Facilitating long-term urban freight sustainability: indicator integration in a policy evaluation framework
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Extended abstract

Objectives and motivation
Freight mobility in urban areas represents to a growing extent a major challenge for modern cities in Europe. While the urban population and – inherently – the demand for goods grows steadily, the need to organise freight movements in an efficient and sustainable way is pressing. Europe’s logistics sector faces the tremendous challenge to halve its fossil fuel use and greenhouse gas emissions, while catering in a cost-effective way for goods transportation in the next decades (Smokers, Tavasszy, Chen & Guis, 2014). In the Belgian region of Flanders, representatives of both policy and industry initiated a number of activities in order to address this need. However, for local authorities to introduce competent solutions, correctly estimating the effect of these solutions on the city’s main concerns is crucial. Two difficulties currently impede a sustainable mobility evaluation at the local city level. Firstly, a gap exists in suitable urban freight sustainability indicators that fit the context. Secondly, local authorities in charge of urban mobility solutions generally lack the required skills and/or funds to individually collect, process, analyse and implement data-sets. Therefore, the abstract first proposes the identification of appropriate indicators for evaluating the sustainability of urban mobility, and the integration of these indicators in a composite index. Secondly, the data availability is analysed and solutions for currently lacking data are proposed. Thirdly, the selected indicators are linked to an integrated policy evaluation framework, containing tools such as an external cost calculator, social cost-benefit analysis and multi-actor multi criteria analysis. In this way, a better monitoring of the long-term shift towards sustainable urban freight movements is envisioned.

General description
Currently, an urban mobility policy evaluation framework is being developed for the Flanders region, in order to assess the impact of mobility and logistics measures on urban sustainability. An important element in this framework is the development of an index based on easily measurable and manageable indicators. The goal of this paper is twofold. First, the paper will describe the setup of such an index, taking into account data availability for the individual indicators. Secondly, the paper will investigate how these indicators can be linked to the additional tools for decision aiding that are incorporated in the policy evaluation framework, such as external cost calculation, social cost-benefit analysis and multi-actor multi-criteria analysis.

Indices or composite indicators are increasingly acknowledged as a useful tool in policy analysis and public communication (Bax et al., 2012; Hermans, 2009; Singh et al., 2009). To a large extent, they have become the focus in the field of environmental systems analysis (Zhou et al., 2006). The Compendium of Sustainable Development Indicator Initiatives mentions over six hundred efforts to create sustainability indicators. Parris and Kates (2003) refer in this respect to the concept of “indicator industry”. Nevertheless, a review of 36 sustainability evaluation frameworks demonstrates the gap in indicators that are able to adequately assess freight mobility. Of all studies investigated, that differ considerably in publication year, scope and procedure, 22 frameworks include indicators on freight. Nevertheless, as passenger mobility is excluded to a lesser extent, only two studies contain indicators that are explicitly addressing logistics activities. The aim of this research is to define a set of core indicators for this specific application that is well capable to be added to the already existing indicators that are relevant for sustainability assessments at the local level.

The Compendium of Sustainable Development Indicator Initiatives (2005) states that indices are highly competent to illustrate complex and elusive issues in wide-ranging fields, such as environment, economy and society. Given their ability to summarise, focus and condense complex phenomena into meaningful units of information, indices are ideal tools for assessing multidimensional concepts, such as sustainability (Li et al, 2012; Singh et al., 2009). For policy-makers, indices present a number of advantages. An index is a competent communication tool for addressing stakeholders and stimulating public interest, awareness and discussion (Li et al., 2012; Gilbert et al., 2002; Saisana, & Tarantola, 2002). The tool also enables comparison between other cases, or internally over time (Welsch, 2005; World Economic Forum, 2005). Furthermore, implementing an index enables to set priorities, justify policy measures, evaluate progress and ensure appropriate public funding (Patier & Browne, 2010; Hermans et al., 2009; Gilbert et al., 2002). In order to tackle the challenges that freight mobility imposes on the urban environment, accurate measurement is an essential condition to good management.

The drawbacks associated with indices are addressed by providing a detailed and transparent overview of the indicator selection process, which needs to be scientifically sound and based on solid statistical and conceptual principles (Nardo et al., 2005). Otherwise, the index can provoke misleading information, simplistic conclusions or theoretical discussions that might tackle the evaluations’ outcomes (Hermans et al., 2009; Nardo et al., 2005; Saisana, & Tarantola, 2002).

