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Need for a holistic assessment of urban mobility measures – Review of existing methods and design of a simplified approach

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Abstract

The lack of suitable tools to assess sustainable mobility measures' costs, benefits and overall impacts is a significant factor impeding their implementation. Cost-benefit analysis (CBA) is often applied to large-scale infrastructure projects, but does not capture all relevant socio-economic impacts. Small-scale but potentially highly cost-effective measures often do not have the critical mass to warrant a thorough cost-benefit analysis. This paper reviews existing assessment methodologies, including their advantages, limitations and application to different urban mobility measures, and current assessment practice in cities based on survey results. Based on these analyses, a holistic approach for project appraisal is proposed, consisting of aspects of a multi-criteria analysis (MCA) and CBA and applicable to a variety of urban mobility measures.

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1. Introduction

Planning and managing urban transport is often a difficult task for local administrations. A reliable urban transport system is crucial to a functioning local economy, as it provides access to services and enables personal mobility (Browne and Ryan, 2011). At the same time, high levels of traffic impose negative externalities on society, including congestion, accidents, noise pollution or environmental damage (Santos et al., 2010). Decision-makers must consider a variety of different impacts (economic, social and environmental) resulting from urban transport projects or measures, along with their objectives. Investments in urban transport should deliver the maximum economic, social

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and environmental benefits; while in times of constrained budgets, projects' economic viability is often the deciding factor. Decision-makers need information on the potential costs, benefits and overall impacts of urban transport measures or projects.

The concept of evidence-based decision-making is intended to help policy-makers to maximise the benefits from their investments, and to prevent investments in measures or projects that fail to address critical problems. Ideally, decisions should be based on ex-ante assessment of measures' potential effects, preferably from all relevant fields. However, there is a tendency in transport decision-making to assess measures more narrowly, focusing on direct economic effects, which favours traditional measures. Including a wider range of factors when assessing urban transport measures promote the implementation of soft measures or innovative projects, whose costs and benefits lie predominantly beyond direct economic effects. Road expansion, for instance, might promise short-term congestion relief and economic benefits, but wider sustainability concerns are typically not addressed well, if at all.

This paper examines how cities can assess the costs, benefits and overall impacts of urban transport projects and measures on an ex-ante basis to facilitate sound decision-making. To do so, firstly, the advantages and limitations of the methods most commonly used to appraise transport projects are analysed, especially cost-benefit analysis (CBA) - frequently applied to large-scale infrastructure projects - and multi-criteria analysis (MCA), often seen as an alternative to CBA (Beria et al., 2012). Secondly, examples of these methods' application are presented - for both the ex-ante and ex-post assessment of various urban transport measures - from an extensive review of scientific literature and complementary examples from grey literature. Thirdly, current practice for ex-ante impact-assessment in European cities is examined, based on a written survey of 14 cities, conducted as part of an EC FP7 project (i.e. TIDE – Transport Innovation Deployment for Europe). Insights from the survey are complemented by literature analysis. Based on the overall analysis, a new approach for a holistic impact-assessment method was designed, reflecting cities' needs and also the need for applicability to a diverse range of urban mobility measures.

2. Analysis of existing assessment approaches and their application

This section contains an introduction to the two widely used assessment methods, and their advantages and limitations. Subsequently, examples of various measures' assessments are presented, followed by an overview of assessment practice throughout Europe.

2.1. Common assessment approaches

Cost-benefit analysis (CBA) and multi-criteria analysis (MCA), common methods for ex-ante and/or ex-post evaluation of transport projects or measures (Beria et al., 2012), have been subject of a detailed analysis, below. Other approaches, such as cost-effectiveness analysis - designed to identify the lowest-cost option to achieve a specific objective - or environmental impact assessment, have not been included as they focus on a selected set of impact factors rather than all of a project's or measure's impacts (Browne and Ryan, 2011).

Cost-benefit analysis

The idea of a CBA is to express a project's or measure's impacts, direct and indirect, in monetary terms, allowing the economic viability of a project to be assessed and expressed by viability indicators such as benefit to cost ratio (BCR), internal rate of return (IRR) or net present value (NPV). Impacts already expressed in monetary terms, such as investment or operative costs can be included easily in a CBA, whereas those impacts expressed in non-monetary terms must first be monetized. Some of these impacts have a direct market value, such as travel times or material damage caused by accidents. Otherwise, non-monetary impacts may be monetized by determining a monetization factor for them, for which many techniques are available (Tudela et al., 2006).

One of the main advantages of the CBA method is the ease in communicating its results through one or more indicators (Browne and Ryan, 2011). A project can be easily accepted or rejected based on the NPV (which indicates whether the benefits exceed the costs). By comparing the BCR of two alternative projects, the project that yields the higher benefits for each Euro spent can be identified easily. Especially in times of constrained local-government budgets, a project's economic efficiency is important to local decision-makers. The limitations of the method arise