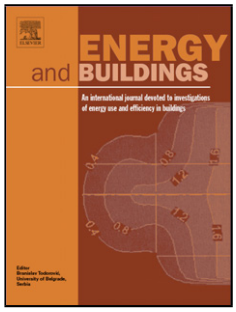

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Studies in the assessment of vegetation impact in the urban context

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ABSTRACT

Over the last years there has been a massive – and partially chaotic – increase in the extent of metropolitan areas. As a result, the microclimate of the cities, the performance of buildings, and the quality of urban life are critically affected by anthropogenic heat flux, heat absorbing construction materials, and reduced vegetation coverage. In light of this, the consideration and adoption of measures for the improvement of thermal conditions in the urban environment is a necessity. In this context, the present paper reports on a number of original case studies, which address the role of urban vegetation and green areas in different ways in terms of measures, methods, and scales. Thereby, the case studies are structured in terms of two general vantage points. Whereas the first group is primarily concerned with the implications of vegetation for microclimatic conditions in the urban settings (e.g. the effect of trees on the microclimate of streets and courtyards), the second group addresses the vegetation implications for the performance of buildings (e.g., cooling energy use and thermal discomfort in indoor environments).

Keywords: *thermal building performance, microclimate, vegetation, green roofs, urban trees*

1. INTRODUCTION

Over the last years there has been a massive – and partially chaotic – increase in the extent of metropolitan areas (Bhatta 2010; Duranton and Puga 2014). As a result, the microclimate of the cities, the performance of buildings, and the quality of urban life are critically affected by anthropogenic heat flux, heat absorbing construction materials, and reduced vegetation coverage (Erell et al. 2011; Krpo et al. 2010; Shahmohamadi et al. 2011; Obiakor et al. 2012; Ryu and Baik 2012; Salamanca et al. 2014). According to Erell et al. (2011), due to the extensive use of air-conditioning systems, densely developed cities may have significant anthropogenic heat flux with immediate negative effect on external air temperature. Furthermore, Krpo et al. (2010) noted that the required cooling energy for maintaining the internal comfort conditions is far greater for building materials with high thermal conductivity and low heat capacity. Consequently, this increases the energy use for cooling and subsequently the outdoor temperature rise.

In turn, resulting higher outdoor air temperatures affect the thermal performance of buildings by further increasing the building's cooling demand, which leads to even higher anthropogenic heat