed 2004-12-27.

Portugal, as well as Greece, Ireland and the Czech Republic are the EU25's countries where the largest increase in polluting emissions was registered, not only due to the large increase in road transportation but also due to the high average age of the fleets (CE, 2003).

Particularly regarding private transport, in Portugal there has been a significant increase in the kilometres covered by car. On average, there was a rise from 2694 km in 1990 to 4641 km in 1997, which represents an annual growth rate of 8% (MCOTA, 1999). According to the latest Population Census, between 1991 and 2001, the modal share of private cars in commuter trips within the Lisbon Metropolitan Area rose from 24% to 44%. Within the Porto Metropolitan Area, the evolution in the same period was from 23% to 49%.³

In contrast, as a result of the existing ambiguity of their roles in transport policy, the demand for public and rail transportation is in decline, and concurrently, the cost incurred by operators tends to rise (Caetano, 2004). This fact can be related both to the quality and steady decline in supply and to changes in ways of life and consumer habits that benefit the private car. However, between 1996 and 2003, approximately sixteen billion euros were invested in public transportation (Pereira, 2004). After decades of unsustainable growth, the transport sector requires an urgent strategic intervention.

Portugal also benefits from several financing and cooperation sources promoted by the EU with the aim of supporting sustainable mobility measures. The cohesion fund, foreseen in the Maastricht Treaty (1993), is a financial instrument created to reinforce the economic and social cohesion of the more needy Member States, as is the case of Portugal, Spain, Greece and Ireland (Ponte, 2003). This fund was created to support, among others, projects focusing on the environment and a trans-European transport network with co-participation rates that may reach 85% of the investment (Ponte, 2003). The 3rd Community Support Framework (2000-2006), a European initiative for growth, networking and knowledge investment to sustain employment growth, presents sector support strategies which are defined in the operational programmes designed to improve accessibility and transports, and the environment.⁴ Also in the scope of the 5th FP (1998-2002) for Portugal, around half is destined to transport management.

³ At <http://www.eu-tapestry.org> accessed 2004-12-27

⁴ In <http://www.qca.pt/>, accessed 2005-01-21

However, only a few sustainable measures can be seen. According to Ponte (2003), one of the main reasons why measures targeting sustainable mobility have not yet been implemented is economic, since the transport sector has a strong relevance in the economic growth of the country and occupies a primary position in Portugal's revenues. Portugal is presently resting on a rather solid pillar in terms of the financial incentives coming from this sector, as gains in the transport sector are large and diversified. Indeed, the main sources of the revenue budget for the economic year of 2002 were identified as proceeding from (Ponte, 2003): indirect taxes on consumption specially from fuel industries; fines, duties and other penalties (including traffic fines and other duties related to the sector and its agents); transfers regarding credit institutions and insurance companies (on average, 5 million Euros from the vehicle system alone).

Supplementary to the economic importance of the transport sector, when we look at the 3rd CSF programme for accessibility and transport, we realise that EU funds intended for the transport sector in Portugal are channelled mainly to the creation of trans-European connections, including railway. Thus, significant funds have not yet been made available to implement most of the important measures needed for the development of sustainable mobility, such as, for instance, measures aimed at reducing greenhouse-effect gas emissions or diminishing traffic jams.

There are, however, other reasons why these measures have not been implemented. Since 1974 living standards in Portugal have progressively improved (Ponte, 2003). The increase in people's purchasing power has allowed them to acquire more and better goods, such as private cars, for example. It should be remembered that, unlike countries such as Japan, individuals can easily buy a car. Added to this, we are faced with another problem: many people prefer to endure traffic jams rather than change their habits (Gilbert, 2000), which makes the proposal of replacing private cars with public transport even more difficult.

Comparing the Portuguese transport sector with most European countries, it is clear that Portugal continues to reveal unsatisfactory performance levels which are critical to international competitiveness. Regulations are highly dispersed and fragmented and huge differences can be observed between different modes and even between different urban areas. Several recent strategic measures have been adopted in Portugal designed to change this bleak scenario in the transport sector through more sustainable management strategies.

3.2 Existing sustainable mobility measures

On the mobility issue, the governmental strategy presented can be summarised under three lines of action: the privatisation of public transport operators; the promotion of railway transport, which appears as a strategy for national mobility in the future both as an option of alternative public transport and as a connection to the centre of Europe and the creation of Metropolitan Transport Authorities. Along with these lines there were also the promotion of public transport and measures to discourage private transports.

The relationship between the environment and mobility management could also be observed in other government policies, such as the National Strategy for Sustainable Development (ENDS), the National Programme for Climatic Change (PNAC), the Programme for the Reduction of National Emissions (PTEN) and the National Reference Strategic Framework. The ENDS, the programme that best interrelated mobility with sustainable development, intended to invest in new transport solutions in urban areas. Thus, it would permit the reduction of traffic jams and environmental degradation without the need for heavy infrastructural investments, experimenting with new technological innovations – in the areas of fuel and motorisation – and new organisational solutions in public transport management (Mota et al., 2005). The National Reference Strategic Framework was created for the period 2007-2013. This framework also includes a priority strategy for the qualification of cities through several actions where sustainable mobility is included (Vazquez et al., 2004).

To achieve sustainable development, and consequently sustainable mobility, it is important that efficient coordination between entrepreneurial initiatives and actions be developed, both from the urban and economic sectors' point of view. Thus it is critical that the municipalities play an active role in this process.

In 800 years of Portuguese history, municipalities have played an important role in public administration. However, after the 1974 revolution they were restricted to mere administrative units of the state, as all regulations came from the central level and were directly applied at the local level (Carlens, 2003). In the last few years, major reforms have taken place in the relationship between the central, regional and local levels of administration, in the organisational design of public policies, and in the evaluation of administrative outcomes and outputs (Nikos, 2000). Indeed, the government recently announced the creation of two Metropolitan Transport

Authorities (Lisbon and Porto), declaring furthermore that the future transport policy would be centred on the municipalities.⁵ The goal is to insure the strengthening of national cohesion and interregional solidarity, and to promote efficiency in public management and effectiveness, taking into account the rights of citizens.

The Metropolitan Transport Authorities have assumed the responsibility of the transport sector in the two metropolitan areas, Porto and Lisbon, which until now were divided between the central administration and different municipalities. At this point, the implementation of Metropolitan Transport Authorities, as proposed by the government, is important in order to bring solutions to public transport, which might lead to an increase in the number of interfaces between private and public transport, thus improving the quality of services (Ponte, 2003).

When it comes to the consequences of all these changes, local authorities have faced both a lack of capacities and organisational problems. It is clear that most of the municipalities, especially the rural areas, were not adequately prepared to deal with the changes brought on. Corroborating this, a survey conducted in 2002 by the consultants Neoris revealed that 44% of Portuguese mayors considered administrative modernisation a necessity and 39% of the mayors defined it as a major priority (Carlens, 2003).

Thus the central government made efforts to meet these municipalities' needs by providing them with support agencies. This autonomy, however, is sometimes experienced as being highly relative. In a situation of drastic cuts in public expenditure, the central government is challenging municipalities to find new sources of funding for investments in transports, bearing in mind the need to reduce private cars, thus improving urban mobility (Carlens, 2003).

Local authorities are very diverse and apply different methods to promote the participation of local communities in the formulation of sustainable development policies, and usually work in several partnerships. Évora, for instance, is considered a good example of what is being done by Portuguese municipalities due to its great capacity to adopt a global vision of urban issues (CE, 1996). However, is not possible to identify one Portuguese city where we can find a truly integrated strategy at the local level.

Local governments are closer to the people they represent, making them better able to respond to their needs and they became to recognise their responsibility in developing sustainable

⁵ www.portugal.gov.pt accessed in 05.01.25.

communities. Also it is possible to create networks of municipalities (even though this is a long term process), which offer a solid structure that might contribute to the exchange of best practices. Unfortunately, these networks are not very frequent in Portugal (CE, 1996).

It is important to note that some working methods, certain organisational and management processes, and mechanisms for action have been introduced both in land use planning and in mobility management, always with the goal of achieving sustainable development. In this context, the main directives of projects developed in Portugal in the area of mobility and traffic jams are (Osório-Peters et al., 2002): intermodal transport and inter-operability; unbalanced regional development; transport price; public transport infrastructures; incompatibilities, urban transport jams, precarious regional situation. Given the innovative initiatives already underway, such as the creation of the Metropolitan Transport Areas, new trams and subways, logistics platforms, and others, the important issue here is to adopt an integrated approach that guarantees an equal share of the environmental, social and economic costs (Banister, 2000).

