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Traffic risk generated by large urban commercial centers

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Abstract

As a consequence of development policies urban areas are substantially different in terms of road traffic risk. The shape, size and configuration of urban areas, the transport supply to meet people and goods mobility needs, as well as human behavior have huge influence on the road traffic volume and pattern and, hence, on the associated road crash risk. In this context, the paper reveals the effects of locating large shopping centers in the central areas of the city on the already over-congested road network. We use specific spatial analysis models in order to estimate vehicle and customers flows, attracted by one of the largest shopping malls in Bucharest. This approach gives theoretical and practical added value to the study: providing analysis tools to local decision makers for the ex-ante assessment of the consequences of locating large malls, in terms of traffic flow and associated crash risk.

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1. Introduction

Amongst the concerns regarding the negative local and global urban traffic externalities, road crash risk has an increasingly central role. In order to accomplish the sustainable mobility requirements, analyses should be extended upstream of transport. More precisely, the interactions between land use, urban planning and transport need to be examined. Urban shape, size and structure decisively impact on the characterization of people and freight mobility needs. Satisfying these mobility needs leads invariably to the emergence of specific traffic flows.

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The rapid and radical changes of socio-economic life in Bucharest (major changes in urban commerce structure caused by the emergence of large commercial centers, new concentration of urban and suburban residential areas, spatial and structural changes to places of interest - for work, education, leisure, etc.) have led to changes in the size and structure of urban traffic flow in the last two decades. In an urban environment with an inadequate road network to accommodate increasing traffic flows and new motorization indices, coupled with large arterial areas occupied by parked vehicles, traffic congestion has increased. The flow-on effect is an increase in the number of crashes and their severity.

From our research study aiming to analyze the urban areas with high crash risk, we have selected for the purpose of this paper several aspects concerning “vulnerable zones with high injury risk”. The large commercial and recreational spaces, which are located inside these areas with high density population (Fig. 1), generate and attract significant vehicle and pedestrian flows.

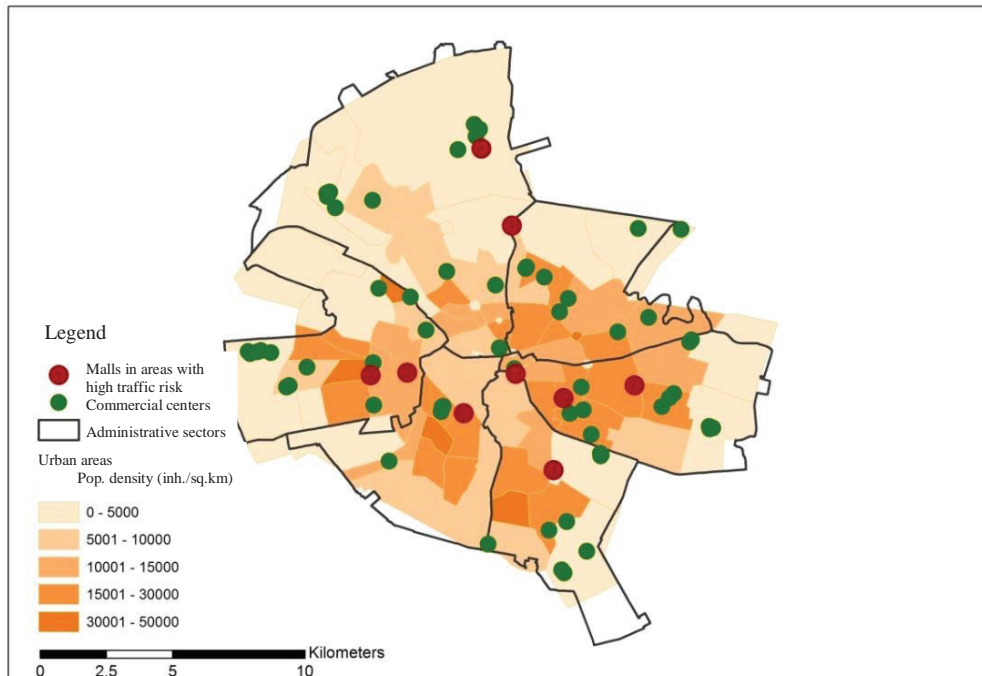


Fig. 1. Location of large commercial centers in Bucharest.

The supply needs of these large commercial centers produce important freight traffic. Overall, at the level of metropolitan Bucharest, about one million movements of freight vehicles are recorded weekly, of which 600,000 loaded, corresponding to an annual volume of about 14 million tons of freight. Urban freight distribution generates about 15-20 % of daily traffic expressed in physical units (Bucharest General Master Plan of Transport, 2008). Obviously, the level of traffic generated and attracted by large commercial centers is not the only contributing factor for road crash risk.

The road crash data analysis reveals multiple interactions specific to geographical urban zones. From a phenomenological point of view, the urban area is modeled as a complex system, where different levels of analysis are required, both synthetic and analytical. The traffic risk derives from the following classes of input features:

- *Object class* - defines the different types of elements which impact on risk, such as mobile entities (vehicles, cyclists, pedestrians, etc.) or elements of the technical and road urban infrastructure.
- *Actor class* - defines different groups or organizations that could influence the system; this category may include urban authorities, urban networks management, other associations, community.

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