

AN ANALYSIS OF ENERGY CONSUMPTION FOR TRANSPORTATION IN PORTUGUESE CITIES USING ARTIFICIAL NEURAL NETWORKS

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Abstract

Empirical studies carried out in several parts of the world have highlighted the existence of a strong relationship between the physical planning of cities and energy use for transportation. Despite the economic and environmental costs produced by urban sprawl, several countries have not yet started to study the phenomenon in order to better understand it and to somehow control it. Thus, this study tries to bring a contribution to the subject through an analysis of the situation found in some of the main Portuguese cities, which however do not include Lisbon and Oporto. The main objective of this work is to identify the variables related to physical aspects of the cities and socioeconomic characteristics of urbanized areas in Portugal that significantly influence energy consumption for transportation. After the spatial and socioeconomic data were combined in a single database, they were analyzed using Artificial Neural Network models, in order to identify variables that are relevant to energy consumption for transportation, along with their relative weights. The results found in the current study confirmed the trend observed in several countries worldwide, in which the *characteristics of urban form and population distribution* played an important role influencing energy use for transportation.

Key words: Energy consumption; Urban transportation; Portuguese cities; Artificial Neural Networks Topic Area Code: F3

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1. Introduction

Starting from the year 1990 and mainly after the first Earth Summit, which was held in Rio de Janeiro in 1992 focusing in general terms on the sustainability issue, and also in the urban sustainability problem in particular, the interest for the compact city concept has been increasing. The following planning strategies and policies came along with the compact city concept: high population densities, mixed land use, urban redevelopment and reorganization of public transportation systems. The concept is somehow a reaction to the extreme urban sprawl conditions observed in several parts of the world.

One of the main consequences of this urban sprawl seems to be the excessive fuel consumption resulting from the large number and length of trips conducted every single day by millions of people worldwide. Internationally known cities, such as Houston, Phoenix, Los