Local government could and should pioneer new approaches to sustainable development and urban management. Thus, it would be important for municipalities to assume the responsibility for (and organise) all the resources needed to address the environmental problems facing their communities. Since the local authorities do not have the regulatory and financial authority required to effectively contribute to sustainable mobility, other levels of government must provide resources and support for the financing, management and policy-making necessary for municipalities to achieve sustainability in their communities.

Although there is still a lack of an integrated sustainable mobility measure with a solid supporting background, public actions are now more focused on improving the image of public transportation. In fact, in Portugal different actions have taken place throughout the country. Most of these actions have in fact been promoted or supported by municipalities and metropolitan areas.

One of the most well-known mobility campaigns is the “European mobility week” and “In town without my car”, a European initiative which is today internationally renowned, that takes place in September of each year. This campaign is coordinated by Eurocities, Energie-cités and Climate Alliance and national coordinators and financed by the European Commission.

In Portugal this campaign started in 2000 and is promoted by the Environment Ministry through the Environment Institute.⁶ Unfortunately, the number of municipalities that joined the initiative has decreased over the years. In 2003 there were 74 municipalities, in 2004, 57, and in 2005, just 46 municipalities participated in this initiative (Serra, 2005).

Nevertheless, the campaign has always had a positive impact both on the citizens and the people responsible for making the decisions, as well as increasing public awareness of these issues. Also this Campaign is designed to promote programmes to introduce permanent sustainable mobility measures in cities. Table 4 shows the permanent measures introduced.

Table 4: Permanent measures introduced within the scope of the European campaign “European Mobility Week” up to 2003

Type of initiative	Number of permanent measures
New pedestrian areas	33
Bicycle lanes or parking facilities	9
Development of public transportation network	8
New “car-free days”	2
Parking areas (new or enlargement of existing)	8
Free – use bicycles	2
Electric vehicles	1
Traffic control	13
Urban public space regeneration	6
Noise monitoring and control	3
Air quality improvement	2
New roads for diverting traffic from urban centres	1
Parking control	2
Bicycle rental systems	1

Source: Tapestry (2003: 141), at <http://www.eu-tapestry.org> accessed 2004-12-27.

Other initiatives are underway all over the country. Lisbon and Porto, the municipalities with the most serious mobility problems, took part in the initiative “Switching to public transportation”, coordinated by the UITP (International Unit of Public Transportation) and promoted by several transport operators. The main aim of this project was to make people use public transport more often by providing more precise information and networks.

Other campaigns to promote public transportation were made. One of these campaigns involved several operators and was launched by the government agency responsible for the application of EU funds to the transport sector. The campaign slogan was “Together everywhere you go” Also the rail operator, following the approach of the public transportation campaign, launched a

⁶ At www.mobilityweek-europe.org accessed 2005-01-21.

nationwide campaign to promote rail services, especially in urban areas. The campaign slogan was “Don’t lose time behind the wheel of your car!”.⁷

Moreover, different initiatives to promote intermodality were also initiated in the two largest Portuguese cities (Porto and Lisbon). One of the most relevant examples took place in Porto, where the recent opening (in 2003) of the light rail network represented a positive enhancement factor by encouraging a partnership between the bus and metro operators, and enabling the introduction of the multimodal contactless card called “Andante” (meaning “on the move”). The “Andante” campaign is part of a broader initiative designed to accompany the extension of coverage to several public and private operators. This measure is very important since public transportation in Porto is poorly integrated. Those who use public transportation in Porto are unanimous in recognising that there is a lack of integration namely at the level of time schedules between operators, and a lack of network coherence. It is expected that “Andante” and this new approach may play an important role in changing people’s attitudes towards urban mobility as it permits users to get more accustomed with the advantages of transport services and the possibility of multimodality.

Similarly, Lisbon introduced a new contactless card called “Lisboa Viva” (“Live Lisbon”). Although Lisbon already had a social pass that could be used in different operators, “Lisboa Viva” uses new technology. This multimodal pass, like the “Andante”, was considered a success given the number of cards issued within a short period of time.

Real time information at bus stops was also one of the pilot actions recently implemented. Some operators have started to devise other ways to inform clients about bus schedules. The SMSBUS was created in Porto (mobile phone text messages, called ‘SMS’ in Portugal, providing information of public transportation), taking advantage of the huge success of mobile phones in Portugal. If a client in Porto wants to know at what time a given bus is going to pass at a specific bus stop, all he/she has to do is send a text message to the number 3001 with the code of the bus stop in question at a cost of 0,20 Euros. Up to April 2005 the SMSBUS received about 133.500 messages.⁸ Another important initiative in Porto was the *itinerarium.net* that serves to guide users across the urban public transport system, enabling web searches for single or multimodal routes between two points, considering as parameters cost, comfort and speed.

⁷ At <http://www.eu-tapestry.org> accessed 2004-12-27.

⁸ At www.stcp.pt accessed on 06.04.15.

The Lisbon municipality has also adopted several tough measures and recently closed a traditional central district (Bairro Alto) to car traffic, and other similar initiatives are under study. The most innovative initiative concerning mobility and transport infrastructure took place in Lisbon with the introduction of the first “on and off” bus lane. This lane has a mechanism that switches to “on” and gives lane priority to buses whenever a bus is approaching and private cars can no longer enter the lane.

Several programmes were created in the last few years, with different rates of participation. The 3rd CSF (2000- 2006) alone financed 410 million euros for cities and metropolitan regeneration measures within the scope of the CCDR’s Regional Programmes. All together, the Urban Environment Improvement programme, the Digital City project, URBCOM, URBAN II, and Urban Rehabilitation Programme (PRU) account for more than 418 million euros in public expenditure with particular incidence on urbanism and mobility (Portas et al., 2003).

Despite all these initiatives, both with regard to mobility and transport infrastructure and urban system-related policies, a comprehensive picture of the perception and commitment at a decentralised level is still missing (particularly) in the Portuguese case.

In the next section, we attempt to fill this gap by presenting and discussing new evidence, gathered through a direct survey of the Portuguese local entrepreneurial governance modes regarding sustainable mobility management.

4. The perception of Portuguese local public authorities regarding sustainable urban mobility

4.1 Methodology and representativeness of the data

The main goal of this research is to identify the different sustainable mobility strategies and the corresponding perceptions of Portuguese local public authorities. There is scant empirical assessment from this perspective, and the existing reflection on governance aspects targeting sustainable policies has not yet dealt with the issue properly and in a convincing way. Such a shortcoming is particularly acute in Portugal where sustainable urban mobility management is still an undeveloped and scarcely studied reality.

Given the absence of databases on these matters, we devised a direct survey which was sent to all the Portuguese municipalities (308) and allowed us to gather new evidence on the perceptions

and strategies of Portuguese local public authorities regarding sustainable urban mobility management.

The data gathered permits an evaluation of the best practices and the inherent factors that contribute to or restrict the development of mobility plans at the local level in Portugal. In particular, it provides answers to a third of our main research questions: What is the sensibility or perception of Portuguese local authorities regarding sustainable mobility issues? Are they aware?

The survey is divided into three groups. The first group of questions targeted the degree of commitment of municipalities regarding mobility issues. Specifically, it questioned whether there is an independent department in the municipality to deal with mobility issues, the size (number of employees) of that independent department (or in the absence of an independent department, the size of the department that dealt with mobility issues), and the percentage of skilled/educated workers (i.e. workers with a university degree) of that same department.

The second group of questions sought to ascertain the degree of intervention of the municipalities with regard to sustainable mobility. In particular, it asked more quantitatively related aspects concerning mobility indicators, namely: the existence of parking for private cars, freight transportation and bicycles; parking distribution in terms of the corresponding cost (private parks, parking meters or public parks); the existence of special lanes for buses and bicycles; intermodality and costumer information, and the existence of railways.

Finally, the third group focused on land use and urban planning, with the intention of assessing the pro-activity of the municipalities in this regard. We questioned municipalities on their involvement and participation in urban programmes, whether they had mobility plans and whether they had conducted or contracted studies concerning mobility management and land use.

The survey was conducted by e-mail, telephone and fax between March and December 2005. In total, 192 of the 308 municipalities responded to the survey, which corresponds to an above average response rate of 62.3%, a truly remarkably rate for a non-compulsory survey.

