International Journal of Sustainable Built Environment (2017) xxx, xxx–xxx

HOSTED BY

ELSEVIER

Gulf Organisation for Research and Development

International Journal of Sustainable Built Environment

ScienceDirect
www.sciencedirect.com

Original Article/Research

The effect of parking in local accessibility indicators: Application to two different neighborhoods in the city of Lisbon

Ana S. Vasconcelos *, Tiago L. Farias

IDMEC/IST – Instituto Superior Técnico, Dept. of Mechanical Engineering, Universidade de Lisboa, Portugal

Received 27 October 2015; accepted 8 February 2017

Abstract

When analyzing urban accessibility at a neighborhood scale, the pressure of parking is determinant to decide whether using a private car is an option for accessing local facilities or not. This paper intends to analyze the impact of different parking pressure characteristics in the estimation of local accessibility. Short trips to pharmacies, groceries, bakeries and primary schools were analyzed and a comparison of accessibility indicators for walking and car was made, considering four different parking scenarios. The methodology was applied to two different neighborhoods in the city of Lisbon, with significant differences in their urban planning and mobility patterns.

The results obtained show that, for a neighborhood with high walking accessibility, only a low parking pressure scenario would have better indicators when compared to the walking mode. The increase in 5 min in the time for the search for a parking place represents a decrease in the accessibility indicators in more than 20% and an elimination of the parking searching time plus a reduction of the distance to destination up to 25 m can increase accessibility up to 47%.

However, in areas more car-oriented, parking management can lead to significant reductions in car attractiveness. Only a high or very high pressure parking scenario would be less attractive than the walking mode. The parking policies could lead to a decrease in 80% of the car accessibility. Yet, this kind of measure would not represent a better overall accessibility to the neighborhood, contributing, however to a lower use of the motorized modes.

Keywords: Accessibility; Indicators; Urban neighborhood; Parking

1. Introduction

Nowadays the city centers have been characterized by an excessive use of private vehicles, as a consequence of last century urban transformations and of the built environment more focused on the private transportation which results in chronic congestion with consequences in the forms of delays, noise and air pollution. Urban areas now constitute the living environment of the vast majority of the population and therefore it is the utmost importance that the quality of life be as high as possible. Data from the Word Health Organization shows that by 1990 less than 40% of the global population lived in cities. However; in 2010, more than half of the population lived in urban areas and it is expected that by 2030, 6 out of every 10 people will

* Corresponding author at: Av. Rovisco Pais, Pav. Mecânica I, 2 Andar, 1049-001 Lisbon, Portugal. Fax: +35 1218417640.

E-mail addresses: ana.vasconcelos@tecnico.ulisboa.pt (A.S. Vasconcelos), tiago.farias@tecnico.ulisboa.pt (T.L. Farias).

Peer review under responsibility of The Gulf Organisation for Research and Development.

http://dx.doi.org/10.1016/j.ijsbe.2017.02.006

Please cite this article in press as: Vasconcelos, A.S., Farias, T.L. The effect of parking in local accessibility indicators: Application to two different neighborhoods in the city of Lisbon. International Journal of Sustainable Built Environment (2017), http://dx.doi.org/10.1016/j.ijsbe.2017.02.006

live in cities, and by the year 2050, this rate will increase to 7 out of 10 people (WHO, 2014).

For this reason, it is urgent to change the existent car-dependent life-style and return to an urban-style development more focused on the neighborhoods and also promoting soft and cleaner transport modes. Parking management has an important role, as inhibitor, if parking is too hard, or promoter of car usage, if a lot of parking space is available.

One way to study the impacts of modal choices in the quality of living is by studying the accessibility of the different areas. Accessibility has been identified as a performance indicator that can link land use and transport and can be very useful to assess "urban form, the density and spatial distribution of people and activities, as well as urban policy" (Benenson et al., 2011).

