

## Chapter 5

# Sustainability Evaluation of Green Urban Logistics Systems: Literature Overview and Proposed Framework

**Jesus Gonzalez-Feliu**

*Ecole des Mines de Saint-Etienne, France*

### ABSTRACT

*This paper aims to propose a systemic vision of literature on sustainable urban logistics assessment and evaluation. Although non-extensive, this overview pretends lack of unification in the subject of assessing and evaluating the impacts of green urban logistics systems, and, through the proposal of a general assessment and evaluation framework, the steps done and being in course towards standards on this field. First, an overview of the research in urban logistics is provided, after what the main visions of sustainable development and their derived issues for urban logistics assessment and evaluation are presented. Then, a framework to assess and evaluate green urban logistics systems via scenario comparison is proposed. This framework aims to propose a methodological framework to use and combine existing methods to assess scenarios, and not a “black-box” model of software ready to use. This is done to make synergies between existing methods, and to show that, although they remain at an initial stage, steps on the way of defining standards are made. After that, the main applicability and application issues of the proposed methodological framework are addressed, showing those principles of standard from the literature. Finally, and to conclude, future developments on urban logistics research are proposed.*

### INTRODUCTION

In the last years, the importance of urban goods transport has changed the way city planners and transport and logistics practitioners organize their activities and define their priorities for action. Indeed, in various European countries, urban goods transport needs to be taken into account in transport plans for medium and big cities (CERTU-ADEME, 1998; Spinedi, 2008; Macharis and Melo, 2011; Arndt et al., 2013) and the debates on urban logistics are numerous. Indeed, in the last five years, various conferences on urban

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logistics (or having it as one of the main topics) have been held in different countries (Gonzalez-Feliu, 2016a). Opposing to pioneer events, more related to the scientific community, since 2012 those conferences have a higher implication of practitioners, which shows the interest of the different stakeholders on the subject and the needs of improving urban goods transport (Taniguchi et al., 2001; Macharis and Melo, 2011; Arndt et al., 2013; Gonzalez-Feliu et al., 2014b).

At the same time, those needs contrast with the difficulty of well identifying and quantifying urban goods transport. Indeed, we observe in literature a plethora of methods and procedure to collect and estimate data for assessing the efficiency and the sustainability of urban goods trips. Moreover, the visions and terms used by the different actors do not always coincide, making more difficult the communication and understanding of the different stakeholders.

However, and although several authors highlighted in a recent past a lack of unification in urban logistics planning and management (Macharis and Melo, 2011; Gonzalez-Feliu et al., 2014b), unified frameworks are starting to be observed, and the road towards a standard is maybe started. As a contribution to that path, this chapter aims to provide an overview, as well as a guide to scenario assessment in urban goods transport, mainly for sustainability analyses. The paper is organized as follows. First, an overview of the different times and developments in urban logistics is provided, as well as the main definitions needed for our overview and analysis purposes. Then, the main visions of sustainable development, their derived issues for urban logistics assessment and evaluation and the main indicators used in those assessments and evaluations are presented. After that, a methodological framework to assess and evaluate green urban logistics systems via scenario comparison is proposed. It is aimed at using and combining existing methods to assess scenarios, to make synergies between existing methods, and to show the potential of defining unified paths from existing works by similarity. After that, the main applicability and application issues of the proposed methodological framework are addressed by relating it to existing works and showing those principles of standard from the literature. Finally, and to conclude, future developments on urban logistics research are proposed.

## **An Overview on Urban Logistics: From Jules Caesar to City Logistics 4.0**

The planning and organization of goods transport in urban areas is not new. Indeed, the first written document that deals with the regulation of the transport of goods in a city is attributed to Jules Caesar, in the 1<sup>st</sup> B.C. (Quak, 2008): the *Legge Iuliana Municipalis*, who regulated urban deliveries by setting up night transit slots. Far from stopping here, the planning and organization of Rome city's food supply for the Empire, which since the reign of Augustus, named a figure, the prefect to the Annona, in charge of Rome city food supply, and dedicated to this purpose a set of logistical areas called Horrea, (Petit, 1974; Virlouvet, 2000, 2006). In the middle ages, guilds of merchants and craftsmen, as well as feudal lords ensured those functions of logistics city and supply (Boone *et al.*, 1990; Britnell, 1995; Kidd and Stumm, 2005). It was only with the industrial revolution and the consequent development of cities that the supply of these urban centers has changed drastically (Williamson, 2002), following the market economy developments and a more liberal and less centralized organization. The organization of transport in general was a private affair, and that period was characterized by small public intervention in terms of urban transport and logistics, for both people and goods.

This trend is highly changed in the 20<sup>th</sup> century, mainly in the 50's-60's with an important public investment in urban accesses and transport infrastructures, and a public intervention mainly in terms of personal transport, but not in goods transport. Cities are (even nowadays) planned and organized by

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