In addition to the information gathered through the survey, we collected from secondary sources (Fonseca, 2002) and the Sales Index 2003 (*Marktest*) a set of variables that enabled a comprehensive characterisation of the municipalities. These ‘control’ variables were divided into four main groups: demographic (population density), income and employment (income index, employment index, and employment ratio), human capital (education and culture index, development index), and transport infrastructure (total vehicles to employed population, total vehicles to population, total private car to population, total freight to population, auto average age, and motorcycles to 10000 inhabitants).

Table 5: Regional representativeness of the respondent municipalities by NUTs III

	% total respondent municipalities	% total municipalities (population)	N
Minho-Lima	2.6	3.2	10
Cavado	2.6	1.9	6
Ave	2.6	2.6	8
Grande Porto	4.2	2.9	9
Tâmega	5.3	4.9	15
Entre Douro e Vouga	2.1	1.6	5
Douro	3.7	6.2	19
Alto-Trás-Montes	5.8	4.5	14
Baixo Vouga	5.3	3.9	12
Baixo Mondego	3.2	2.6	8
Pinhal Litoral	2.1	1.6	5
Pinhal Interior Norte	6.3	4.5	14
Dão-Lafões	5.8	4.9	15
Pinhal Interior Sul	1.1	1.6	5
Serra da Estrela	1.6	1.0	3
Beira Interior Norte	3.2	2.9	9
Beira Interior Sul	1.1	1.3	4
Cova da Beira	1.6	1.0	3
Oeste	4.2	3.9	12
Médio Tejo	2.6	3.2	10
Grande Lisboa	3.7	2.9	9
Península de Setúbal	2.1	2.9	9
Alentejo Litoral	1.6	1.6	5
Alto Alentejo	5.8	5.2	16
Alentejo Central	4.2	4.2	13
Baixo Alentejo	4.2	4.2	13
Lezíria do Tejo	3.7	3.6	11
Algarve	4.2	5.2	16
Região Autónoma Açores	1.6	6.2	19
Região Autónoma Madeira	2.1	3.6	11
Group Total	100.0	100.0	308

Source: Authors’ computations based on a survey of Portuguese municipalities, March - December 2005.

The data collected are distributed throughout all the Portuguese NUTs II, from a minimum of 2 respondent municipalities in Pinhal Interior Sul and Beira Interior Sul up to a maximum of 12 respondent municipalities in Pinhal Interior Norte. In regional (NUTS III) terms, the data present a fairly good representativeness, although the Douro region and the Azores are relatively underrepresented and the Grande Porto NUTs III is overrepresented. The representativeness in terms of NUTs II is depicted in Figure 2, which again demonstrates the relatively poor coverage of our survey regarding the islands.

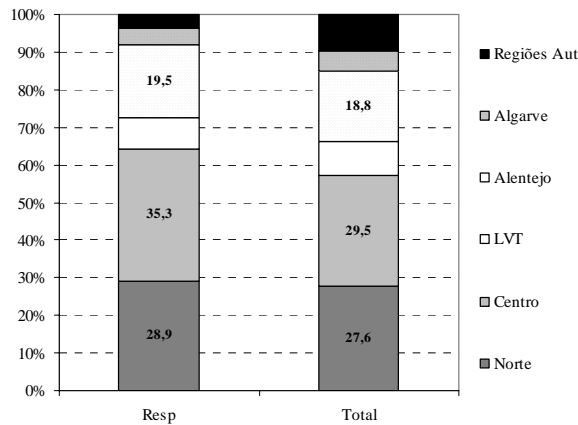


Figure 2: Representativeness of the respondent municipalities by NUTs II

Source: Authors' computations based on a survey of Portuguese municipalities, March - December 2005.

It is interesting to note however that both respondent and non-respondent municipalities present similar characteristics (cf. Figure 3) in terms of transport infrastructure, human capital, income and development, and demographic indicators.

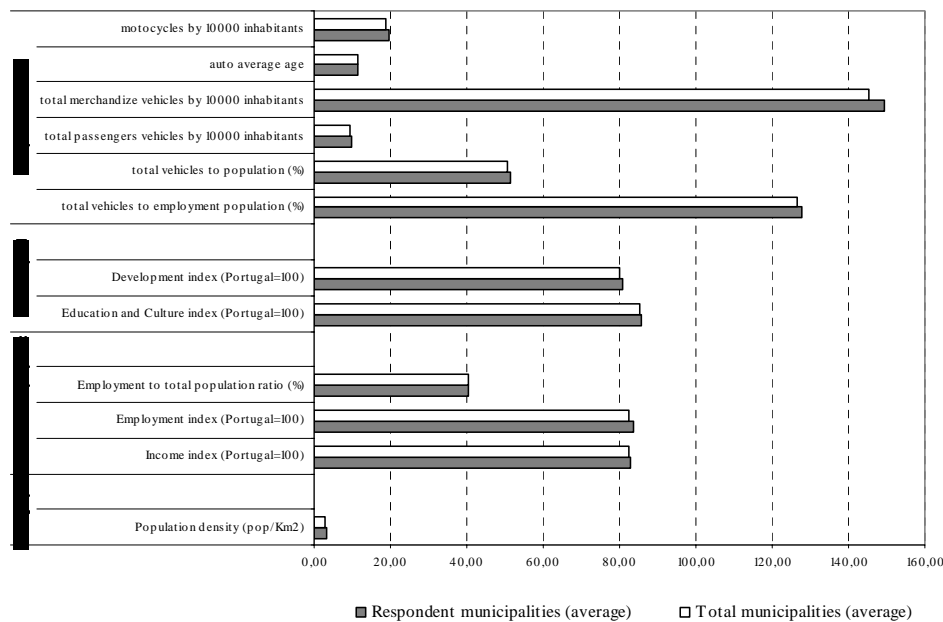


Figure 3: Characteristics of the respondent municipalities *versus* total Portuguese municipalities

Source: Authors' computations based on a survey of Portuguese municipalities, March - December 2005.

For instance, the respondent municipalities present an average value for the income index of 82.7, which is very close of the corresponding value of the whole population of Portuguese municipalities (82.3). This means that on average, respondent municipalities have an income level that is 80% of the Portuguese total aggregate value. The same occurs when we look at the education and culture index and the development index. Respondent and non-respondent municipalities present similar (average) levels of education, culture and development. With regard to the indicators of transport infrastructure, although they are slightly higher for the respondent sample, differences are not striking, presenting the highest discrepancy in relation to total merchandise vehicles per 10000 inhabitants – 149.5 for the respondents against 145.5 of the total population. Such evidence provides further support to our earlier statement about the soundness of the data’s representativeness.

4.2 Variables and descriptive results

To better assess the sensibility of the municipalities in relation to mobility management issues we analyse three variables simultaneously that we considered as the most relevant: mobility studies, mobility plans and surveys to assess citizens’ satisfaction.

There is some degree of linear association between the mobility studies, mobility plans and mobility surveys at the municipality level - the estimates of the Pearson linear correlation coefficient are positive and significant at 5% (cf. Table 5).

Table 5: Pearson linear correlation estimates (municipalities)

Variables	(1) Mobility Studies	(2) Mobility Plans	(3) Mobility Surveys
(1) Mobility Studies	1	0.247**	0.294**
(2) Mobility Plans		1	0.245**
(3) Mobility Surveys			1

Note: Significant at *** 1%; ** 5% e * 10%. N=177

Source: Authors’ computations based on a survey to the Portuguese municipalities, March December 2005.

To determine the sensibility and pro-activity of regions regarding urban sustainable mobility issues, Figure 4 show the regions were municipalities have the possible combination of the three different mobility variables used to assess the sensibility of the municipalities.

Beira Interior Sul is the only region where half of its municipalities have the three variables (mobility studies, mobility plans and mobility surveys) simultaneously. Cova da Beira, Grande Lisboa and Alentejo Litoral also have a relatively high percentage (33.3%, 42.9% and 33.3% respectively) of their municipalities with the three mobility sensibility measures. Nevertheless, in more than half (57%) of the total twenty-eight NUTs III regions, none of the municipalities claim to have all three indicators.

In Entre Douro e Vouga, Cova da Beira, Pinhal Interior Sul, Beira Interior Sul, and Grande Lisboa half or more of their municipalities claim to have, at least, two of the three variables.