Recently, the differences between accessibility and mobility have become duly addressed and a visible growth in research activities concerning the estimation of accessibility indicators, in opposition to mobility indicators, has been noticed. Accessibility was firstly addressed by Hansen (1959) and can be defined as the "ease of reaching destinations", which is different from mobility, which is the "ease of movement" and can have opposite impacts (Levine and Garb, 2002). Although, mobility is related to the impedance factor of accessibility (reflecting the ease/difficulty of reaching a destination), policies to increase mobility will not necessarily increase accessibility. For instance, it is possible to have a good mobility (good roads and high levels of services) but with no desirable destinations available and on the contrary, it is possible to find zones with high congestion levels (low mobility) but where residents can achieve the desired destinations in the proximities (in short distances) (Handy, 2005; Levine and Garb, 2002). This means that planning for accessibility will require different methodologies and goals than the existing mobility-enhancing planning, as can be observed in different studies on accessibility in urban settings that have been performed over the past recent decades (De Montis and Reggiani, 2013).

Most research activities concerning the estimation of accessibility indicators have their focus on a regional scale and in the comparison of regional and metropolitan areas; however, there are some studies which focus on accessibility at a local scale (Handy and Clifton, 2001; Handy, 1992; Iacono et al., 2010; Omer, 2006; Silva and Pinho, 2010; Vasconcelos and Farias, 2012).

Handy (1992) was one of the first authors looking at local accessibility, comparing regional and local accessibility and the effect of new traditional development in trips with non-work purpose. For the question of knowing "whether traditional suburban forms engender less non-work travel than alternative forms", the conclusion was that although "the impacts of local accessibility on total travel were not conclusive, the findings clearly showed that local accessibility has an impact on travel patterns". The study was applied in four case study areas and show that in the areas which resemble to the neo traditional neighborhoods, the residents were significantly "more likely to make walking trips to commercial areas". Nevertheless, conclusions demonstrated the inability of establishing "whether these walking trips replace or are in addition to driving trips".

Other authors studied the impact of the city form in transportation and in mobility (Williams et al., 2005) and questioned about what should it be the best urban form to facilitate the sustainable transport solutions and consequently to reduce trip time, length and car-dependency. Kwok and Anthony (2004) developed an indicator to define the difference between public transport and car accessibility, allowing assessing and monitoring the sustainable transport developments. However, some authors defend that increasing mobility, along with the increase of transportation performance, can influence destination "to move farther and farther apart", representing, consequently, an increase in time and on the money spent (Levine and Garb, 2002).

Although the accessibility research has been studied since 1959 (Hansen, 1959), the implementation of accessibility measures only recently started to be considered in several countries. In the last decade, in the United Kingdom, the national guidance suggests, for the selection of sites for new developments, conducting transport assessments and for the definition of parking standards, the need to include accessibility indicators in technical studies (accessibility by non-motorized modes for the local facilities, the accessibility to and of transit systems, the accessibility of using transportation systems to or for opportunities and a comparison of accessibility for different mobility groups). Origin and destination accessibility are treated separately, considering that "origin accessibility measures the ease of reaching an opportunity (access to) and destination accessibility measures the ease with which a destination can be reached (access of)" (Halden, 2002).

When analyzing the accessibility at a local scale, the availability and ease of parking can determine the attractiveness of using this transportation mode in daily trips; if shops are close enough (within a walking distance) and parking is hard, residents may opt to use non-motorized modes (walking and bicycle) instead of car. Although several authors are now looking at the neighborhood scale, only a few studies address the effect of parking on neighborhood accessibility (Benenson et al., 2011; Salonen and Toivonen, 2013). Additionally, the availability of data on parking characteristics at a city scale was found to be scarce. van Ommeren et al. (2012) defined a distribution of cruising times for searching a parking place between no cruising and more than 3 min, however the predictable time is less than 1 min. These authors mentioned the difficulty to generalize this information "because these studies measure cruising in areas where it may have been expected, and is even much more difficult to generalize to other countries where the level of curb parking prices are much higher". In the same reference paper, the time taken to look for

Please cite this article in press as: Vasconcelos, A.S., Farias, T.L. The effect of parking in local accessibility indicators: Application to two different neighborhoods in the city of Lisbon. International Journal of Sustainable Built Environment (2017), http://dx.doi.org/10.1016/j.ijsbe.2017.02.006