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The way to sustainable mobility. A comparative analysis of sustainable mobility plans in Spain

Miguel Ángel Mozos-Blanco[a], Elisa Pozo-Menéndez[a], Rosa Arce-Ruiz[b], Neus Baucells-Aletà[b,*]

[a] Universidad Politécnica de Madrid, 28040 Madrid, Spain
[b] TRANSyT, Universidad Politécnica de Madrid, 28040 Madrid, Spain[1]

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ABSTRACT

After the approval and implementation of Sustainable Urban Mobility Plans (SUMP) in different cities of Spain, the evolution and the level of development of each one are still unknown. In fact, as many of them were approved before 2010, they didn't include a precise methodology for the further analysis of the proposed and/or implemented mobility measures. So, this evaluation of the mobility plans, their results and the comparison between cities and their evolution towards a more sustainable mobility represents nowadays a challenge in many cases.

In 2011, the Spanish Law for a Sustainable Economy (Law 2/2011) was approved, which encouraged local administrations to create a SUMP. The approval of a SUMP was compulsory to local authorities to get any public funding for public transport projects. The main objectives of these plans were not only the reduction of the urban congestion and pollution, but also to encourage the citizens to change their habits so they are less car-dependent and more active in their daily trips. However, it is still necessary an evaluation to confirm that these SUMPs have represented a substantial change in terms of logistics and management of the transports and vehicles, both private and public, as well as of behaviour and habits of the citizens.

The main objective of this paper is to show the results of a research conducted on 38 Sustainable Urban Mobility Plans. The cities are all members of the Spanish Network of Smart Cities (Red Española de Ciudades Inteligentes -RECI-).

The SUMPs are analysed, addressing the identification and evaluation of the different specifically proposed mobility measures included in plans, the degree of definition of them, the costs, the implementation programs, etc. Also, follow-up programs were discussed.

First, an analysis was made of the diagnosis of the mobility situation in each location according to the diagnosis document included in many of the SUMPs. The second stage consisted on the analysis of the measures in the plan, considering sixteen indicators, such as accessibility, intermodality, pedestrians or design of public space. Finally, it was also determined whether the document included a monitoring plan, a budget and a timeline.

Through the comparison of the results, we obtain a brief overview about the evolution of efforts to get a more sustainable mobility in Spain. With these results, we finish our study proposing some guidelines for further analysis as well as for the new SUMPs that will be approved on the following years.

1. Introduction

Cities are today the predominant place of residence of the world's population, 54% of the world's population reside in urban areas (United Nations, 2014). Cities also concentrate a significant proportion of economic activities and business opportunities and generate more than 80% of global GDP (Dobbs et al., 2011). Currently, 64% of all travel undertaken is within urban environments and the total number of urban kilometres travelled is expected to triple by 2050 (Van Audenhove, Korniichuk, Dauby and Pourbaix, 2013). Although cities may have a different history, culture and geography, they all share a series of similar problems that have both a local impact and a global

* Corresponding author.
E-mail addresses: madelosmozos@gmail.com (M.Á. Mozos-Blanco), e.pozo@upm.es (E. Pozo-Menéndez), rosa.arce.ruiz@upm.es (R. Arce-Ruiz), neus.baucells@upm.es (N. Baucells-Aletà).
[1] Transport Research Centre.

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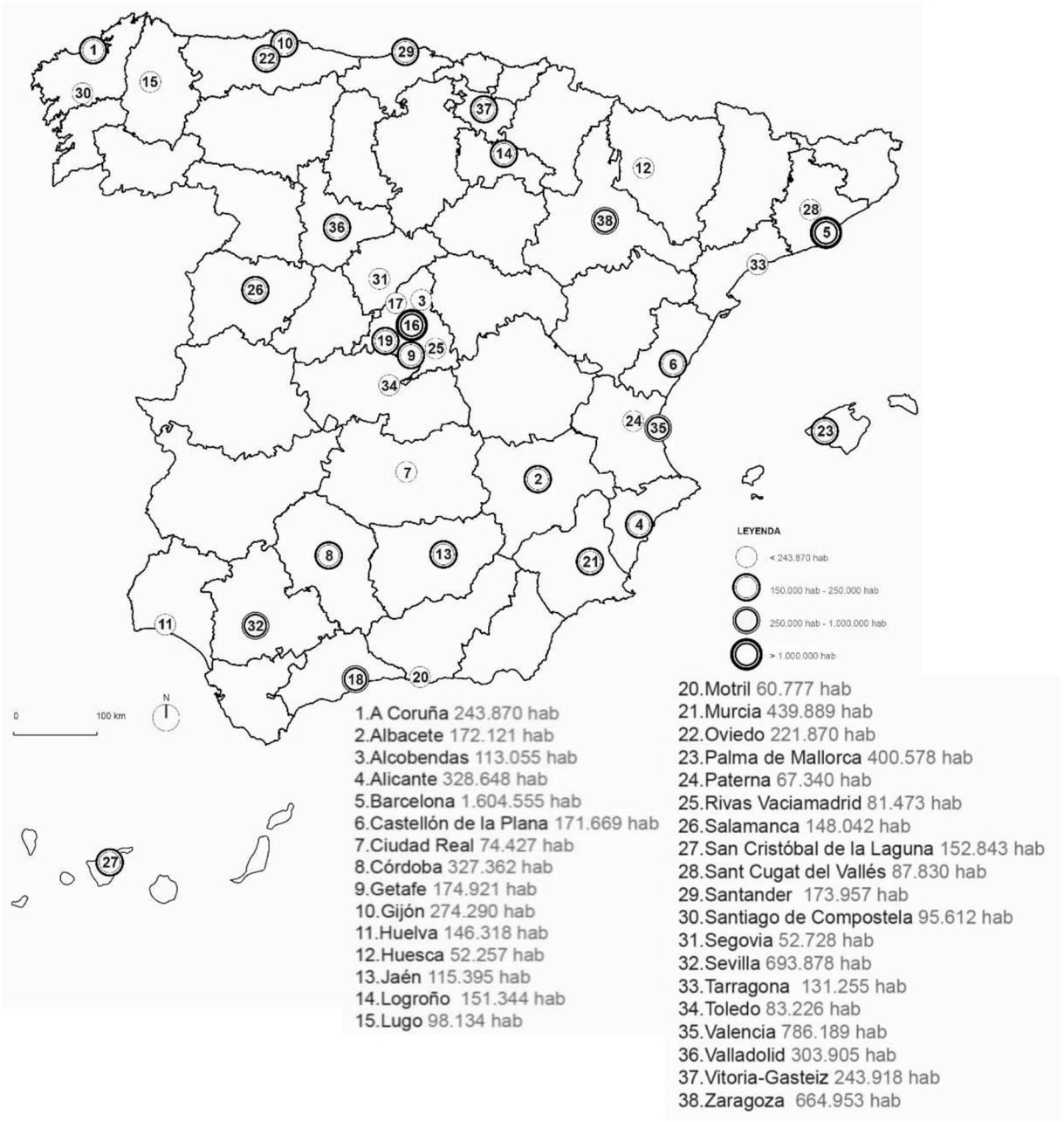

Fig. 1. Location of the cities analysed and inhabitants (National Statistics Institute, 2015).

scale; one such problem is their negative impact on the environment due to pollution, as 40% of CO2 emissions come from urban traffic (Mataix González, 2010). Air pollution and traffic noise cause discomfort and undermine the quality of life in cities, in addition to representing a cost in time and energy which –quite apart from the impact on the health of the population– also leads to a loss of economic productivity and efficiency. The European economy loses about 100,000 million euros annually due to traffic congestion in cities, a source of pollution, accidents, and productivity and efficiency in enterprises (European Commission, 2007). Though, rapid growth of urban mobility systems presented a big challenge to city authorities around the world. Therefore, the crucial target in cities nowadays is to enhance mobility and at the same time reducing congestion, accidents, and pollution (Camagni et al., 2002; Mihyeon Jeon and Amekudzi, 2005). The livability of the metropolitan surroundings need to be assured by a sustainable mobility.