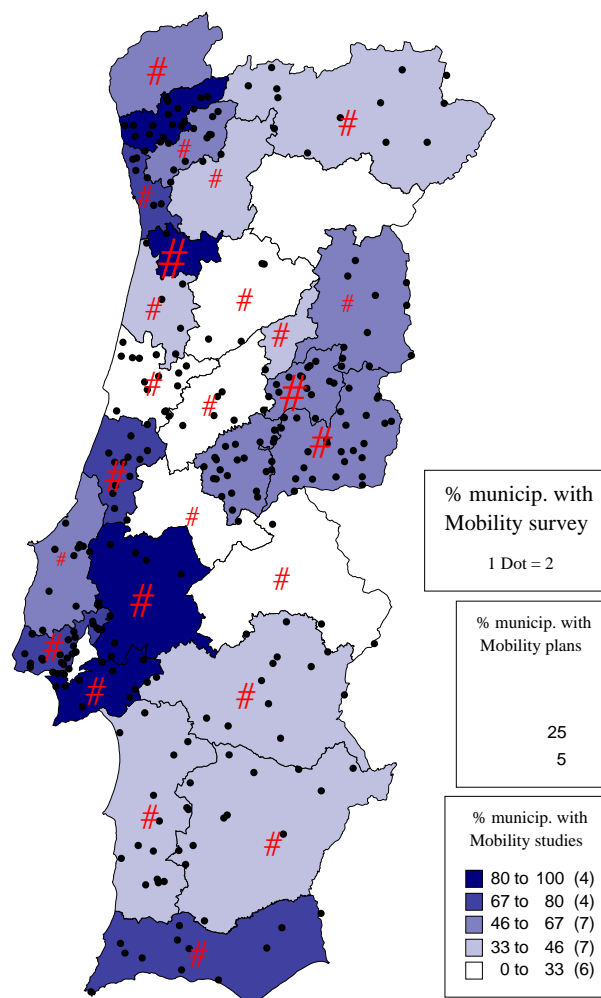


Figure 4: Relation between the percentage of municipalities in each NUTs III having mobility studies, mobility plans and mobility surveys

Source: Authors' computations based on a survey to the Portuguese municipalities, March December 2005.

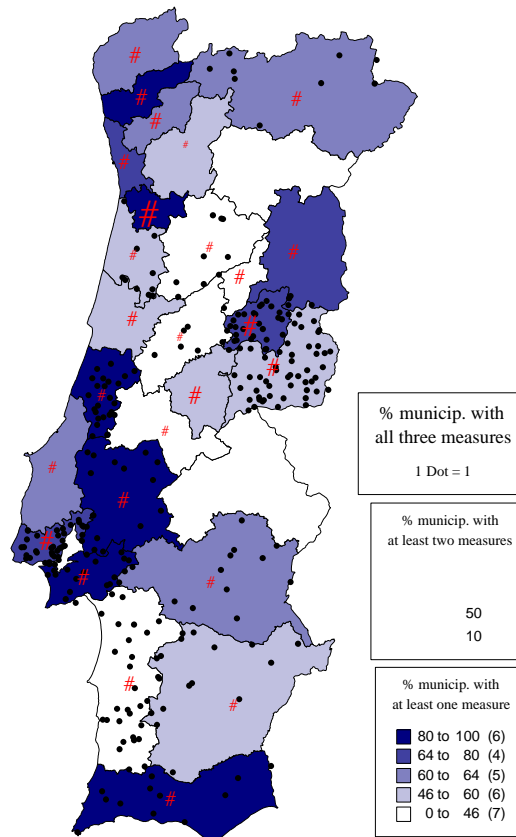


Figure 5: Relation between the percentage of municipalities in each NUTs III possessing at least one of the measures, at least two of the measures or all three measures

Source: Authors' computations based on a survey to the Portuguese municipalities, March December 2005.

With regard to mobility studies, 46.6% of the respondent municipalities declare having a mobility study. Although it is a solid percentage (almost half of the total respondent municipalities) most of them (84%) were completed in the last 5 years (cf. Figure 6). It should also be noted that a significant part of these studies aim to assess the municipality's conditions for people with physical disabilities.

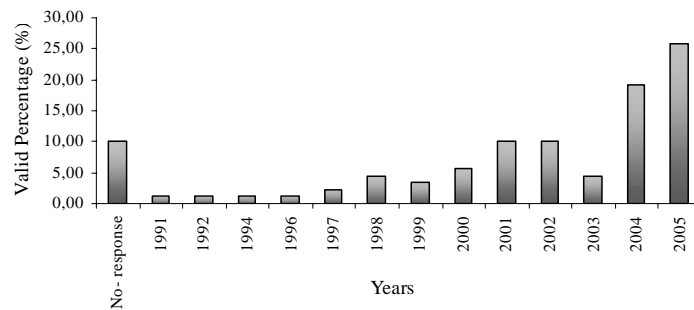


Figure 6: Evolution of municipalities' mobility studies distribution (in %) between 1991 and 2005

Source: Authors' computations based on a survey to the Portuguese municipalities, March December 2005.

It is interesting to note that the first municipalities to perform mobility studies in Portugal (from those that responded to our survey) are rather peripheral and inland municipalities, namely Mação (Pinhal Interior Sul), in 1991, followed in 1992 by Montalegre (Alto Trás os Montes), in 1994 by Guarda (Beira Interior Norte) and in 1996 by Faro (Algarve).

As expected, a high percentage of the municipalities (93.3%) outsourced their mobility studies to consultants or universities, usually in partnership with the municipality.

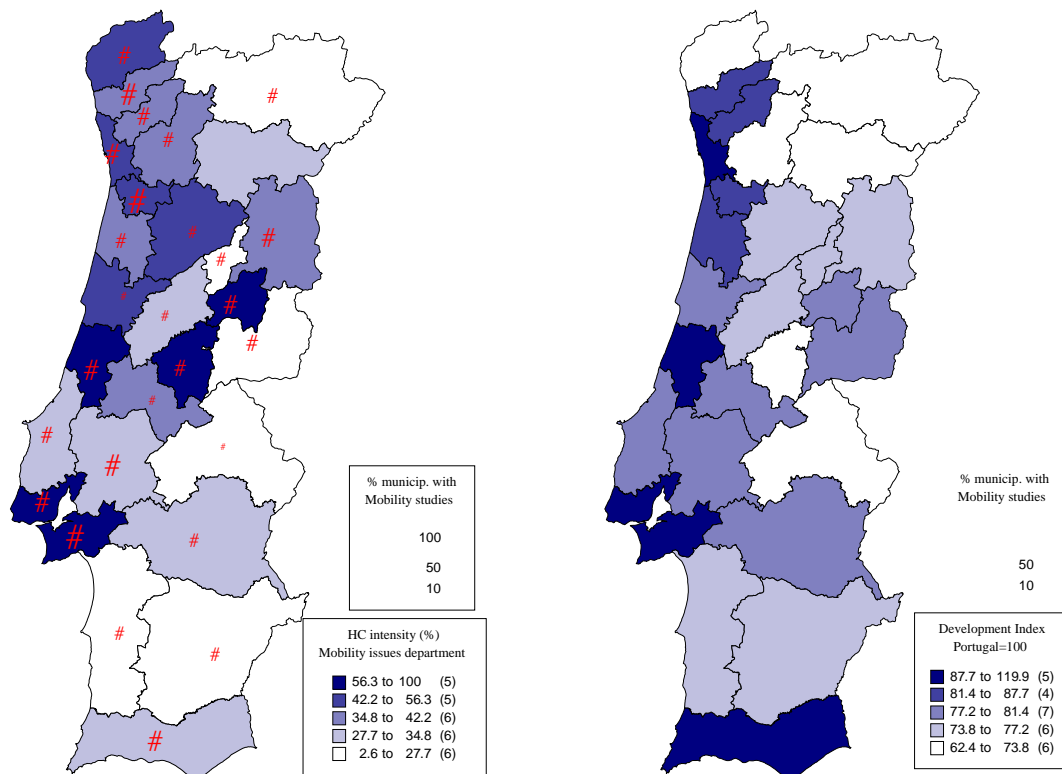


Figure 7: Relation between the percentage of municipalities in each NUTs III having mobility studies and Development Index and ratio of educated workers in the mobility issues department

Source: Authors' computations based on a survey to the Portuguese municipalities, March-December 2005.

The Development Index was taken from Fonseca (2002), "Índices de Desenvolvimento Concelhio", *Revista de Estatística*, INE.

