Improving urban freight transport sustainability: Policy assessment framework and case study

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ABSTRACT

Although urban freight transport (UFT) is vital for importing and exporting necessary goods and waste, a number of negative sustainability impacts characterise the process. The relatively recent attention for UFT spurred the emergence of a variety of policy measures. Nevertheless, local authorities experience difficulties in choosing a successful solution. Generally lacking are short and long-term assessments, a multi-stakeholder approach and a solid contextual understanding based on data. In order to tackle these pressing causes for policy failure, we developed a *policy assessment framework*. The framework includes four methodologies that are relevant for UFT policy assessment and introduces 45 indicators for the collection of UFT data that enable monitoring and benchmarking and provide input for the assessment methodologies. The paper covers the policy assessment framework and a case study application on the Belgian city of Mechelen. As the city struggles with selecting an appropriate and broadly supported policy measure to increase UFT sustainability, a multi-actor multi-criteria analysis (MAMCA) is applied. The results show that conflicting interests greatly impede policy measure selection, making further adaptations to the city's proposals necessary. The policy assessment framework represents a well-reasoned and solid process for UFT policy-making that is supported by the stakeholders involved.

1. Introduction

Cities are increasingly confronted with major challenges imposed by transport. Up to 20% of urban transport is related to freight and service trips but these contribute proportionally more to the negative side-effects than passenger related trips (Verlinde, 2015). Due to the negative impacts of vehicle movements, warehousing, distribution centre operations and delivery and collection activities, urban freight transport (UFT) is considered unsustainable (Allen, Anderson, Browne, & Jones, 2000). The impacts can be categorised according to the triple bottom line of sustainability (profit, people, planet). Firstly, economic impacts contain time losses and unreliable deliveries due to congestion, use of resources and cost of governmental regulation and planning. Secondly, social impacts include quality of life issues, damage to infrastructure and health related risks linked to accidents and noise. Thirdly, the environmental impacts include emissions of global and local pollutants, next to use of non-renewable resources and waste of products (Verlinde, 2015).

Although local authorities traditionally focus more on passenger movements, various initiatives have been taken in the past decade to enhance UFT (Ducret, Diziain, & Plantier, 2015; Rodrigue, 2006). Policy measures aimed at improving sustainability in urban areas can be categorised in three groups: pricing initiatives; licensing and regulation initiatives; and parking and unloading initiatives (Quak, 2008). Adjusting UFT is, however, a complex matter as cities manage only limited resources (Gatta & Marcucci, 2016a). As UFT policies are likely to have highly differentiated effects among stakeholders, it is critical to take these conflicting interests into account (Gatta & Marcucci, 2016b). Many researchers have shown that UFT policy implementation failed because these stakeholders were not or insufficiently involved in the process (Ballantyne, Lindholm, & Whiteing, 2013; Macharis & Kin, 2016; Stathopoulos, Valeri, & Marcucci, 2012). According to Ballantyne et al. (2013), key stakeholders need to perceive the UFT issue that is being tackled and understand the elements involved. Stathopoulos et al. (2012) state that failing to take stakeholder-specific problem perceptions into account jeopardises the successful introduction of innovative UFT policies as well as their continuation in time.

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Macharis and Kin (2016) point out that although authorities are responsible for governing the area, the distribution of goods is carried out by private actors. Hence, involving relevant stakeholders should be a primary focus.

Next to poor stakeholder-involvement, UFT policy implementation is often unsuccessful because of a lack of systematic assessment of short and long term effects (Gatta & Marcucci, 2014; Macharis & Milan, 2015). Appropriate assessment tools to appraise, monitor and evaluate policy measures are essential. The European level initiated Sustainable Urban Transport Plan (SUTP) (Van Uytven, 2014), Sustainable Urban Mobility Plan (SUMP) (Wefering, Rupprecht, Bührmann, & Böhler-Baedeker, 2014) and Sustainable Urban Logistics Plan (SULP) (Ambrosino, 2014) support local authorities in the planning, development and implementation of an adequate transportation management. The plans discuss the main features of sustainable transport but, despite the highlighted need for monitoring, reviewing and reporting, do not provide a performance assessment framework. A complicating factor is that information on freight is characterised by multiple difficulties. Leonardi et al. (2009) state that data on freight transport performance is often incomplete, inconsistent or non-existent, differences occur in the units of measurement used and data is held by many different organisations. The need for proper indicators of measure has been highlighted by Lindholm (2013). Hence, a need to implement more integrated planning processes is pressing (Wefering et al., 2014).