The idea of a paradigm shift in urban transport is gaining acceptance in many parts of the world, related with decouple transport from fuel supply and with to open the way to more sustainable cities of the future, less polluted, economically viable, and socially just (Cervero, 2013; Shen and Hermans, 2016).

Urban mobility of the future faces many changes that are taking place: new vehicles, changes in vehicle ownership and use models; mobile technologies that equip and empower individuals, etc. (Lyons, 2016). The sustainable mobility approach requires actions to reduce the need to travel (less trips), to encourage modal shift, to reduce trip lengths and to encourage greater efficiency in the transport system (Banister, 2008). Although it is debatable, even some author thinks that some European cities have shown that it is possible to decouple urban traffic growth from economic growth (Jones, 2014).

To tackle this issue in Europe, several actions have been adopted (EC, 2001, 2006, 2007, 2009, 2011, 2013, 2016), as May (2015), May et al. (2017) Arsenio et al. (2016), Diez et al. (2018), Decker et al. (2012) and others comment.

Table 1
Criteria used in assessing mobility plans.

CRITERIA	Items included in the criterion
1. Highway hierarchy and traffic and circulation	Reorganisation and restructuring of the roads with a view to reducing traffic and congestion and prioritising pedestrian or bicycle mobility.
2. Public transport	Measures and actions intended to improve public transport infrastructure and services in the location and the municipality. This category is in turn divided into eight subdivisions to assess separately the measures corresponding to the bus, metro, commuter railway, tram, public bicycle, on-demand transport, trolleybus and BRT networks.
3. Private car	Assessment of the measures designed to reduce the use and presence of private cars, and car-sharing initiatives.
4. Parking	Actions and measures concerning the regulation of parking, the reduction of the presence and use of cars in public spaces and the creation of new parking areas.
5. Pedestrians	Actions and initiatives to promote displacement on foot and improvements in public spaces for use by pedestrians. Pedestrianisation of streets, widening of pavements, improvements in accessibility –although this is assessed in a specific category– and road safety are among the measures commonly included in many mobility plans.
6. Cycling	Measures to promote the use of the bicycle as a mode of transport in the city, from the creation of bike lanes through to the installation of secure parking. This category also covers the implementation of a bike rental system; although this is discussed independently in the section on public transport, it is an important factor in encouraging cycling mobility.
7. Electric cars	Measures considered to encourage the uptake and use of electric cars.
8. Urban goods deliveries	Actions designed to organise the goods transport system in cities, from the regulation and reservation of parking spaces through to the creation of distribution centres.
9. Intermodality	Measures designed to facilitate the transfer from one mode of transport to another, such as “park&ride” initiatives, the creation of common travel passes for all transport modes and the “single ticket” for use on any of several transport modes on a single trip, the synchronisation of the schedules of the different service networks (buses, metro, commuter railway and others), cycle parks in the stations of other services, adaptation of trains or buses to allow users to board with bicycles and so on.
10. Design of the public space	This concerns attention to the detailed design of aspects such as street layout and structure (street sections, materials, type of platforms and so on), elements of urban furniture installed to reduce the use of private vehicles or limit the presence of cars (trees, bollards and others), and the design of urban elements to encourage mobility by pedestrians or cyclists.
11. Accessibility	Initiatives for the adaptation of public spaces and services for people with special mobility needs. This section normally includes initiatives relating to street design, the modification of pedestrian routes to eliminate architectural barriers, and the implementation of systems to facilitate the use of public transport for people with mobility difficulties.
12. Road safety	The initiatives in this category frequently involve the regulation of traffic, primarily signposting, educating the population to heed traffic regulations, and in some cases they also consider aspects of urban design that contribute to ensuring pedestrian safety.
13. Air and noise pollution	Initiatives aimed at reducing atmospheric and acoustic pollution. It was decided to create an independent category to analyse this type of measures, as this is an extremely important environmental factor that is directly linked to problems associated with mobility.
14. Regulations	Initiatives that involve the implementation of bylaws, plans or applied urban regulations for regulating traffic, classifying parking areas and circulation on public highways, among others.
15. Public participation	Measures that promote participation by residents, not only in terms of raising awareness and notifying them of activities, but also by actively working with the public to allow and encourage their contributions and ideas while performing an active and ongoing task of educating the public to change their habits.
16. Indicators	Degree of definition of the indicators associated with each measure in the mobility plan, and an analysis of whether the document establishes a monitoring plan.

At the national level, the Spanish Energy Savings and Efficiency Strategy (IDAE, 2003) and the Strategic Infrastructures and Transport Plan (Spanish Ministry of Development, 2005) address issues related to transport and mobility from a sustainable point of view, and define the energy targets to be achieved and the measures and instruments with which to achieve them. The proposed measures include Sustainable Urban Mobility Plans (hereafter, SUMP), and other strategic documents such as Company Mobility Plans, and strategies that promote the introduction of electric vehicles, always within the drive to transform the country's mobility model.

A turning point was the approval of the Sustainable Economy Act (Act 2/2011), which ruled that a SUMP was a prerequisite for access to the public transport subsidies granted by the Spanish Treasury (Government of Spain, 2011). This legislation also defined the minimum content of the SUMP,[2] and came into effect in 2014. In Spain, currently, over 300 municipalities have drafted SUMPs, most which have already been approved (Davies Sala and Mínguez Alarcón, 2016).

However, no uniform methodology has been applied in either the drafting or the implementation of the SUMPs, making it difficult to assess their effectiveness using a homogeneous criterion. In 2006, the “Guía Práctica para el desarrollo e implementación de un PMUS” (IDAE, 2006) and the ELTIS guidelines in 2014 “How to develop a Sustainable Urban Mobility Plan for a polycentric region” (ELTIS, 2014) laid down a number of indications for preparing these documents, although the heterogeneity has persisted. Also, until 2010, most of the documents failed to define a monitoring plan, despite the European reference documents (Diez Martínez and López Lambas, 2014). The lack of uniformity poses problems when attempting to analyse the actual changes in mobility and to compare one city with another.

ELTIS, the Urban Mobility Observatory, published an online tool for the self-assessment of mobility plans in the form of a questionnaire that allows users to measure the progress of the implementation of the SUMP (ELTIS, 2014). Additionally, the guide to “Developing and implementing a sustainable urban mobility plan” (ELTISplus, 2013) contains factsheets with the basic content and the methodology for developing and evaluating the degree of efficacy of the implementation of the SUMP within a sustainability policy. However, this is still today a work in progress.