As we can see in Figure 7, the existence of mobility studies in the municipality is significantly (linearly) correlated with the Development Index. That is, those regions where municipalities have more mobility studies, namely Grande Porto, Pinhal Litoral, Grande Lisboa, Península de Setúbal and Algarve, are also the ones that rank higher in terms of development.

Although not as significant, there is also a very good correlation between regions where municipalities have mobility studies with the level of educated workers in the mobility issues department. Once again, the regions Grande Porto, Pinhal Litoral and Peninsula de Setúbal appear as the ones where their municipalities have a high human capital intensity in the department in charge of mobility issues.

The Douro region is less sensitive to mobility issues, given that it comprises the municipalities that claim to not have mobility studies, and are simultaneously the municipalities with low human capital intensities in the mobility issues department.

Only a small number, 29.7%, of the respondent municipalities acknowledge having a mobility plan. However, most of them (61.7%) only began in the last 3 years. Figure 22 illustrates the evolution of mobility plans over the years. Similarly to mobility studies it is possible to see a positive evolution of the municipalities' interest in mobility management. Curiously, the pioneering municipalities in this regard were Góis (Pinhal Interior Norte, which implemented its mobility plan as far back as 1980, and Évora (Alentejo Central), which implemented its mobility plan ten years later.

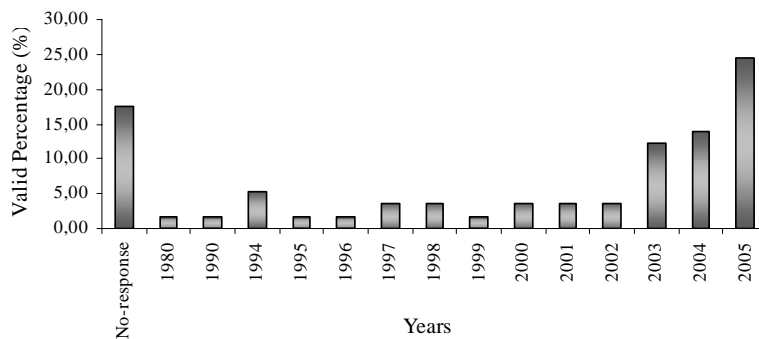


Figure 8: Evolution of municipalities' mobility plans distribution (in %) between 1980 and 2005

Source: Authors' computations based on a survey to the Portuguese municipalities, March-December 2005.

As we can see in Figure 9, out of the twenty eight NUTs III regions, only Entre Douro e Vouga, Cova da Beira, Beira Interior Sul, Pinhal Litoral and Lezíria do Tejo have more than half of their municipalities with mobility plans. It is interesting to note that among these regions Pinhal Litoral is the only one that presents a reasonably high level of development (as measured by the Development Index).

There are three regions where none of the municipalities have mobility plans: Cávado, Douro and Pinhal Interior Sul, the latter two being the Portuguese regions with the lowest level of development.

Correlating the (average) human capital intensity in the department in charge of mobility issues and the percentage of municipalities in each NUTs III with mobility plans, Cova da Beira and Pinhal Litoral appear as regions with a significant percentage of municipalities (66.7% and 50%, respectively) with mobility plans and a high average human capital intensity of employees in mobility-related departments. Nevertheless, Pinhal Interior Sul, where none of its municipalities have mobility plans, is the region with the highest rate of top educated workers in the mobility issues department. This situation is related to the small number of total workers in the mobility issues department in the municipalities of this region, usually one (university graduate) worker per department.

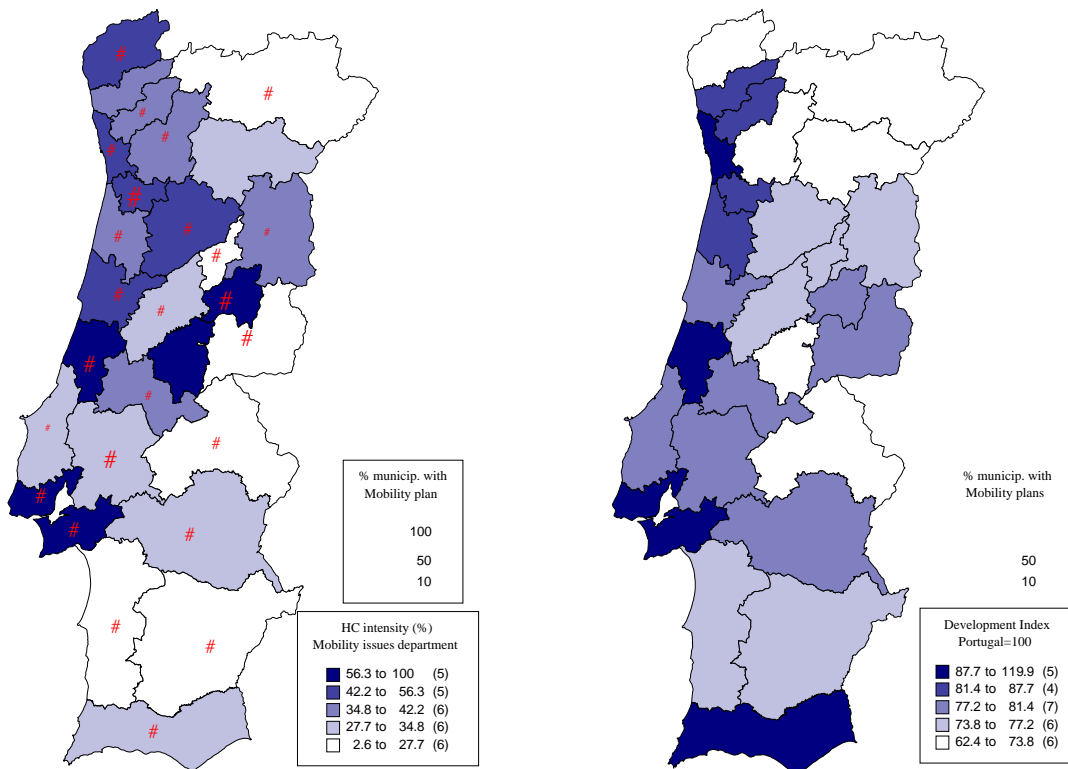


Figure 9: Relation between the percentage of municipalities in each NUTs III having mobility plans and the Development Index and ratio of educated workers in the mobility issues department

Source: Authors' computations based on a survey to the Portuguese municipalities, March December 2005.

The Development Index was taken from Fonseca (2002), "Índices de Desenvolvimento Concelhio", *Revista de Estatística*, INE.

As for the municipalities' mobility surveys, the 'top' regions (those that present half and over of their total municipalities with mobility surveys) are Beira Interior Sul, Grande Lisboa and Península de Setúbal.

With regard to the potential correlation between the ratio of municipalities with mobility surveys and the Development Index, our data show a very significant (statistical linear) correlation coefficient. In fact, although in the case of Beira Interior Sul the two variables are not directly related (this region has the highest percentage of its total municipalities with mobility surveys combined with a very low Development Index), most of the regions with a large percentage of their municipalities with mobility surveys are the ones with the highest Development Index (e.g. Cávado, Grande Lisboa). The worst examples come from Minho-Lima, Douro, Tâmega, Entre Douro e Vouga, Serra da Estrela, and Médio Tejo, which represent, in economic terms, some of the less developed Portuguese regions and an alarming picture of not having mobility surveys.

Despite the importance of citizens' feedback and the existence of reasonable levels of communication between citizens and the municipal authorities, only 18% of the respondent municipalities have prepared a mobility survey.

Such evidence underlines the fact that the Portuguese local authorities lack a certain degree of entrepreneurial behaviour and still have a long way to go in terms of sustainable mobility.

