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A novel approach for assessing sustainable city logistics

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Abstract

City logistics is a key catalyst in the urban economy but, in parallel, urban road freight transport significantly affects the quality of life in the urban environment. Optimization of urban freight transport (UFT) can make an important contribution to the sustainability and livability of cities, conducting in the alleviation of traffic congestion and the mitigation of CO₂ emissions and noise impacts. The detailed understanding of the causal effect of UFT measures on achieving sustainability of city logistics is the main scope of this paper. Life cycle sustainability assessment (LCSA) is adopted to assess selected UFT measures by advancing the research in life cycle analysis (LCA) to city logistics processes. Focusing on administrative/regulatory schemes, strongly related to city typology, a scenario is evaluated and two indices are estimated, one addressing the city (demand logistics sustainability index), and the second referring to logistics stakeholders (supply logistics sustainability index). The difference between the two indices, referred to as logistics gap, is also estimated.

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1. Introduction

During the last decades, technological, economical and social transformations, reclassifications in the urban land uses, and environmental consequences of road based transport systems, caused significant changes in patterns of freight movements, and have increased the interest and attention to freight transportation within urban areas. Traditionally, urban planning has been focused on passenger transport, and this, over the years, led to serious problems that cities had to deal with, resulting from the lack of an integrated freight urban transportation system design and implementation.

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Nowadays, both citizens and decision makers and planners face a contradictory situation, since, although they have technological instruments to ameliorate their daily lives, still, the economic crisis restricts the introduction and absorption of such instruments to sustainable management. It is clear that cities need to identify new strategies in order to improve quality of life of citizens, adjusting their planning to economic competitiveness and market needs, but also to emerging consuming behavior and trends. Statistics are revealing and actions, initiatives and sustainable solutions and approaches are required. A glance of the stage of play is depicted, as follows:

- Over 50% of the world population is living in cities (Grimm et al., 2008);
- More than 100 million people have migrated to cities globally since the beginning of this decade (Lee, 2014);
- In Europe, around 75% of the population lives in urban areas (European Commission, 2014);
- Urban mobility accounts for 40% of all CO₂ emissions of road transport and up to 70% of other pollutants from transport (European Commission, 2015);
- Annually, approximately 1% of Gross Domestic Product is lost by the European economy due to congestion (European Commission, 2011);
- Urban freight vehicles account for 6-18% of total urban travel (Figliozzi, 2010);
- Urban freight transport accounts for 19% of energy use and 21% of CO₂ emissions (Russo & Comi, 2012).
- By 2050, at least 70% of world population will live in cities (Lee, 2014);

Urban implications have been of concern for the Communitarian Bodies, and when the mid-term review of Transport White Paper (COM(2006)314) was carried out in 2006, the intention of introducing a Green Paper in urban transport was announced by the European Commission. The Green Paper “Towards a new culture for urban mobility” (COM(2007)551 final) was presented in September 2007 and contained a number of questions addressed to stakeholders and citizens, in order to indicate the most serious problems on urban mobility and possible solutions to these problems. This consultation resulted in the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions “Action Plan on Urban Mobility” (European Commission, 2009). In this Action, urbanization and its impact on transport was indicated as one of the key challenges in achieving more sustainable transportation systems that integrate urban mobility and promote partnerships at a local, regional and national level and enhance the involvement of European Union stakeholders, citizens and industry (European Commission, 2009). In addition, in the Transport White Paper of the European Commission, the achievement of CO₂-free city logistics by 2030 was set as an intermediate objective towards a reduction of 60% in Greenhouse Gas (GHG) emissions (European Commission, 2011).

City logistics have been introduced as an efficient concept to address the intricate problems arising from the multidimensional character of urban areas, which is formulated by environmental considerations, economic growth, new and smart technologies, legal and institutional frameworks, but also by congestion, air pollution, noise, crashes and reduced accessibility due to obsolete infrastructure or environmental and traffic restrictions. Optimization of Urban Freight Transport (UFT) can make a significant contribution to the sustainability and livability of cities, alleviating traffic congestion and mitigating emissions and noise impacts. The necessity to find solutions in order to reduce the undesirable impacts of urban freight logistics on quality of life and market, has encouraged a number of initiatives in urban areas and several measures of city logistics have been implemented and relevant solutions have been demonstrated in European cities.

To this end, two basic categories of measures are indicated related to city logistics: administrative/regulatory schemes and incentives, and collaborative schemes and cooperative logistics. This paper focuses on the first category, since the relevant measures are strongly related to the city typology, as concerns their feasibility and effectiveness. A list of indicative measures follows (Torrentellé et al., 2012; TURBLOG, 2011; BESTFACT, 2013; Ruesch and Glücker, 2001; TRAILBLAZER, 2013; SUGAR, 2011; Dasburg and Schoemaker, 2006; Geroliminis et al, 2005; STRAIGHTSOL 2012, European Center for Government Transformation, 2015; Papoutsis and Nathanail, 2015):

- Use of restriction/low-emission/light or low traffic zones, which integrate access control within time windows or by load factor and determine loading/unloading and parking areas for freight vehicles.

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