Methodology for assessing the cost effectiveness of Sustainable Urban Mobility Plans (SUMPs). The case of the city of Burgos

Jose Maria Dieza,⁎ Maria Eugenia Lopez-Lambasb, Hernán Gonzaloa, Marta Rojoa, Andres Garcia-Martinezb

a Universidad de Burgos, Spain
b Transport Research Centre, TRANSyT, Universidad Politecnica de Madrid, Spain

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ABSTRACT
74% of Europeans live and move every day in cities, and 40% of the total CO2 emissions from transport is caused by urban mobility. The decarbonisation of urban transport can therefore produce a substantial reduction in total CO2 emissions. Cities have proposed various measures to reduce CO2 emissions from mobility, concentrating particularly on reducing private individual transport (car) by offering a range of alternatives.

Sustainable Urban Mobility Plans (SUMPs) are not new in Europe, as numerous precedents in France, UK, Italy and Germany have now been underway for a decade. SUMPs propose a strategy to reduce dependence on private cars by imposing a series of measures.

As the plans were designed for the long term (ten to fifteen years), it is only natural to question their effectiveness after a certain time has elapsed. However, there is little literature on this issue. To fill this gap this article proposes a methodology to evaluate Sustainable Urban Mobility Plans using indicators to assess the current situation of the city in terms of the effectiveness of the measures implemented, focusing on the specific case of the city of Burgos in Spain, where the Sustainable Urban Mobility Plan was introduced in 2005, and on the results based on the proposed methodology.

CO2 savings are always the primary target of a SUMP. Most assessments highlight changes in behaviour or public perception, but contain no in-depth analysis of cost-effectiveness. This paper aims to calculate a cost analysis for each tonnes of CO2 saved. This methodology is used in other fields such as lighting and energy, but not in transport due to its complexity. However, effectiveness ratios can be calculated with the available data on modal shift and investments in the SUMP, taking into account the costs as a whole. Other methodologies to determine external cost savings are included in the proposed methodology to achieve a more accurate ratio and consider more external factors.

1. Introduction

According to the European Commission and the Green Paper on Urban Mobility (European Commission, 2007), urban transport in the European Union is responsible for almost 40% of CO2 emissions from the total for the transport sector, and 70% of emissions of other pollutants. The same paper reports that 69% of road accidents occur in cities, and one out of three fatal accidents takes place in urban areas, with pedestrians and cyclists the most vulnerable in the system, and the main victims. According to the paper, each year the European economy loses around one hundred billion euros –representing 1% of EU GDP– due to urban congestion. However, these figures are in line with the population distribution: 74% of the European population lives and works in cities, with a projected increase of up to 82% by 2050, according to the European Commission (2012).

Dekoster and Schollaert (1999) noted that nearly 50% of car journeys in cities cover less than 8 km, and less than 3 in approximately 25–30%. These distances could easily be covered by a more sustainable transport mode (walking or cycling).

In accordance with the principle of subsidiarity in the European Union (1992), cities are ultimately responsible for their mobility and for providing accessible, safe and equitable transportation for their citizens (European Commission, 2007). Cities are also in charge of developing a Sustainable Urban Mobility Plan (SUMP), whose main objective is to provide and promote alternative means of transport to private cars (Monzon et al., 2006).

The main aims of this paper are to:

⁎ Corresponding author at: Universidad de Burgos, Dpto. Ingeniería Civil, EPS Universidad de Burgos, Campus ‘La Milanera’, Calle de Villadiego, s/n, 09001 Burgos, Spain. E-mail address: jmdmartinez@ubu.es (J.M. Diez).

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a. Create a methodology to estimate the total cost of the tonnes of CO₂ saved through the use of more sustainable means than private car in urban trips.
b. Identify the relevant variables affecting the assessment of the plans.
c. Model and propose a new system to assess the measures implemented in a SUMP.

The first part of the paper explains the situation of SUMPs in Spain and introduces the case study. The second part describes the different SUMP evaluation methods, focusing on the CiViTAS methodology for assessing the measures. The third section examines the SUMP in the case study and the separate assessment of the measures. The fourth section covers the methodology and application to the case study with the results obtained. The last part of the paper contains a critical self-assessment, conclusions and the discussion.