The final indicator set presented in the research has been developed based on an extensive literature review, taking into account a number of research projects and publications in the field of mobility and logistics. The review resulted in over one thousand potential indicators, that were examined based on a step-wise approach. In a first selection phase, applicability and usability criteria were implemented to achieve an initial shortlist. In a second phase, the final indicator proposal was listed, according to a set of predefined selection criteria. The process of selecting competent indicators is a widely discussed issue in literature. Naturally, it is highly important to carefully select the
indicators that capture the totality of the system, balancing the impacts of all relevant dimensions (Sikdar et al., 2012). Based on the review of 44 sustainability evaluation projects, six indicator selection criteria are listed. However, as opposed to most sustainability studies, the initial indicator selection is not data-driven but pursues a state-of-art evaluation set-up. Therefore, the research initially makes abstraction of data-availability and comparability. In order to be qualified for the final indicator selection, the indicator needs to be actionable, communicative, comprehensive, feasible, interpretable and relevant. Furthermore, the indicator can be both quantitative as qualitative, in order to evaluate all relevant aspects of mobility. The result is a most-preferred selection of indicators, that needs to distinguish between best needed and best available final indicators. Whereas best needed indicators can be seen as the most ideal selection set, that has only a limited number of shortcomings, best available indicators score better when taking data-requirements into account (Hermans, 2009).

Next, the data availability for the selected indicators is analysed and solutions for currently lacking data are proposed. Currently, the need for better and more accessible datasets related to urban freight logistics is increasingly recognised and new activities are being initiated. This paper will look at the current status in Flanders and will suggest solutions for indicators where data is not yet readily available.

In addition, the indicators used in constructing the index can also provide an important input for other decision aiding tools in the policy evaluation framework such as external cost calculation, social cost-benefit analysis and multi-actor multi-criteria analysis. Therefore, the appropriateness of the selected indicators for use in such tools will be analysed. It is increasingly acknowledged that the sustainability evaluation of the freight system in a specific urban context requires the support of all stakeholders involved (Macharis & Van Mierlo, 2013).

Next to the policy representatives, inhabitants and commercial actors, it is crucial to take the experiences of those performing freight transport and logistics operations into account. A number of difficulties are raised in this respect and include congestion, parking, loading and unloading issues and inadequate and conflicting policies, which are key to consider (Allen & Browne, 2010). The participatory nature of the policy evaluation framework will be stressed, and the potential for participatory data gathering that could in turn feed the indicators will be explored.

Results and conclusions

The literature review and selection process results in a hierarchical tree structured set of key indicators, covering the three pillars that constitute sustainability: people, planet and profit. In addition, a fourth pillar for policy is introduced, given the importance of policy interventions in local sustainability efforts. Allocating the indicators into one of the four categories is, however, not in every case a straightforward process. Therefore, the research proposes an overview of possible overlaps. On the next level, 22 sub-categories are introduced, structuring the indicators in a clear and clarifying way. Although the original framework includes both passenger and freight mobility, the abstract presented here merely covers activities related to logistics. First, representing the economic considerations, freight mobility and infrastructure are introduced. Second, land development, emission standard, energy consumption and emission constitute the environmental pillar. Third, the societal aspect is divided into noise, security, safety, health and employment. Fourth, the policy part contains human and financial resources, sustainable policies and businesses and public participation. As sub-indicators collect the indicators with similar cores, they have no meaningful unit of measurement and no obvious way of weighing. (Saisana & Tarantola, 2002) Therefore, the relevant linkages need to be extensively described in a theoretical or empirical way to the greatest extent possible (Nardo et al., 2005). To every indicator, a trend that reflects the desired direction of change is added (Parris & Kates, 2003). In this view, sustainability is envisioned as a pathway, instead of an end state (Behrends, Lindholm & Woxenius, 2008). By implementing this indicator-set onto a specific urban situation, the needs, strengths and opportunities uncover, forming a solid base for the introduction and evaluation of new transport concepts that contribute to sustainability. In addition, the selected key indicators will constitute a major input in the policy evaluation framework for scoring alternatives on the different criteria in an objective way. Throughout the analysis, the different preferences become visualised and give clear direction to the local authorities about the desired following steps of the policy-making process.

In a future stage, the theoretical framework will be applied on different case study situations, representing the urban diversity in Flanders. The case-studies allow improvements and adaptations where required and enable a first sustainability check for the cities involved. Here, the data-collection projects, that are currently ongoing in the region of Flanders, form a crucial base. The potential added value and future opportunities of these activities are taken into account.

References

Keywords: Urban freight mobility; Sustainability assessment; Evaluation framework; Sustainability index