4.3 Econometric results

The aim here is to find out which are the main determinants of the municipalities' propensity/sensibility for sustainable urban mobility. To assess the municipalities' sensibility we use a combination of three different yet interrelated dimensions or indicators of the phenomena (as described in the previous sections): 1) the municipality conducted a mobility study; 2) the municipality has a mobility plan; 3) the municipality conducted a survey of its citizens regarding their satisfaction with mobility issues. Thus, we built three indicators of the municipality's sensibility regarding mobility issues: 1) the municipality has **one of the three** above-mentioned items (mobility study; mobility plan; mobility survey); 2) the municipality has **two of the three**

above-mentioned items (mobility study; mobility plan; mobility survey); 3) the (log) **number of the items** (mobility study; mobility plan; mobility survey) that the municipality has.⁹

The nature of the data observed relative to the first two dependent variable [Have one (or two) of the tree measures? (1) Yes; (0) No] dictates the choice of the estimation model. Conventional estimation techniques (e.g., multiple regression analysis), in the context of a discrete dependent variable, are not a valid option. Firstly, the assumptions needed for hypothesis testing in conventional regression analysis are necessarily violated – it is unreasonable to assume, for instance, that the distribution of errors is normal. Secondly, in multiple regression analysis predicted values cannot be interpreted as probabilities – they are not constrained to fall within the interval between 0 and 1.¹⁰ The approach used, therefore, is to analyse each situation in the general framework of probabilistic models.

$$Prob(\text{event } j \text{ occurs}) = Prob(Y=j) = F[\text{relevant effects: parameters}].$$

In our theoretical model of the municipalities' sensibility towards sustainable mobility issues it is believed (*cf.* Sections 1 and 2) that a set of factors gathered on a vector X , can explain the outcome, so that $Prob(Y=1) = F(X, \beta)$ and $Prob(Y=0) = 1 - F(X, \beta)$.

Among these factors we have the *organisation of the department in charge of mobility issues* (number and type of workers employed); the *sustainable mobility indicators* (alternative transportation – bicycle parks and lanes; public transportation – number of operators, exclusive lanes, social passes, schedule and route information, ratio of public transport to population, trains; and private transportation – number of motorcycles per 10000 inhabitants, private vehicle and freight parks, ratio of private vehicles and freight to population, auto average age); *local policy related indicators* (the municipality participates in programmes targeting urban regeneration; urban plans and the PDM explicitly mentioning mobility issues); *characteristics of the municipalities* namely in terms of development – Education and Cultural Index, and Employment ratio; *location/region of the municipality* (whether it is an inland or coastal municipality, and if it belongs to the North, Centre, Lisboa e Vale do Tejo, Alentejo or Algarve).

⁹ Regarding this latter variable we add 1 to the number of items in order to avoid the impossibility when we log the number [i.e., the new variable comes $\log(\text{number}+1)$].

¹⁰ The logistic regression model is also preferred to another conventional estimation technique, discriminant analysis. According to Hosmer and Lemeshow (1989), even when the assumptions required for discriminant analysis are satisfied, logistic regression still performs well.

The set of β parameters reflects the impact of changes in X on the likelihood of the municipality being ‘sensitive to sustainable mobility issues’. The problem at this point is to devise a suitable model for the right-hand side of the equation. The requirement is for a model that will produce predictions consistent with the underlying theory. For a given vector of regressors, we would expect $\lim_{\beta'X \rightarrow +\infty} Prob(Y = 1) = 1$ and $\lim_{\beta'X \rightarrow -\infty} Prob(Y = 1) = 0$.

Partly because of its mathematical convenience, the logistic distribution, $Prob(Y = 1) = \frac{1}{1 + e^{-\beta'X}}$, has been used in many applications (Greene, 2000). Rearranged in terms of the log odds,¹¹ this expression is the so-called *logit* model.

The probability model is a regression of the following kind: $E(Y \setminus X) = 0[1 - F(\beta'X)] + 1[F(\beta'X)] = F(\beta'X)$. Whatever distribution is used, it is important to note that parameters of the model, like those of any non-linear regression model, are not necessarily the marginal effects. In general, $\frac{\partial E(Y \setminus X)}{\partial X} = \frac{dF(\beta'X)}{d(\beta'X)}\beta = f(\beta'X)\beta$, where $f(\cdot)$ is the density function

that corresponds to the cumulative distribution, $F(\cdot)$. For the logistic distribution, $\frac{d\Lambda(\beta'X)}{d(\beta'X)} = \frac{e^{\beta'X}}{(1 + e^{\beta'X})^2} = \Lambda(\beta'X)[1 - \Lambda(\beta'X)]$.

Thus, in the *logit* model, $\frac{\partial E[Y \setminus X]}{\partial X} = \Lambda(\beta'X)[1 - \Lambda(\beta'X)]\beta$. It is obvious that these values will vary with the values of X .

In interpreting the estimated model, it would be useful to calculate this value at, say, the means of the regressors and, where necessary, other pertinent values. In the logistic regression, the parameters of the model are estimated using the maximum-likelihood method (ML). That is, the coefficients that make observed results most “likely”, given the assumptions made about the error distribution, are selected.

The empirical assessment of the sensibility to sustainable mobility is based on the estimation of the following general logistic regression:

¹¹ The odds of an event occurring are defined as the ratio of the probability that it will occur to the probability that it will not.

$$P(\text{SensibilitySMobility}) = \frac{1}{1 + e^{-Z}}; \text{ with}$$

$$\begin{aligned} Z = & \beta_0 + \underbrace{\beta_1 \ln \text{Worker s} + \beta_2 \text{HC}}_{\text{Mobility department's organization}} + \underbrace{\beta_3 \text{BicyParks} + \beta_4 \text{BicyLanes}}_{\text{Alternative Transp}} + \\ & + \underbrace{\beta_5 \text{PubLanes} + \beta_6 \text{NoPub} + \beta_7 \text{Passes} + \beta_8 \text{Inf} + \beta_9 \text{R PubPop} + \beta_{10} \text{Train}}_{\text{Public Transportation}} + \\ & + \underbrace{\beta_{11} \text{MotorInha} + \beta_{12} \text{VehiParks} + \beta_{13} \text{FreiParks} + \beta_{14} \text{R FreiPop} + \beta_{15} \text{RVehiPop} + \beta_{16} \text{RVehiEPop} + \beta_{17} \text{VehiAge}}_{\text{Private Transportation}} + \\ & + \underbrace{\beta_{18} \text{Urban Pr og} + \beta_{19} \text{UrbanPlans} + \beta_{20} \text{PDM}}_{\text{Local Policy}} + \underbrace{\beta_{21} \text{EduCult} + \beta_{22} \text{EmplR}}_{\text{Regional Development}} + \\ & + \underbrace{\beta_{23} \text{Coast} + \beta_{24} \text{NUTsII}}_{\text{Region}} + \varepsilon_i \end{aligned}$$

In order to have a more straightforward interpretation of the logistic coefficients, it is convenient to consider a rearrangement of the equation for the logistic model, in which the logistic model is rewritten in terms of the odds of an event occurring.

Writing the logistic model in terms of the odds, we obtain the *logit* model

$$\begin{aligned} \log\left(\frac{\text{Pr ob(Sensible)}}{\text{Pr ob(Not Sensible)}}\right) = & \beta_0 + \underbrace{\beta_1 \ln \text{Worker s} + \beta_2 \text{HC}}_{\text{Mobility department's organization}} + \underbrace{\beta_3 \text{BicyParks} + \beta_4 \text{BicyLanes}}_{\text{Alternative Transp}} + \\ & + \underbrace{\beta_5 \text{PubLanes} + \beta_6 \text{NoPub} + \beta_7 \text{Passes} + \beta_8 \text{Inf} + \beta_9 \text{R PubPop} + \beta_{10} \text{Train}}_{\text{Public Transportation}} + \\ & + \underbrace{\beta_{11} \text{MotorInha} + \beta_{12} \text{VehiParks} + \beta_{13} \text{FreiParks} + \beta_{14} \text{R FreiPop} + \beta_{15} \text{RVehiPop} + \beta_{16} \text{RVehiEPop} + \beta_{17} \text{VehiAge}}_{\text{Private Transportation}} + \\ & + \underbrace{\beta_{18} \text{Urban Pr og} + \beta_{19} \text{UrbanPlans} + \beta_{20} \text{PDM}}_{\text{Local Policy}} + \underbrace{\beta_{21} \text{EduCult} + \beta_{22} \text{EmplR}}_{\text{Regional Development}} + \\ & + \underbrace{\beta_{23} \text{Coast} + \beta_{24} \text{NUTsII}}_{\text{Region}} + \varepsilon_i \end{aligned}$$

The logistic coefficient can be interpreted as the change in the log odds associated with a one-unit change in the independent variable. Then e raised to the power β_i is the factor by which the odds change when the i^{th} independent variable increases by one unit. If β_i is positive, this factor will be greater than 1, which means that the odds are increased; if β_i is negative, the factor will be less than one, which means that the odds are decreased. When β_i is 0, the factor equals 1, which leaves the odds unchanged.

In the case where the data corroborates the hypothesis: “*Municipalities with high human capital intensive departments (which are in charge of mobility issues) are more likely to be sensitive to*

sustainable urban mobility”, the estimate of β_2 should appear as positive and significant for the conventional levels of statistical significance (that is, 1%, 5% or 10%).