Some studies have analysed different specific aspects of SUMP: sustainability comparative analysis in Brasil (Cavalcanti et al., 2017), bridging climate change and equity targets in Portugal (Arsenio et al., 2016), cost-effectiveness in terms of CO2 in Burgos, Spain (Diez et al., 2018) or Bologna, Italy (Nocera et al., 2015), or general (Hickman et al., 2013), ITS and car sharing (Zavaglia, 2016), success cases versus failed cases (López-Lambas et al., 2013), barriers to implementation (May et al., 2008), SUMP in France (Merle, 2013) and sometimes with the focus on political or procedure issues (Marsden and Groer, 2016), or scoring measures effects (López-Ruiz et al., 2013).

[2] The subjects included at least in a Sustainable Mobility Plan are: the diagnosis of the situation, the objectives to be achieved, the adopted measures, the appropriate mechanisms to fund the plan and the procedures for monitoring, evaluation and review and finally an analysis of costs and the economic, social and environmental benefits (BOE no. 55, 5 March 2011).

Moreover, there are some follow up of SUMP in projects like the EU co-funded project CH4LLENGE[3] (Balant et al., 2016), that aims to address significant barriers for the wider take-up of SUMPs in Europe. CIVITAS or ENDURANCE are networks where cities share experiences. However, any of the studies realize a wide comparative analysis of measures included in the plans and in which extent. Only some papers that analyse specific cases, frequently a small number (Decker et al., 2012), include the review of measures.

The present study is framed within this context, and is intended to provide an overview of the measures proposed by the SUMPs in Spain and a comparative assessment of their features in the Plan documents. This will help to know the preferences and the ways of doing and to identify the common aspects and the differences. This will give idea of the multiple views of sustainable mobility and the ability to act of different communities.

A total of 38 cities were selected, and an assessment was made of the degree of development of the SUMP approved in the municipalities and the type of proposed measures.

The article has a second section, after this introduction, dedicated to explain the selection of the cities and describe the methodology of analysis, followed by other section to comment the results of the SUMP analysis and the final one dedicated to conclusions.

2. Methodology

The aim of the present study is to assess the SUMP in Spain in terms of the type of measures included in each one and their degree of definition. The study addresses a comparative assessment between cities of the degree of definition and development of the SUMP, and the measures proposed in each one, together with the estimated costs, the associated timelines and the monitoring methodology.

2.1. Cities

A total of 38 cities were selected from the Spanish Smart Cities Network (Red Española de Ciudades Inteligentes- RECI),[4] which had a SUMP in January 2016. The decision to select a set of cities from the RECI as a significant sample is justified by the fact that the cities in this network (65 in total on that date) have demonstrated a commitment to innovation and to providing their cities with more efficient economic and political model, with the result that they all have strategic plans that are already under way. These cities work on different areas, including sustainable mobility, and 70% of the cities in this network have a SUMP. The cities analysed, which have a total population of 12.949.474 (Government of Spain, 2016) are listed in Fig. 1.

2.2. The analysis

The first phase addresses an analysis of the SUMPs, the proposed measures and a comparison between them. Sixteen evaluation criteria (Table 1) were defined based on the indications contained in the *Guía Práctica para el desarrollo e implementación de un PMUS* (IDAE, 2006) and other aspects, included the degree of detail of the prior diagnosis and the process of public participation in its preparation and approval. Most of the plans were elaborated after the Guide publication, in 2006, and follow it. Finally, an analysis was made of the level of definition of the monitoring programme, the budget and timeline (See Fig. 2).

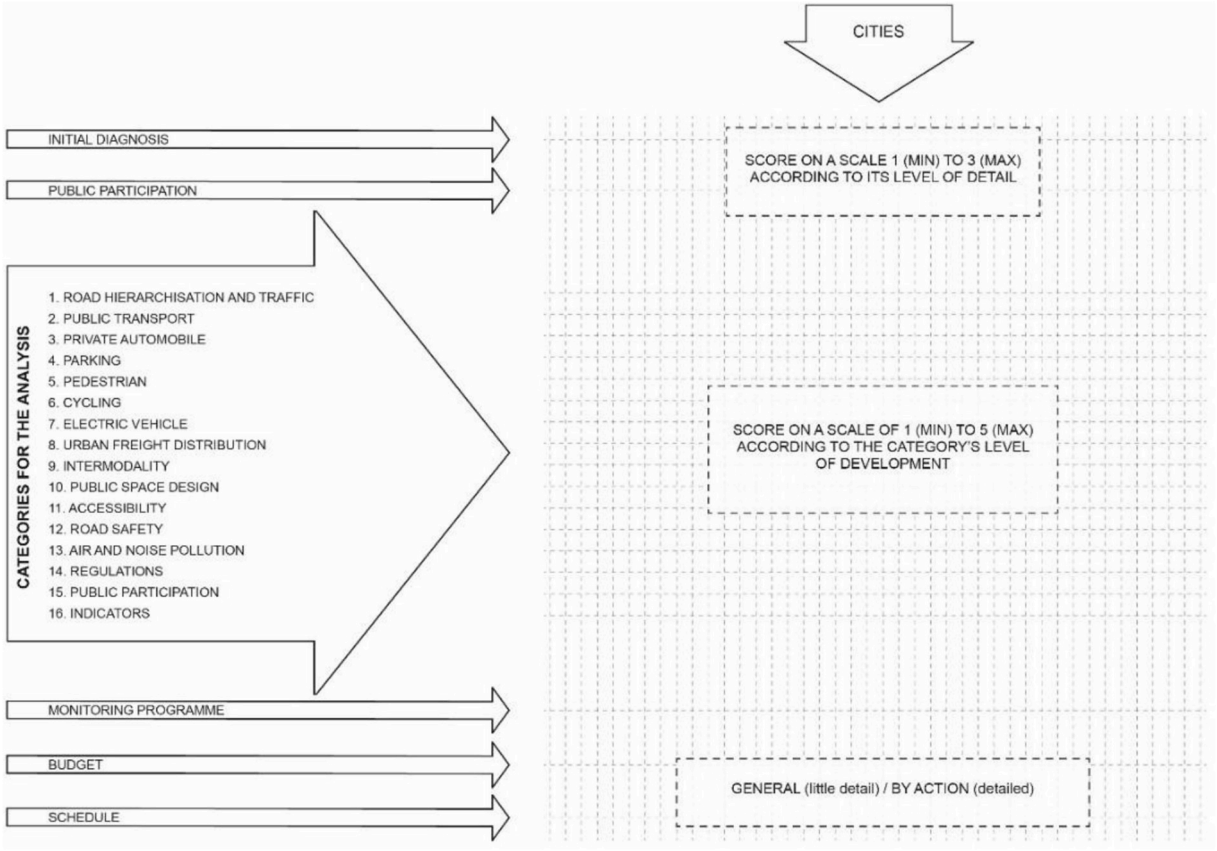

Fig. 2. Diagram of the assessment process.

[3] http://www.eltis.org/sites/default/files/tool/monitoring-and-evaluation. A list of related projects can be consulted in this link. Consulted 29th/05/2018.

