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## Modeling delivery spaces schemes: is the space properly used in cities regarding delivery practices?

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### Abstract

This paper discusses through modeling methods how the space is used in cities regarding urban freight transport. We will examine this question through one specific object: the loading/unloading (l/u) spaces. By comparing two fields of study (Lyon and Bordeaux in France), their actual situations and various scenarios, we will demonstrate why urban planners have to combine a large variety of solutions to improve the use of space in cities.

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### 1. Introduction

Quantifying spaces for freight deliveries is a fundamental stake in urban freight policies: some works showed that impertinent l/u spaces systems can have negative effects on traffic congestion and security (Aiura and Taniguchi, 2005, Delaître and Routhier, 2010). Other works investigated different solutions to reduce these negative impacts. Alho et. al (2014) present a model framework able to optimize the location and number of spaces. Unfortunately this work does not present any productions of the model because of the complexity of its calibration. Dezi et al. (2010) tackle the subject of optimizing the loading/ unloading (l/u) spaces system in a real situation with the city of Bologna. Even though not integrated in a modelling framework, this paper integrates both the temporal and spatial dimensions

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and the effects of the various configurations of l/u spaces on the urban environment, the main object of study being the loading/unloading space, its dimensions, number and location. The work presented in our paper is however not intended to discuss only these elements, but also to explore alternative solutions, to quantify their effects and to discuss the efficiency of actual l/u systems.

Until a recent period, there were no standardized methods in France to help local authorities with the problem of dimensioning l/u spaces. In 2009, the CERTU published a method to plan the needs for such objects (CERTU, 2009).

This method, suggested by the CERTU in France, translates the acceptability in terms of land use for delivery spaces for local authorities. Today this method has been adopted by many local authorities in France and is considered as a benchmark for quantifying needs for delivery spaces. We propose in this paper to compare the work of local authorities to elaborate l/u spaces systems to the methods suggested by the CERTU and to scientific methods.

The FRETURB model (Routhier and Toilier, 2007) that was calibrated thanks to the French surveys on urban goods movements (Patier and Routhier, 2009) will help us with the quantification of the needs for l/u spaces in order to absorb the freight delivery and pick-up activity. By mixing modeling and spatial analyses using GIS methods, we can refine this methodology and compare it to the reality of the field.

The CERTU method implies heavy field work. We therefore suggest the use of modeling tools, in this case, the FRETURB model, in order to generalize this method to an entire city. Indeed this model does not only measure traffic, but also the act of delivery (Gonzalez-Feliu et al., 2012).

We will compare two methods:

- Method 1, the number of movements modeled is translated to a number of delivery spaces thanks to the CERTU method. This method will be used in the paper to discuss policies on delivery spaces.
- Method 2, the number of movements is translated into consumed space by delivering vehicles, using a statistical method derived from the Freturb model results. This method will be used to discuss the real needs for l/u spaces with various shifts in practices.

Through the case study of two cities in France (Lyon and Bordeaux) we will compare the results of field work in these two cities thanks to collected and modeled data: the freight movements, the number of l/u spaces and their real uses. Thanks to this approach we will discuss the urban freight policies of cities in France, regarding the use of space.

The first method does not consider variations in delivery practices. Indeed, we will not consider the optimization measures in the modeling results of the first part of this paper. However the second method allows the discussion of shifts in delivery and pick up practices, such as reinforced control of delivery bays or delivery space booking (McLeod and Cherrett, 2011, Patier et al., 2014) or off-peak deliveries (Holguin-Veras et al., 2011). Though we won't discuss the feasibility of these measures, we will end this paper by considering their effects on different shifts in practice, urban planning and organizational measures, and their potential consequences on the use of the urban space, therefore proving that attaining sustainable freight systems cannot only be achieved through the use of space.

## **2. The CERTU method as a national standard**

Loading/unloading spaces and their dimensions/configuration is a stake for cities. Discussing the methods that are available for urban planners and their application is fundamental for building city logistics measures. Consequently, let us first describe the methodology available in France, issued by the CERTU, which can be considered as a standard method.

Between the end of the 1990s and the beginning of the years 2000, cities in France started to tackle more seriously the problem of freight transport in urban areas. The main subject of reflection was the improvement of delivery systems in city centers such as the works done in Paris, Lyon, Bordeaux (Ambrosini et al., 1998, Ripert, 2009). This motivated a reflection in Lyon that started in 2004, about the configuration and dimension of the delivery space system in the city center. Extensive work led to the edition of a guide especially intended for urban planners to quantify the needs for l/u spaces. As this guide was only distributed in the area of Lyon, it inspired the CERTU to adapt this guide for national purposes, in order to be used in other cities in France.

The main feature of this guide is to describe a method that helps urban planners to quantify the needs for l/u spaces. The main elements that are taken into account in this method are:

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