## PUBLIC TRANSPORTATION EFFICIENCY ANALYSIS

## Phase 2: Innovation

**The relationship between innovation and regulatory change in transport is not new. There are a number of examples that show the interaction between these two aspects. The importance of both regulation and innovation has been experienced in many transport sectors. For example, Gallamore (1999) shows the relationship between innovation and regulation in the American railroad industry.**

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## Introduction

## Metropolitan areas have experienced in the last decades an increasing expansion bringing, as a consequence, several socio-economic problems such as an unequal spatial urban development, a high pressure on disposable infrastructure, land and housing shortages, and, with emphasis, lack of urban services. These problems, in addition to low income and unemployment, expel poorer people to urban peripheries where housing costs are lower.

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## Urban expansion, a conurbation phenomenon in which city limits loose expression bring planning difficulties. Notwithstanding the difficulties, people require in each area an adequate public transport that allows easy moves to work, shopping, educational, health, and cultural centers. Thus, a metropolitan public transport system needs to assure mobility and accessibility through a fast, secure, regular, and trustable transport at a reasonable cost. Unfortunately it is not easy to assure all these characteristics due to complex institutional arrangements between state and several municipalities.

## The main objective of this paper consists of directive propositions to a new institutional arrangement to the Recife Metropolitan Area – RMA based on efficiency analysis of several transport systems.

## SYSTEM DESIGN

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## Figure -1 Public transportation efficiency analysis

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## MODULES

## Quality and efficiency in public transport

## Quality and efficiency of public transport systems may be analyzed based on several factors relating to the quality of the service that is offered – service performance – and to the performance of the agencies and companies in charge of it. As an example, Santos (2000) points several characteristics required for a good performance:

## System accessibility, determined by the distance between users origin and the initial station and between the last station and the final destination. The shorter this

## Measuring efficiency in public transport – a DEA analysis

## The efficiency of transport systems is determined by a data envelopment analysis – DEA. Urban transport systems are considered decision making units – DMUs that relatively measured in relation to those that determine the efficiency frontier. There are two major approaches – a parametric and a non-parametric one. Parametric frontiers are characterized by a production function of constant parameters. This method was originally developed by Aigner and Chu (1968). A functional form is defined and

## Background

## Several studies have been carried out to analyze the efficiency of urban transport services, using non-parametric techniques. A brief review of some of these studies are presented.

## Karlaftis (2004) presented a review of papers analyzing the performance of transport systems. Tomazinis (1977) specified a number of parameters to measure public transport systems and defined some basic concepts for the evaluation, such as efficiency, productivity and service quality. Fielding et al., 1978, Fielding

## Selected transport services, variables, and data

## Nineteen public metropolitan transport systems were analyzed (Table 1): seven Brazilian, five Spanish, two English, one French, one German, one Dutch, one Greek, and one Lithuanian. The selection of different countries services is justified, even if public transport policies are different, because of proposals similarity, that is, all present the goal of decreasing inputs and increasing outputs, assuring the highest quality as possible.

**RMA Agency and Metropolitan Transport Consortium**

**The administrative agency for the Recife Metropolitan Area, known as EMTU/Recife, is composed of 29 members representing the state government, 14 municipalities that compose the metropolitan area, state congress, municipal council of all 14 municipalities, public and private operators representatives, and representatives of employees, of users, and of producers and service providers. But EMTU/Recife was not empowered to administer and control all municipal transport systems. Thus,**

**Results**

**The efficiency scores obtained from the DEA model are presented in Table 3. The following systems were considered efficient: Seville, Madrid, Barcelona, Bilbao, Valencia, Manchester, Amsterdam, Athens, Vilnius, and Sao Paulo. The others are inefficient in different degree: London, Lyon, Frankfurt, Recife, Belo Horozonte, Fortaleza, Joao Pessoa, Salvador, and Teresina.**

**Of all Brazilian systems, only one was efficient. This represents 14% of the analyzed systems.**

**Analysis**

**The efficiency scores were analyzed according to the following criteria: power partition among the components of the administrative agency of the transport system and tariff structure.**

**Proposals for the institutional re-organization of RMA**

**Efficiency analysis comparing Brazilian and European transport systems may be very important to highlight aspects for service improvement. The DEA variable returns model used showed that only 14.3% of the analyzed Brazilian systems are efficient or 5.3% of the total analyzed systems. In contrast, only 25% of European systems were inefficient. A comparison of efficient and inefficient systems determines differential characteristics.**