[4] RECI (www.redciudadesinteligentes.es).

Table 2
Scale of compliance with criteria.

Value	Definition
1	The plan sets a series of general targets.
2	The plan sets general targets and cites generic measures.
3	The plan sets specific targets and measures, but with only rudimentary development. That is, it cites specific measures for application to particular local points with varying degrees of definition, but without actually justifying them and developing them in depth.
4	The plan sets specific targets and measures, but they are only partially developed. This implies that the measures considered in the plan have been precisely prepared.
5	The plan sets specific targets and measures that are fully developed and completed, including an approximate budget for each action, a detailed timeline for the strategies, and a series of associated indicators to monitor each measure.

First, an analysis was made of the *diagnosis* of the mobility situation in each location. Each diagnosis was assigned a value of 1–3 according to the degree of detail and the accuracy of the analysis contained in the document.

Public participation in the process of drafting the plan was also assessed in a 1 to 3 scale, based on whether it is limited to communications and questionnaires by the local governments, or it takes the form of active participation on working committees or workshops. Also, it was determined whether the document included a *Monitoring plan*, a *Budget, g*eneral o by action*,* and a *Timeline,* general o by action.

Safe route to school and *car sharing initiatives* are also considered in this study, but not as measures. The first one is not an indicator because it affects to a set of vulnerable population, groups of children in this case. Sometimes, some of the measures related to this kind of programs are focused on education and learning steps, not in mobility itself. Moreover, it includes not only pedestrian measures but also cycling or parent's car sharing options. Some cities have its own safe route to school plan whitout SUMP. Then, this point is too complex to summarize it as an indicator.

Car-pooling proposals is a similar fact. It covers journey to work, safe route to school, and other different initiatives. It is difficult to establish a comparison about its implementation.

The second stage was to conduct an *analysis of the measures in the plan*, which are assessed with the following criteria (See Table 1):

Compliance with each criterion was assessed on a scale of 1–5, as follows (see Table 2):

3. Results

In general, the documents in the SUMPs containing the **prior analysis and diagnosis** are meticulously prepared and have a high level of detail, which does not always match the degree of development of the SUMP itself. One positive result is that all the cities have a thorough knowledge of the base situation before undertaking their SUMP; however, it is worth asking whether the investment involved in carrying out this type of analysis is proportional to the development of the mobility plan itself.

The results for **public participation** and its presence in the preparation stage of the SUMP –a fundamental aspect when approaching a mobility project– are not always positive. Just one third of the cities analysed include a participation process in the form of discussion panels, workshops or public suggestion boxes, while 19% of the cities simply run a communication and awareness campaign. Almost half of the cities even completely omit the issue of public participation from their SUMP, making it difficult to determine whether it was taken into account, although it can be assumed *a priori* not to have been considered.

This is not rare, Franceschini and Marletto (2015) mention several studies that show that practical applications of a participatory approach to sustainable urban mobility around Europe are limited to gather preferences and opinions or to increase public policy legitimacy.

As many papers state, citizen and stakeholder engagement is a precondition for sustainable urban mobility planning (Arsenio et al., 2016; Franceschini and Marletto, 2015; Lindenau and Böhler-Baedeker, 2014; López-Lambas et al., 2013). But very few plans contemplate active participation by the public, and are limited to measures for gradual awareness-raising and sensitisation.

Pedestrians, Cycling, Bus and Parking measures are in all the plans and with a very good result in detail and developing issues. Road hierarchisation are the following measures.

A broad majority of the SUMPs describe the measures for increasing and improving **cyclist and pedestrian mobility** in great detail. Almost two thirds of the SUMPs analysed contain detailed proposals (a score of 4 and 5 on the scale) for improving pedestrian mobility and for cycling mobility, with a similar degree of detail in all the plans. The most common actions include traffic calming measures, pedestrianisation of central areas in the city, the implementation of bike lanes and secure bike parks, and the promotion of bicycle mobility.

It is worth noting that most of the documents include a specific proposal for the "*Camino Seguro al Cole*" (Safe Route to School), designed to improve safety and accessibility for children on their way from home to school and enable them to walk or go by bike. However, there is a lack of proposals addressing the design of public spaces from any other than a merely functional point of view. Comfort in a public space is a key factor in encouraging users to modify their mobility routines, but the plans only occasionally include the use of ground floors of buildings, perception of safety, type of street section and displacement times.

The **bike rental** system is present in 62% of the plans. The degree of development is uneven and tends to be fairly limited, but as an additional measure it can be viewed as an essential complementary means for driving the shift to bicycle mobility (see Tables 3 and 4).

In the area of **public transport**, almost all cities (95%) consider the restructuring of bus lines as the primary action for optimising the existing service, establishing new routes or improving current ones. Other developments include accessibility at public transport stops and in the vehicles, the creation of segregated bus lanes and the use of new technologies to improve the user information service. In 77% of cases, these measures are well defined and have the maximum level of detail.

With the exception of the bicycle rental service, the remaining measures for improving public transport are difficult to assess as a whole, as not all the cities have a metro, commuter railway or tram network. The trolleybus, BRT and on-demand transport only appear in six of the documents analysed.

Nor do the action measures referring to the **metro or commuter railway network** provide much information for comparison purposes. These are networks that also integrate several municipalities, so the measures included are in most cases limited to references to the issue of accessibility in stations and intermodality with other modes of transport.

Also a broad majority (85%) of the plans specify actions referring to measures for **road hierarchisation and traffic reorganisation**. Several plans propose the construction or modification of existing infrastructures –in some cases almost certainly inviable– such as burying roundabouts or accesses to the city. However most of the solutions in the plans involve pedestrianising and traffic calming in the more central streets.

Around half of the cases devote a special section to the **design of the public space**. However, the plans that do contain measures in this category describe them in considerable detail, and feature proposals for types of street section, including vegetation in the urban fabric, reordering the space dedicated to private vehicles, materials and type solutions for constructive details.

There are a wide range of initiatives and proposals designed to **limit the presence and use of private vehicles** in cities. Several plans

Table 3
Summary of the matrix for assessing the general characteristics of the SUMP.