The estimates of the β s are given in Table 6 below, related with three alternative models, two logit models, Model I and Model II, which are estimated by Maximum Likelihood (ML) (as explained above), and a linear regression model, Model III, estimated by the traditional Ordinary Least Square (OLS) method.¹² In the first two models the dependent variable is dichotomist, that is, it assumes the values 0 or 1. In particular, in Model I the proxy for the municipalities’ sensibility to sustainable mobility is the indicator ‘having **one of the three** measures – mobility study, mobility plan, mobility survey - selected’, whereas in Model II the dependent variable (municipalities’ sensibility to sustainable mobility) is proxied by the indicator ‘having **two of the three** measures – mobility study, mobility plan, mobility survey - selected’. In Model III the dependent variable is proxied by (the natural log of) a continuous variable that sums up the number of measures related with sustainable mobility that the municipality adopted.

The goodness of fit measures selected - Hosmer and Lemeshow’s test, percentage corrected, and Nagelkerke R^2 , in the case of the two first models, and the F-Statistics, Adjusted R^2 , and Durbin-Watson, in the case of the third model – reveal that all the estimated models have a reasonable fit. In fact, and according to the Hosmer and Lemeshow’s test, both Model I and II reveal a good fit. This test’s null hypothesis indicates that the values predicted by the model are not significantly different from the observed values. Given that the p -value is not significant for standard values (1%, 5%, and 10%), this hypothesis is not rejected, leading us to the conclusion that the models reflect reality reasonably well. Moreover, in both models, around 80% of values were correctly predicted, and they explain (*cf* Nagelkerke R^2), on average, around half of the variance of the dependent variables. In the linear regression model (Model III), the goodness of fit statistics reveal that, overall, the model is significant (F-Statistics is significant at 1%), explaining on average, around one third of the variance of the dependent variable (adjusted R-square of 34%), and the residuals are not serially correlated (Durbin-Watson test is around 2).

¹² Linear Regression estimates the coefficients of the linear equation, involving one or more independent variables, that best predict the value of the dependent variable. This model assumes that for each value of the independent variable, the distribution of the dependent variable is normal; the variance of the distribution of the dependent variable is constant for all values of the independent variable; and the relationship between the dependent variable and each independent variable is linear, and all observations are independent.

Table 6: Determinants of the Portuguese municipalities' sensibility regarding sustainable mobility

		Logit model (ML estimation)				OLS estimation
		Implemented one of the three measures		Implemented two of the three measures		Number of measures adopted (ln)
		$\hat{\beta}$	$Exp(\hat{\beta})$	$\hat{\beta}$	$Exp(\hat{\beta})$	$\hat{\beta}$
<i>Mobility issue department organization</i>	Number of workers (ln)	0,78***	2,17	0,02	1,02	0,07*
	Ratio of graduated to total workers	2,68**	14,58	0,78	2,17	0,20
<i>Alternative transportation</i>	Bicycles parks (yes=1)	1,70***	5,49	1,54***	4,67	0,27***
	Bicycles lane (yes=1)	2,30***	9,93	0,76	2,14	0,30***
<i>Public transportation</i>	Public transportation lane (yes=1)	1,01	2,74	0,81	2,25	0,14
	Number of public transport operators (ln)	0,71	2,04	-2,16	0,12	-0,08
	Social pass (yes=1)	0,50	1,64	1,18	3,27	0,13
	Public transportation schedule and route information (yes=1)	0,56	1,75	1,25	3,50	0,10
<i>Sustainable mobility indicators</i>	Ratio of the number of public transports to population	-192,22	0,00	-372,43	0,00	-37,41
	Train (yes=1)	0,26	1,30	1,08*	2,93	0,07
<i>Private transportation</i>	Number of motorcycles by 10000 inhab.	0,01	1,01	0,01	1,01	0,00
	Private vehicles parks (yes=1)	2,04*	7,70	1,19	3,30	0,17
	Freight vehicles park (yes=1)	-0,24	0,78	0,26	1,30	-0,03
	Ratio of the number of freight to population	-23,94	0,00	45,96	9,16E+19	0,45
	Ratio of private vehicles to employed population	3,22**	24,98	1,22	3,39	0,38**
	Auto average age	1,34***	3,82	1,14**	3,11	0,18***
<i>Local policy related indicators</i>	Urban regeneration programs (yes=1)	-0,06	0,94	1,35**	3,85	0,08
	Urban plans explicit mentioning mobility (yes=1)	1,67***	5,29	0,53	1,70	0,20*
	PDM explicit mentioning mobility (yes=1)	0,22	1,25	0,99	2,69	0,10
<i>Development indicators</i>	Education and cultural index	-0,03	0,98	0,03*	1,03	0,00
	Employment ratio	26,09***	2,14E+11	10,17	2,61E+04	2,78**
<i>Region</i>	Coast municipalities (yes=1)	-0,92	0,40	-0,85	0,43	-0,11
	North	2,07*	7,95	2,74**	15,51	0,31**
	Centre	-0,52	0,59	0,49	1,62	-0,02
	Alentejo	1,78	5,95	-0,32	0,73	0,19
	Algarve	1,12	3,07	2,42	11,25	0,26
	<i>Constant</i>	-36,12***	0,00	-28,29***	0,00	-4,20***
	% correct	80,0		81,5		<i>F-stat</i> 3,65***
	<i>Nagelkerke R²</i>	0,52		0,53		<i>Rsquare adj</i> 0,34
	<i>Hosmer & Lemeshow Test (p-value)</i>	11,07 (0,20)		9,23 (0,32)		<i>D-W</i> 1,97

Significativo a *** 1%; ** 5% e * 10%.

Using the results of the first model, which compares municipalities that possess at least two of the three selected measures of sustainable mobility (mobility study, mobility plan, mobility survey) to municipalities that do not have any of the measures, the determinants of the

municipalities' sensibility towards sustainable urban mobility is positively and significantly related with the dimension and quality of the department in charge of mobility issues. Specifically, on average, municipalities with large and more human capital intensive (higher number of university graduate workers to total workers) departments are, *ceteris paribus*, those that are more aware of sustainable mobility issues. Moreover, municipalities that have alternative transports, namely bicycles, tend to be more mobility conscious. According to our results, the odds ratio of mobility sensibility changes by the factor 5.49 [$e^{1.70}$] (9.93 [$e^{2.30}$]) when municipalities have bicycle parks (lanes) compared with the case of municipalities that do not have parks (lanes).

All the indicators related with public transport fail to emerge as significant determinants of Portuguese municipalities' awareness of sustainable mobility issues. Controlling for all the factors likely to explain this awareness (included in the models), having exclusive bus lanes, a large number of public transport operators, social passes, and available information on schedules and routes, as well as possessing trains, does not significantly determine the municipalities' sensibility towards sustainable mobility. This result is robust regardless of the model selected.

In what concerns private transportation the picture changes somewhat, where two of the five selected indicators turn out to be statistically significant – the ratio of private vehicles to employed population and (more strongly) the auto average age. Put more simply, all else remaining constant, municipalities with more acute problems in terms of mobility, that is, larger ratios of private vehicles to employed population and older auto parks, seems to be more sensitive to sustainable mobility issues; in other words, these municipalities are more entrepreneurial when devising mobility studies, implementing mobility plans and/or assessing the degree of satisfaction of their citizens in this regard.

When we control for the region, level of development and other municipal traits, participating in urban regeneration programmes (e.g, POLIS, URBCOM) does not necessarily lead to a higher awareness on the part of the municipality of sustainable mobility. Results show that more than simply participating in this type of programme, a more committed attitude is necessary, namely that the municipalities' urban plans explicitly mention mobility issues and indicators.

As expected, municipalities that are characterised by higher employment rates tend to be, on average, more mobility aware, in the sense that employment rates are usually associated with

higher degrees of traffic congestion and require a more in-depth analysis of alternative mobility solutions. The municipal level of education and culture arise as a significant and positive determinant in cases where the municipality's sensibility is assessed by more demanding indicators, in particular that of having two of the three (mobility study, plan or survey) selected measures of mobility awareness.

Finally, although the results do not show any kind of divide between Coastal – In-Land municipalities, all three models clearly estimated evidence of a higher awareness in Northern municipalities of sustainable mobility issues. On average, all remaining factors constant, Northern municipalities present a higher probability of being more sensitive to sustainable mobility issues than municipalities located in Lisboa e Vale do Tejo (the default category). More specifically, the odds ratio of mobility sensibility is 8 times (Model I) to 15 (Model II) times higher in the Northern municipalities than in the municipalities located in Lisboa e Vale do Tejo.