In order to tackle these causes for UFT policy failure, we developed a *policy assessment framework*. The framework consists of two parts. First, a set of four methodologies that are relevant for UFT policy assessment – cost-effectiveness analysis (CEA), social cost-benefit analysis (SCBA), multi-criteria analysis (MCA) and multi-actor multi-criteria analysis (MAMCA) – is described, by listing advantages, disadvantages and outcomes. Guidelines on applicability are provided, enabling local authorities to select an appropriate methodology depending on the identified need. Second, the framework features a set of 45 indicators for the collection of UFT data. The indicator set is multi-applicable and permits to monitor the UFT situation, to benchmark the city's UFT performance against credible targets, other cities or an earlier point in

time and to provide input for the assessment methodologies. The indicator set is designed with a clear operational target, meaning that all indicators are relatively straightforward to manage and measure. Although comprehensive assessment tools have been developed in previous research, such as STRAIGHTSOL (Macharis et al., 2012) and NISTO (Donovan, Keserű, Bulckaen, & Macharis, 2014), the policy assessment framework introduced in this paper distinguishes itself by centralising the local authority perspective with regards to UFT. Furthermore, the framework provides both a uni- and multi-stakeholder approach, complementary assessment methodologies and a set of indicators that enable a solid base for data collection. A testing of the framework in practice demonstrates that the multi-stakeholder approach facilitates understanding and coping with divergence in the preference for alternatives between stakeholders. This is a crucial decision support element, since it allows to analyse how alternatives are perceived by different stakeholders and creates opportunities for improved implementation and deployment paths for urban freight measures that are supported by all stakeholders.

This paper is structured according to five sections. The second section covers the development and discussion of the policy assessment framework, describing the four assessment methodologies (2.1) and introducing the indicator set (2.2). The third section discusses the case study application of the policy assessment framework in the Belgian city of Mechelen. As the city struggles with selecting an appropriate policy measure to increase UFT sustainability that is supported by all stakeholders involved, a multi-actor multi-criteria analysis (MAMCA) based on qualitative data is applied. The fourth section discusses implications for policy and, finally, the fifth section concludes with the major findings and recommendations for further research.

2. Policy assessment framework development

The policy assessment framework aims to provide a useful and solid instrument for local authorities in urban areas to successfully implement adequate policy measures, in order to improve the overall sustainability of its freight flows. As visualised in Fig. 1, the
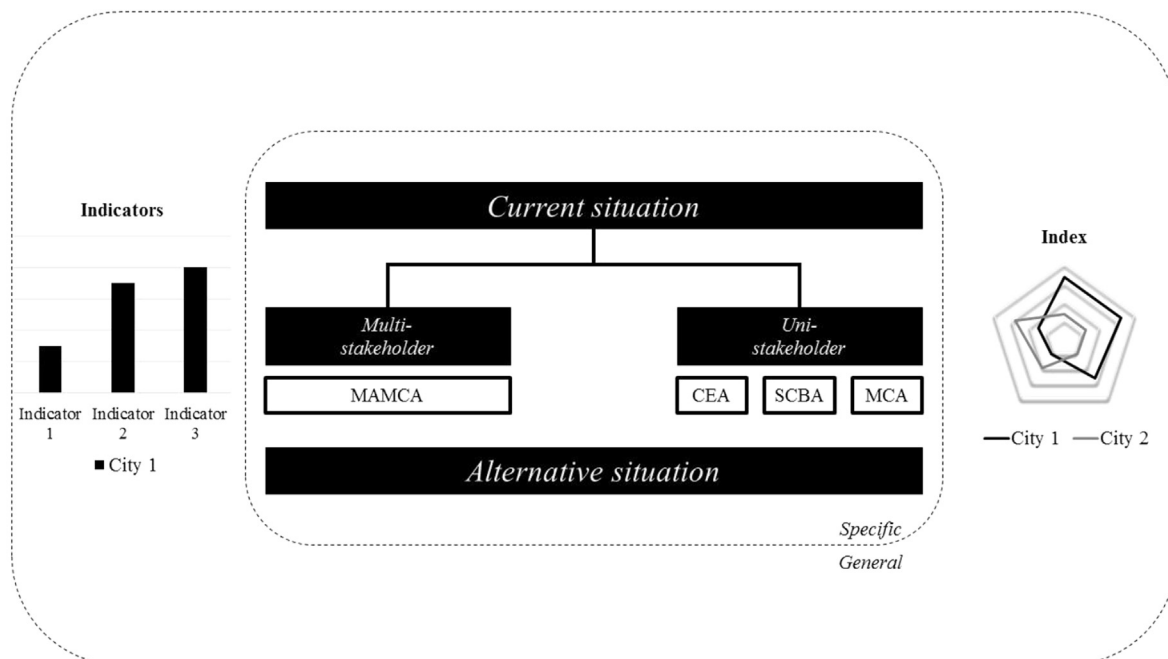

Fig. 1. Methodological approach of the policy assessment framework.