		1. Company / consultant 2. Local technician		LEVEL (1-3)		yes/no			General (G) / by Action (A)	
CITIES	Approval date/ SUMP publication	Redaction	Mean evaluation rate	Public participation and implication	Initial diagnosis	Safe route to school	Car sharing initiatives	Monitoring programme	Budget	Timeline
Madrid	2014	1	2,48	3	3	yes	yes	yes	G	G
Barcelona	2013	1	3,22	3	3	yes	no	yes	G	G
Valencia	2013	2	2,83	3	3	yes	yes	yes	-	A
Sevilla	2004	2+1	1,35		3	no	no	yes	A	A
Zaragoza	2006	1	1,78	1	3	no	no	yes	G	G
Málaga	2015	1	2,09	2	3	no	yes	yes	A	A
Murcia	2013	-	1,48		1	yes	yes	no	-	A
Palma de Mallorca	2014	1	2,70		3	yes	yes	yes	A	A
Alicante	2013	1	2,35	2	2	yes	yes	yes	-	G
Córdoba	2013	1	2,91	3	3	yes	yes	yes	G	G
Valladolid	2004	1	1,22		3	no	yes	yes	A	A
Gijón	2014	1	1,65	1	2	no	no	no	-	A
A Coruña	2013	1	3,52	3	3	yes	yes	yes	A	A
Vitoria-Gasteiz	2007	1	2,96	3	3	yes	no	yes	A	A
Oviedo	2012	1	1,43	3	3	yes	yes	yes	A	A
Móstoles	2010	1	1,78		2	yes	yes	yes	A	A
Castellón de la Plana	2012	-	2,39		3	no	yes	yes	G	G
Santander	2010	2+1	1,52			yes	yes	yes	A	A
Albacete	2010	1	2,13	2	3	yes	no	no	-	-
Getafe	2007	1+2	2,43	2	3	no	yes	no	-	-
Logroño	2013	1	3,48	3	2	yes	yes	yes	A	A
Salamanca	2013	1	1,78	2	3	no	no	yes	A	A
Huelva	2014	1	1,74		3	yes	yes	yes	A	A
Tarragona	2012	1	2,74		3	yes	no	no	A	A
Jaén	2013	1	1,83		3	yes	yes	yes	-	A
Alcobendas	2015	1	2,78	2	3	yes	yes	yes	A	A
Lugo	2009	1+2	2,13			no	yes	yes	A	A
Santiago de Compostela	2012	1	1,70	3	3	no	yes	yes	A	A
Sant Cugat del Vallés	2014	2	2,04	3	3	yes	no	yes	A	A
Rivas Vaciamadrid	2009	1	0,91			yes	no	yes	G	G
Ciudad Real	2012	1	1,96			yes	no	yes	A	A
Majadahonda	2010	1	2,09		2	no	yes	yes	G	G
Paterna	2009	1	1,83	2	3	no	no	no	A	A
Motril	2007	1	2,00			no	yes	no	-	-
Segovia	2007	2	1,48	1	3	no	no	yes	G	G
Huesca	2014	1	1,22		2	yes	no	yes	-	-
Toledo	2012	1	1,70	1	2	yes	yes	yes	G	G
San Cristóbal de la Laguna	2014	-	2,65	2	3	no	no	yes	A	A
Number of SUMP that consider / include it						23	23	31		
Percentaje						60,53%	60,53%	81,58%		
Number of SUMP that don't consider / include it						15	15	7		
Percentaje						39,47%	39,47%	18,42%		

Table 4
Summary of the matrix for assessing the degree of definition and development of the measures in the SUMP.

	DEFINITION LEVEL (1-5)*																							
CITIES	Pedestrians	Cycling	PT: bus	PT: metro	PT: commuter railway	PT: tramway	PT: bike rental	PT: on-demand transport	PT: trolleybus	PT: BRT	Road hierarchisation, traffic reorganisation	Design of public space	Private vehicles	Electric vehicles	Parking	Goods distribution	Intermodality	Accessibility	Road safety	Air and noise pollution	Urban planning regulations	Public participation	Indicators	Mean evaluation rate
Madrid	4	4	3	1	3		3				3		3	4	4	3	4	4	4		3	4	3	2,48
Barcelona	5	5	5	3			4				4	4	5	3	5	5	4	4	3	5		5	5	3,22
Valencia	5	5	5								5	5	4	3	4	3	3	3	3	5	3	4	5	2,83
Sevilla		2	3	3	2	2		5			4		2		1		2				3		2	1,35
Zaragoza	5	5	5		5	5					4				3		3			2	2		2	1,78
Málaga	3	3	5	1			2				3	3	2	1	4	3	3	2	3	1	2	3	4	2,09
Murcia	3	2	3			3		3							3	4	2	3	2			2	4	1,48
Palma de Mallorca	4	4	4				4				4	4	3	2	4	4	4	4	3	3	4	3	4	2,70
Alicante	5	5	5				3	4			5	2	3	2	4	2	2	2	2	1		3	4	2,35
Córdoba	4	5	4		3		4				5	3	3	2	5	4		4	4	4	4	4	5	2,91
Valladolid	3	2	4			1					4	2			4	2		3			3			1,22
Gijón	4	4	4								3	4	2	3	3	2		3	3		3			1,65
A Coruña	5	5	5				5				4	5	5	5	5	5	3	5	5	5	5	5	4	3,52
Vitoria-Gasteiz	5	4	4			3		3			5	5	4		4	5		4	4	5	4	4	5	2,96
Oviedo	3	4	5								5		4		5	1		3		3				1,43
Móstoles	4	4	3	2	1		2				4			1	4		2	2	3	2	2	2	3	1,78
Castellón de la Plana	5	5	3				2		5	5	4	2			3	3		5		2	4	3	4	2,39
Santander	4	4	4			2	3							2	4			5			3	1	3	1,52
Albacete	5	5	4		2		4				5	4	4		5		3	2	3		3			2,13
Getafe	4	4	5				4				4	3	2	2	4	4	3	4	4		3	2	4	2,43
Logroño	5	5	5				5				5		5	5	5	5	5	5	5	5	5	5	5	3,48
Salamanca	5	5	5				2				5	3	4	2	5		1		2	1		1		1,78
Huelva	3	3	4				3				3		3	2	3	3		3	4	2	3	1		1,74
Tarragona	5	5	5		4						5		3	4	5	5	2	4	4	3	4		5	2,74
Jaén	3	4	4			3							3	2	4	3	3	3	3	3			4	1,83
Alcobendas	5	5	5					3			5	3		2	5	3	4	4	4	4	3	4	5	2,78
Lugo	4	4	4		3		3				4	4			4	4	3	4		3			5	2,13
Santiago de Compostela	5	4	5										4		4	1	3			3	1	4	5	1,70
Sant Cugat del Vallés	4	4	4		1						4		2	2	4	3	2	3	3		3	4	4	2,04
Rivas Vaciamadrid	3	2	4				1				1		1		1					1	1	2	4	0,91
Ciudad Real	5	5	5				3				5		2	1	5	3		2			2	4	3	1,96
Majadahonda	4	3	4	2		2	2				3		2	2	3	4	1	3	3	2	3		5	2,09
Paterna	4	4	4	2		2	4				3	4	3		2		3	2	2	2		1		1,83
Motril	4	4	4				4				4	3	2	2	4	3		3	2	2	2	3		2,00
Segovia	3	3	3				2				3	4	2		4			2	2			2	4	1,48
Huesca	4	3	3										3		2				3		2	3	5	1,22
Toledo	4	4	2					4			3	3	3		2	1	1	2	2	1	2	4	1	1,70
San Cristóbal de la Laguna	4	4	4			3	3				4	3	3	3	4	3	4	3	4	4	3	3	2	2,65
Definition level average	4,05	4,00	4,13	0,37	0,63	0,68	1,89	0,58	0,13	0,13	3,47	1,92	2,39	1,50	3,79	2,39	1,84	2,76	2,34	1,95	2,24	2,26	3,11	
Percentage	81%	80%	83%	7%	13%	14%	38%	12%	3%	3%	69%	38%	48%	30%	76%	48%	37%	55%	47%	39%	45%	45%	62%	
Number of SUMP that consider this measure	37	38	38	7	9	10	23	6	1	1	33	21	30	23	38	28	25	32	28	26	29	28	30	
Percentage	97%	100%	100%	18%	24%	26%	61%	16%	3%	3%	87%	55%	79%	61%	100%	74%	66%	84%	74%	68%	76%	74%	79%	
Number of SUMP that don't consider this measure	1	0	0	31	29	28	15	32	37	37	5	17	8	15	0	10	13	6	10	12	9	10	8	
Percentage	3%	0%	0%	82%	76%	74%	39%	84%	97%	97%	13%	45%	21%	39%	0%	26%	34%	16%	26%	32%	24%	26%	21%	
Number of SUMP with lowest rating (1)	0	0	0	2	2	1	1	0	0	0	1	0	1	3	2	3	3	0	0	5	2	4	1	
Percentage	0%	0%	0%	5%	5%	3%	3%	0%	0%	0%	3%	0%	3%	8%	5%	8%	8%	0%	0%	13%	5%	11%	3%	
Number of SUMP with highest rating (5)	14	13	14	0	1	1	2	1	1	1	11	3	3	2	10	5	1	4	2	5	2	3	11	
Percentage	37%	34%	37%	0%	3%	3%	5%	3%	3%	3%	29%	8%	8%	5%	26%	13%	3%	11%	5%	13%	5%	8%	29%	