1.2. Introduction to the case study

The first official document published on this subject in Spain dates from 2006: “Guía práctica para la elaboración e implementación de Planes de Movilidad Urbana Sostenible – PMUS” (“A Practical Guide for the development and implementation of Sustainable Urban Mobility Plans – SUMPs”). These guidelines were promoted by the IDAE (Spanish Institute for the Diversification and Saving of Energy at the Ministry of Industry), although some cities—Burgos among them—had previously drafted their own mobility plans.

SUMPs require major investments from cities, and involve a series of actions to be developed over a period of about ten years. These actions affect city planning, changes in urban roads, public transport, Intelligent Transport Systems (ITS), and even mobility behaviour changes, always interacting in a harmonised way (Diez and Lopez-Lambas, 2014).

However, although they may include assessment and control systems, cities that implement SUMPs still have no certainty about their degree of success during the process. This is mainly due to their relatively recent introduction (SUMPs have been mandatory in Spain since 2011 through Law no. 2/2011 as a condition for cities receiving funding for urban public transport (BOE, 2011)) and to the lack of literature on the subject, in terms of their cost-benefit advantages or their cost-effectiveness, which is the focus of this article. According to the preparatory papers for the Eltisplus European Guidelines for SUMPs (Wefering et al., 2014), Spain was considered in the second level of development for SUMPs in cities, after Belgium (Flanders), France, Germany, Italy, the Netherlands, Norway and the United Kingdom.

1.1. SUMPs in Spain

The CiViTAS programme is launched through different calls (every four years, with the first call in 2002), and cities can submit projects shared with other cities in a consortium arrangement. To date, 58 cities have taken part in the initiative, receiving funds to implement measures within a Sustainable Urban Mobility Plan to develop local CiViTAS projects.

One of the most important aspects of the initiative is the assessment methodology based on quantitative and qualitative indicators and inspired by various methodologies: Max-Sumo (Rye and Carreno, 2009); Max-EVA (http://www.epomm.eu/maxeva), the web-based evaluation tool of the MAX-Sumo project; and the United Nations initiative, the Agenda 21 indicators (United Nations, 1992). According to Chapman (2007) and Banister et al. (2012), one of the proposed indicators is the reduction in CO₂ emissions (the transport sector can assist in mitigating the effects of climate change, largely by reducing carbon emissions), in this case mainly through specific measures (old and new fleet or emissions per kilometre saved due to shorter routes) or modal change, as the innovative methodology proposed in this article.

The most significant advance in the evaluation of measures was developed within CiViTAS II, which evaluated 17 cities (including Burgos), with 208 measures mainly corresponding to their Sustainable Urban Mobility Plans. CiViTAS II implied a massive financial outlay for the European Commission, and included a large budget for assessment.

The coordinators of the evaluation of the initiative (Klemenschitz et al., 2009, 2012) proposed a total number of 29 framework indicators to be applied to the measures implemented (Table 1 shows a summary by area).

Each city was required to choose four or five framework indicators for each measure. The number was selected depending on the level of complexity and the targets of the measure, and normally included more.

<table>
<thead>
<tr>
<th>Area</th>
<th>Explanation</th>
<th>Measurement</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic</td>
<td>Benefits and costs</td>
<td>€/person-kilometres</td>
<td>Quantitative</td>
</tr>
<tr>
<td>Energy</td>
<td>Energy consumption</td>
<td>Vehicle-km (MJ/vKm)</td>
<td>Quantitative</td>
</tr>
<tr>
<td>Environmental</td>
<td>Air quality/noise</td>
<td>Levels of CO, NOx, PM10 or PM2.5 (g/m³)</td>
<td>Quantitative</td>
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<tr>
<td>Social</td>
<td>Level of knowledge and acceptance/Safety and security/accessibility</td>
<td>Levels of dB or perception (dB)</td>
<td>Quantitative/Qualitative</td>
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<tr>
<td>Transport</td>
<td>Quality of service/safety and security/accidents/modal shares</td>
<td>Perception (%)</td>
<td>Qualitative</td>
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<td></td>
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<td>Benefits for accessibility</td>
<td>Qualitative</td>
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<td></td>
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<td>Perception (%)</td>
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<td>Timeliness (%)</td>
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<td>Accidents and Traffic levels</td>
<td>Quantitative</td>
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<td>Occupation of vehicle (person/vehicle)</td>
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<tr>
<td></td>
<td></td>
<td>Modal shares</td>
<td>Quantitative</td>
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امکان دانلود نسخه ترجمه شده مقالات
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