5. Conclusions

Cities are growing more rapidly than ever with the corresponding increased pressure on the capacity and range of their transport systems, suffering among other problems from car-choked areas.

Although this problem is already widely recognised by the different international groups and governments, it has been very difficult to come to an agreement about what is the best strategy for urban spatial organisation and (sustainable) mobility management.

Nevertheless, today's citizens already understand that sprawling cities that cater to the automobile are, to a large extent, the result of government choices to foster road construction and car infrastructures aimed at boosting economic development. Nevertheless, citizens can bring pressure to bear on local authorities to choose a different future. Cities could be made more sustainable with the integration of innovative types of transports.

The benchmarking of different international cities reveals that some local authorities already have strategies targeting sustainable mobility management, where such strategies are adapted to the cities' and citizens' needs and possibilities. A wide range of measures can be found in different cities such as information campaigns, new forms of land use and physical planning, emissions standards, transport technologies and mobility constraints (pollutant-paid).

The strategy for success is to a large extent explained by the implementation of horizontal measures, such as education and communications, with more practical measures, such as intermodality between different public transportation modes; adoption of alternative non-pollutant transportation, and innovative measures to stop the circulation of private vehicles.

Thus, it is important that the local authorities and society in general assume more responsibilities and challenges in the organisation and management of urban planning and mobility management.

We need to recognise that, in spite of the failures and weaknesses that still persist, EU regional policy has been successful enough to build some strong partnerships at various levels – Regional, Local and Non-governmental (Gudmundsson, 2003).

In Portugal, the transport sector is one of the most relevant sectors in government revenues. Nevertheless, the central government is transferring more competences to local authorities (municipalities), claiming that the municipalities are closer to the citizens and are better prepared to answer their needs. Although Portuguese municipalities still face a lack of capabilities (especially in rural areas), they are aware that administrative modernisation is a necessity, and have come to recognise their role in developing sustainable communities. However, in most of cases, they remain focused on the old, car-centred perspective, giving priority to private car infrastructural investments to boost higher quality for drivers.

Something is however (slowly) changing. Several best practices in Portuguese municipalities can be pointed out which have addressed the growth of urban areas and supported the pressure caused by the rise in the number of vehicles. The public transport system has been expanding both in size and capacity, with the implementation of intermodality and multimodal tickets, more and better public transportation infrastructures, interactive information, alternative transportation, among others. The competitiveness of these entrepreneurial actions has arisen from the intersection of land-use planning, transport systems, know-how and innovation – the interaction between sustainability and globalisation (Marques, 2004).

Our survey was designed to give a global view of the Portuguese municipalities' awareness of sustainable mobility management, assessing their entrepreneurial approach to this issue, through their commitment, intervention and sensibility.

The data gathered in our survey allowed us to conclude that the majority of the municipalities already deal with mobility issues, showing a recent concern for mobility management problems.

One good indicator of this is the fact that the percentage of employees with university degrees working on mobility issues in municipalities is above the corresponding overall Portuguese total employment average. However, most of the respondent municipalities delegate this task to divisions of other departments, revealing therefore a relatively low degree of commitment to the issue. Only six municipalities claimed to have mobility departments and most of them were located in the two Portuguese metropolitan areas (Lisboa and Porto).

In what concerns public transportation, more than half of the municipalities have more than one operator. However, more than two thirds of the municipalities do not have any kind of multimodal tickets, which illustrates a certain lack of communication between the operators, since most of the time they prefer to compete rather than collaborate with each other.

The new organisational systems should benefit, now more than ever, from the coordination and integration of the public transportation supply, given the global international results when it comes to the efficiency of operators (productivity and costs) as well the effectiveness of the public transportation system (more utilisation) (Szyliowicz, 2003).

Although in a significant number of the municipalities there is already information about public transportation schedules and routes, most of the municipalities do not consider the creation of priority lanes for buses relevant, and still give priority to the private car. This point is also clearly demonstrated in the survey when a reasonable number of the municipalities present as mobility indicators in their urban plans the construction of new infrastructures for private car circulation.

This overall Portuguese choice for organising cities in benefit of private cars can also be verified through the number of exclusive parks for private vehicles: more than 90% of the municipalities have these and half of the respondent municipalities plan to build more in the next three years. It should be remembered that the International Association of Public Transportation considered that an excess of parking spaces in town centres is an incentive to car use; towns where the market share of public transportation is high have adopted a restrictive parking policy (UITP, 2003).

All these decisions to adopt the private vehicle as a priority and to build more and better infrastructures are not only legitimate but also natural in the perspective of people's adaptation to the current situation. These decisions are (from an economic perspective) marginally correct but, on the whole, they lead to a situation that is far from satisfactory (Roseland, 1992). Moreover,

Portugal is one of the countries where some of the highest increases in polluting emissions have been registered (CE, 2003).

In terms of existing alternative transportation, the Portuguese case can be considered moderately sensitive to this issue since, on average, only one third of the total respondent municipalities have bicycle parks or/and bicycle lanes.

In terms of the Portuguese municipalities' knowledge levels and planning capacity we concluded that, on average, a third of the respondent municipalities have already made or outsourced a mobility study or implemented mobility plans. Nevertheless, the percentage of municipalities that have assessed their citizens' satisfaction regarding mobility issues is quite low.

One advantage of a closer link between land use and transportation planning is the possibility of adjusting urban development to the needs of the public transportation system, by developing a mix of functions (Herela, 2003). In almost three-quarters of the total respondent municipalities, their urban plans already include mobility management issues and approximately a third has already participated in at least one of the urban programmes.

The evaluation of the municipalities propensity/sensibility towards sustainable urban mobility, allow us to conclude that the determinants of the municipalities' sensibility towards sustainable mobility are very similar both in the models where we compare the municipalities that have at least one or at least two of the three measures with municipalities that do not have any of the measures, and the linear regression model.

On average, municipalities with larger and more human capital intensive (high number of university graduates) departments in charge of mobility issues are those that are more responsive to sustainable mobility issues.

The existence of infrastructure for alternative non-pollutant transportation (bicycles) is also an important determinant of the sensibility of the municipalities since the odds of their sensibility ratio changes, by a factor 5 to 10, when municipalities have bicycle infrastructures in comparison to cases where municipalities do not. Unexpectedly, all the public transportation indicators failed to emerge as significant determinants of the Portuguese municipalities' awareness of sustainable mobility issues. This result proves that there is a need to be more innovative in the presentation of mobility options to the citizens.

It was also possible to conclude, as expected, that municipalities with more problems regarding urban mobility, related to a larger ratio of private cars to employed population, higher employment ratio and especially older auto park, are also the municipalities that are more alert to sustainable mobility issues.

When we assessed the integration of mobility issues with land use planning, we concluded that the municipalities that are more aware of sustainable mobility issues are those that, having participated in urban programmes, have given continuity to the measures proposed in these programmes and are more committed to implementing mobility measures in their urban plans. This is indicative of the importance of the integration of the public transport system with land use planning as already pointed out.

When analysing the sensibility of Portuguese regions, we found that municipalities from the North present a higher probability of being more sensitive to sustainable mobility than the municipalities located in Lisboa e Vale do Tejo. The odds ratio of mobility sensibility rises to 15 times higher in the Northern municipalities when compared with municipalities located in Lisboa e Vale do Tejo.

From our overall exercise, we can point out the most pro-active municipalities with regard to sustainable mobility issues, by combining all the variables used to analyse the sensibility of Portuguese municipalities (mobility studies, mobility plans and mobility surveys). These are, from North to South, Bragança (Alto Trás-os-Montes); Viseu (Dão-Lafões); Fundão (Cova da Beira); Estarreja (Baixo Vouga); Castelo Branco (Beira Interior Sul); Miranda do Corvo (Pinhal Interior Norte); Leiria (Pinhal Litoral); Santarém (Lezíria do Tejo); Cascais, Lisboa and Loures (Grande Lisboa); Almada (Península de Setúbal); Alcácer (Alentejo Litoral); Évora (Alentejo Central); Beja (Baixo Alentejo); and Faro (Algarve).

Although Portugal lacks a cohesion policy regarding sustainable mobility among its municipalities, there are recent and significant developments that signal positive evolution in the years to come.

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