Table 5
SUMP related to Integrated Electric Vehicle Strategy in Spain.

	SUMP with MEASURES RELATED to ELECTRIC VEHICLE	
	No. SUMP	Percentage
Previous to 2012	5	21,7%
From 2013 inc.	18	78,3%
Total	23	100,0%

mention car-pooling or car-sharing (60%) –although without defining any specific proposals–, and the incorporation of facilities for electric cars (charging points, parking places and so on), although these measures are rare. It is worth noting that of the SUMP that include measures associated to electric vehicles, many of them (83%) date from after 2013, coinciding with the launch of the central government's Integrated Electric Vehicle Strategy in Spain (See Table 5).

All the plans include measures to tackle the issue of **parking**, generally with a high degree of detail, although the proposals frequently consist of regulating parking and implementing restricted parking areas. Some plans propose the creation of new underground or multi-storey car parks to eliminate the presence of parked cars on the streets.

76% of the mobility plans consider the aspect of **goods distribution**, but in general terms and with partially developed proposals. Only 13% of the plans outline any solutions in depth. There is a clear distinction between the plans that include a detailed development of this category and offer a variety of exhaustive proposals (urban distribution centres, night distribution and so on), and those where the solutions are limited to regulating loading and unloading hours and reserving parking places.

Intermodality is not always reflected in the proposals, and is only mentioned in 66% of the plans. No plan was found in the selected sampling that provides a detailed breakdown of actions to be carried out to improve this aspect. This may be due to the fact that intermodality is normally seen as an integral part of public transport improvements, and thus does not require its own specific category. However, the plans containing the most detailed measures for intermodality (16%) generally have a greater degree of development in all their proposals.

The measures relating to **accessibility** are closely linked to the proposals for pedestrian mobility, public transport and road safety. These actions usually incorporate standard solutions for conflicting points along pedestrian routes (changes in level, crossings, and accessibility in train and bus stations, among others). 33% of the plans cover the issue of accessibility in detail and 18% omit it completely, either because it is included (without being clearly defined) in the sections on road safety or pedestrian mobility, or else is not considered at all.

Road safety is present in most of the plans analysed (74%) and is generally oriented towards conducting awareness-raising campaigns and training programmes, and to signposting and speed restrictions. In most cases this category is only partially developed.

One of the goals of the mobility plan is to **reduce air and noise pollution** as a key aspect of the transformation of our cities towards sustainability and environmental equilibrium, and to improve the health of the inhabitants. However, not all the plans analysed include this category, and although it is present in many of the cases, it is only described in detail in some of them (21%). From the transversal and holistic point of view, this element should feature more predominantly in mobility plans. Although directly linked to other measures (a reduction in displacements by private vehicle implies less traffic and thus less pollution and noise), the differentiation of these measures within a plan signals that efforts are being made to effectively reduce air and noise pollution. Other authors also identified a non-quantified climate change targets in many other SUMPs (Arsenio et al., 2016).

Also, little attention is given to long-term sustainability, but there is a need for an assessment of longer term impacts.

In the category of **urban planning regulations**, the mobility plans propose the drafting of documents or specific plans to regulate each of the categories in the plan, or bylaws relating to vehicle circulation. In many cases they also propose a review of the General Urban Bylaw Plan (PGOU) and the application of measures to discourage the use of private vehicles, such as the creation of low-emission zones. In general, the action measures are only partially developed, partly due to the more theoretical and legislative requirements for changing or approving a new bylaw or regulation. Most of the plans consider the regulations in their proposals (76%), although in only 18% of cases is this aspect fully developed, whereas in the rest it is only partially developed.

Most of the SUMP analysed (74%) contain measures for **public participation**. The degree of development is much more complete when the public has most actively and fully participated in drafting the plans, through the creation of workgroups and workshops with residents and representatives of various associations and sectors. In some plans, the measures proposed are much less detailed and are limited to communication through awareness-raising campaigns, debating forums and information points.

It is crucial for the plans to include a **monitoring programme** with defined indicators to allow changes in mobility trends to be viewed objectively. The analysed SUMPs have a gap in the evaluation process. After a huge amounts of resources spent in SUMPs, Spanish cities are unable to know if their projects have been a success and whether the actions and measures implemented have truly contributed or not in order to change modal split or to avoid CO2 emissions (Diez et al., 2018). Despite this, only 10% of the plans analysed lack a monitoring plan and indicators associated to each of the measures described. These plans date from before 2010, as until that year monitoring aspects were not always considered when drafting mobility plans. The indicators associated to the action measures are clearly defined and developed in 82% of the plans, and are linked to each of the categories specified in the plan.

The **budget** is not always included. A quarter of the plans analysed do not specify a budget for the actions in the plan, and there is not always the same degree of detail in the plans that do have one. Half of the plans contain an itemized budget for each action, whereas in 24% it is more general and refers to large blocks. The presence of an itemized budget normally depends on the level of definition of the SUMP, so the more precise and detailed plans include a detailed estimate for each of the proposed measures. Similarly, the **timeline** is related to the budget in all cases, and the plans containing more clearly defined actions include a timeline for the implementation of each measure (See Table 6).

It is interesting to note that many of the Plans doesn't mention explicitly the need to develop **ITS solutions for urban mobility or technological innovations,** even though they are all smart cities and, therefore, a special interest is assumed in them for the use of technology in the management of the city, and because of the objectives of smart cities (Lyons, 2016). Only we can find some references to the use of new technologies to improve the user information service or to promote the electric vehicle. It is understandable that some barriers to this can be that the willingness of stakeholders to accept (or reject) the implementation of urban transport innovations is uncertain and, also, public policy and decision making is confronted with the forecast of large uncertainties related to the impacts of these technologies, which inhibit their implementation (Wiesenthal et al., 2011. Marchau et al., 2008).

Table 6
Budget and timeline defined in general aspects and by action.

		BUDGET		TIMELINE	
		No. SUMP	Percentage	No. SUMP	Percentage
1	General	9	23,7%	10	26,3%
2	By action	20	52,6%	24	63,2%
3	No information	9	23,7%	4	10,5%

4. Conclusions

This paper has described a comparative approach to the treatment of the measures in a wide sample of Spanish cities's SUMPs. It has illustrated how the Sustainable Urban Mobility Plans in Spain have a very precise level of definition in most cases and It's not the big cities that have always the best results in the evaluation. In fact, the best results obtained, in comparison, are A Coruña and Logroño, two cities of less than 250,000 inhabitants.

The SUMP documents represent a turning point for the paradigms of modal distribution of transport in our cities. However, although a wide range of initiatives have been put in place, there is still a long way to go until the desired targets are achieved.

In our study, most mobility plans include measures oriented to improving **pedestrian and cycling mobility**, but the initiatives and their implementation are uneven in quality, and in over half the cases they are of a poor standard and are insufficiently adapted to the local environment. Bike lanes have yet to be laid out in all the cities in such a way as to form a continuous itinerary with safe routes and satisfactory signposting and state of repair, and the public **bike loan systems** are poorly adapted to the location or with a rental system that could be improved. A single transport ticket would certainly include this service in alternative public transport and encourage intermodality.

Although most SUMP include measures for **road hierarchisation and circulation and traffic reorganisation**, the results show the degree of definition is normally poor. However, experiences in other cities around the world –for example New York– have shown that no major economic investment is required to change road hierarchy and transform a road with numerous lanes, for example, into a pedestrian street in the city centre, simply through the use of paint, flower pots, benches and street furniture. Therefore, good **design** guidelines for public spaces could produce improvements in accessibility, increase displacements on foot or by bicycle, and improve road safety.

Moreover, **accessibility** and **road safety** measures are normally included as independent categories, implying that particular emphasis is placed on the design and introduction of facilities for uninterrupted and predominantly pedestrian routes.

The **parking** regulation category features in most mobility plans, and is designed to regulate and restrict the presence of vehicles in the public space. They are also a source of controversy, as the mobility model is still highly dependent on private vehicles, and people demand parking places. There is a lack of any innovative measures in this category, such as the elimination of parking areas around office buildings or the reduction of parking spaces in residential areasvi.

Similarly, there is an absence of specific measures to restrict the use of private vehicles. Car-pooling or car-sharing is still not common practice in Spain, and the use of electric vehicles will require a promotional stimulus before it becomes widespread in cities as another transport option.

On the other hand, **goods distribution**, **intermodality** and **urban planning regulations** are categories of measures that are often poorly and imprecisely defined and implemented. As it has been noticed before, innovative measures could be proposed to change the mobility paradigm in Spanish cities.

The reduction of **air and noise pollution** is another as yet unresolved issue in mobility plans. Although most mention these types of measures, it is still notable that many documents fail to include urban green spaces (parks, gardens, flower beds, verges and others) as a design element in cities. The presence of vegetation and uninterrupted green routes in the city are measures that improve not only local environmental quality but also indirectly encourage the use of public spaces, as they generate more user-friendly environments for residents.

Public participation continues to be addressed more in theoretical than in practical terms. The various social, economic, and technical agents must all work together throughout all the phases of the SUMP to ensure its quality.

It is also essential for the monitoring programme and the definition of the indicators to be publicly available and updated on a regular basis in order to assess and renew the engagement with sustainable mobility over the years.

Although some author is optimistic (Glotz-Richter, 2016), the introduction of innovations is slow and has to overcome important legal barriers, that should be faced.

Finally, it should be noted that the SUMPs should address more holistic strategies that consider not only mobility, but also the quality of life of the citizens, the short and long term impacts, the affected groups and the social culture where each measure is applied. Not only measures focusing on public transport, but also on planning the shape and layout of the city must be addressed.

References

Arsenio, E., Martens, K., Di Ciommo, F., 2016. Sustainable urban mobility plans: bridging climate change and equity targets? Res. Transport. Econ. 55, 30–39.

Balant, M., Plevnik, A., Cré, I., Stoycheva, D., Mourey, T., 2016. CH4LLENGE. Addressing Key Challenges of Sustainable Urban Mobility Planning. D6.1 Documentation of Roadmap Development in Follower Cities. European Commission Executive Agency for Small and Medium-sized Enterprises. Intelligent Energy Europe Online at: http://www.sump-challenges.eu/sites/www.sump-challenges.eu/files/1_ch4llenge_documentation_roadmapping.pdf, Accessed date: 23 May 2018.

Banister, D., 2008. The sustainable mobility paradigm. Transport Pol. 15 (2), 73–80.

Camagni, R., Gibelli, M.C., Rigamonti, P., 2002. Urban mobility and urban form: the social and environmental costs of different patterns of urban expansion. Ecol. Econ. 40, 199–216.

Cavalcanti, C.O., Limont, M., Dziedzic, M., Fernandes, V., 2017. Sustainability of urban mobility projects in the Curitiba Metropolitan Region. Land Use Pol. 60, 395–402.

Cervero, R., 2013. Transport Infrastructure and the Environment: Sustainable Mobility and Urbanism. 2nd Planocosmo International Conference.

CIVITAS Network http://civitas.eu/, (01/June/2018).

Davies Sala, C., Mínguez Alarcón, E., 2016. Inventario de Planes de Movilidad Urbana Sostenible (PMUS) en España a marzo de 2016, vol. 39 Asociación Profesional de Técnicos En Movilidad Urbana Sostenible Notas See: www.aptemus.org/inventario-pmus-espana-marzo-de-2016/, Accessed date: 27 May 2018.

Decker, B., Hecimovic, H., Wolek, M., 2012. Sustainable urban mobility planning in central eastern Europe: case examples from Poland and Croatia. Procedia Soc. Behav. Sci. 48 (2012), 2748–2757.

Diez, J.M., Lopez-Lambas, M.E., Gonzalo, H., Rojo, M., Garcia-Martinez, A., 2018. Methodology for assessing the cost effectiveness of sustainable urban mobility plans (SUMPs). The case of the city of Burgos. J. Transport Geogr. 68 (2018), 22–30.

Diez Martínez, J.M., López-Lambas, M.E., 2014. Planes de Movilidad Urbana Sostenible en las Ciudades Españolas. CONAMA 2014, 17.

Dobbs, R., Jaana, R., Sven, S., James, M., Roxburgh, C., Restrepo, A., 2011. Urban world: mapping the economic power of cities. J. Monetary Econ. 36, 49 (March).

EC, European Commission, 2001. (COM (2001) 370 final) European Transport Policy for 2010: Time to Decide. White Paper, vol. 124 Online at: https://ec.europa.eu/transport/sites/transport/files/themes/strategies/doc/2001_white_paper/lb_com_2001_0370_en.pdf, Accessed date: 1 June 2018.

EC, European Commission, 2006. (COM (2006) 314final) Keep Europe Moving -Sustainable Mobility for Our Continent. Mid- Term Review of the European Commission's 2001 Transport White Paper, vol. 29 Online at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52006DC0314, Accessed date: 1 June 2018.

EC, European Commission, 2007. Green Paper - towards a New Culture for Urban Mobility {SEC(2007) 1209}. /* COM/2007/0551 final */ Online at: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52007DC0551, Accessed date: 1 June 2018.

EC, European Commission, 2009. Action Plan on Urban Mobility, (COM (2009) 490 Final. pp. 12. Online at: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52009DC0490, Accessed date: 1 June 2018.

EC, European Commission, 2011. White Paper. Roadmap to a Single European Transport Area - towards a Competitive and Resource Efficient Transport System. Online at: https://ec.europa.eu/transport/themes/strategies/2011_white_paper_en, Accessed date: 1 June 2018.

EC, European Commission, 2013. COM/2013/0913. A Concept for Sustainable Urban Mobility Plans to the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Together towards Competitive and Resource-efficient Urban Mobility. Online at: http://www.ipex.eu/IPEXL-WEB/dossier/document/COM20130913.do, Accessed date: 1 June 2018.

EC, European Commission, 2016. The Implementation of the 2011 White Paper on Transport "Roadmap to a Single European Transport Area – towards a Competitive and Resource-efficient Transport System" Five Years after its Publication: Achievements and Challenges. Commission Staff Working Document. Online at: https://ec.europa.eu/transport/sites/transport/files/themes/strategies/doc/2011_white_paper/swd%282016%29226.pdf, Accessed date: 1 June 2018.

ELTIS. El observatorio de la Movilidad Urbana. Online at: www.eltis.org/es/mobility_plans/planes-de-movilidad-herramientas-y-recursos (27/May/2018).

ELTIS, 2014. The Poly-SUMP Methodology. How to Develop a Sustainable Urban Mobility

Plan for a Polycentric Region, vol. 35 European Platform on Sustainable Urban Mobility Plans.
ELTISplus, 2013. GUIDELINES: Developing and Implementing a Sustainable Urban Mobility Plan. European Platform on Sustainable Urban Mobility Planspp. 150. Online at: http://www.eltis.org/sites/default/files/BUMP_Guidelines_ES.pdf, Accessed date: 29 May 2018.
ENDURANCE, 2016. European SUMP-network. http://www.epomm.eu/endurance/, Accessed date: 1 June 2018.
Franceschini, S., Marletto, G., 2015. Assessing the benefits and the shortcomings of participation – findings from a test in Bari (Italy). J. Transport Geogr. 44, 33–42.
Glotz-Richter, M., 2016. Reclaim street space! – exploit the European potential of car sharing. Transport. Res. Procedia 14 (2016), 1296–1304 6th Transport Research Arena April 18-21, 2016.
Government of Spain, 2011. Boletín oficial del estado Núm. 55. pp. 25033–25235.
Government of Spain, 2016. Boletín oficial del estado Núm. 304. IDAE, pp. 88616–88621.
Hickman, R., Hall, P., Banister, D., 2013. Planning more for sustainable mobility. J. Transport Geogr. 33 (2013), 210–219.
IDAE, 2003. Estrategia de Ahorro y Eficiencia Energética en España 2004-2012.
IDAE, 2006. PMUS: Guía práctica para la elaboración e implantación de planes de movilidad urbana sostenible.
Jones, P., 2014. The evolution of urban mobility: the interplay of academic and policy perspectives. IATSS Res. 38 (1), 7–13 July 2014.
Lindenau, M., Böhler-Baedeker, S., 2014. Citizen and stakeholder involvement: a precondition for sustainable urban mobility. Transport. Res. Procedia 4, 347–360.
López-Lambas, M.E., Vittoria Corazza, M., Monzón, A., Musso, A., 2013. Rebalancing urban mobility: a tale of four cities. Proc. ICE - Urban Des. Plan. 166 (DP5), 274–287 October 2013.
López-Ruiz, H.G., Christidis, P., Demirel, H., Kompil, M., 2013. Quantifying the Effects of Sustainable Urban Mobility Plans. JRC Technical Reports. European Commission, Joint Research Centre, Institute for Prospective Technological Studies.
Lyons, G., 2016. Getting smart about urban mobility – aligning the paradigms of smart and sustainable. Transport. Res. Pol. Pract. 1–11.
Marchau, V., Walker, W., van Duin, R., 2008. An adaptive approach to implementing innovative urban transport solutions. Transport Pol. 15 (2008), 405–412.
Marsden, G., Groer, S., 2016. Do institutional structures matter? A comparative analysis of urban carbon management policies in the UK and Germany. J. Transport Geogr. 51 (2016), 170–179.
Mataix González, C., 2010. Movilidad Urbana Sostenible: Un Reto Energético Y Ambiental. Obra Social Caja Madrid, pp. 71.
May, A.D., 2015. Encouraging good practice in the development of sustainable urban mobility plans. Case Studies Transport Pol. 3 (1), 3–11.
May, A., Page, M., Hull, A., 2008. Developing a set of decision-support tools for sustainable urban transport in the UK. Transport Pol. 15 (2008), 328–340.
May, A., Boehler-Baedeker, S., Delgado, L., Durlin, T., Enache, M., van der Pas, J.W., 2017. Appropriate national policy frameworks for sustainable urban mobility plans. Europ. Transport Res. Rev. 9, 7.
Merle, N., 2013. 30 years of Sustainable Urban Mobility Plans (PDU) in France. CERTU. Centre d'études sur les réseaux, les transports, l'urbanisme et les constructions publiques Online at: https://www.cerema.fr/system/files/documents/2017/11/1304_Fiche30ansPDU_EN_cle6c8317.pdf, Accessed date: 4 June 2018.
Mihyeon Jeon, C., Amekudzi, A., 2005. Addressing sustainability in transportation systems: definitions, indicators, and metrics. J. Infrastruct. Syst. 11 (1), 31–50.
National Statistics Institute, 2015. Instituto Nacional de estadística. Online at: https://www.ine.es/, Accessed date: 1 June 2015.
Nocera, S., Tonin, S., Cavallaro, F., 2015. Carbon estimation and urban mobility plans: opportunities in a context of austerity. Res. Transport. Econ. 51 (2015), 71–82.
Shen, Y., Hermans, E., 2016. Developing a sustainable urban mobility index: methodological steps. In: Emerging Trends in the Development and Application of Composite Indicators, pp. 20–37.
Spanish Ministry of Development, 2005. PEIT: Plan Estratégico de Infraestructuras y Transporte 2005-2020. See. http://www.fomento.es/MFOM/LANG_CASTELLANO/_ESPECIALES/PEIT/, Accessed date: 28 May 2018.
United Nations, 2014. World Urbanization Prospects. Department of Economic and Social Affairs, New York, pp. 32.
Van Audenhove, F.J., Korniichuk, O., Dauby, L., Pourbaix, J., 2013. The Future of Urban Mobility 2.0. Arthur D. Little and UITP, pp. 4.
Wiesenthal, T., Leduc, G., Cazzola, P., Schade, W., Köhler, J., 2011. Mapping innovation in the European transport sector (Wiesenthal et al., 2011). Institute for Prospective Technological Studies, Joint Research Centre, European Commission Online at: https://www.kowi.de/Portaldata/2/Resources/fp/Report-Mapping-Innovation-Transport.pdf, Accessed date: 1 June 2018.
Zavaglia, C., 2016. European Union instruments and strategies for sustainable urban mobility: exploiting PUMS and ITS to develop an efficient car sharing proposal. Procedia Soc. Behav. Sci. 223 (2016), 542–548.