

INFRASTRUCTURE OF DATA AND PROCESSES FOR URBAN GROWTH STUDIES BASED IN REMOTE SENSING, GIS AND SPATIAL MODELING

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ABSTRACT

The level of urbanization in Europe is expected to be about 80% in 2020 and, in 2015, more than half of world's population will be urban (NIC 2000; UNECE 2003). Studying and understanding the reasons leading to urban concentration phenomenon and finding the right strategies for monitoring and planning fast growing regions in a sustainable way is an important issue in the research agenda (EC-JRC et al. 2002; GLP 2006). Remote sensing, GIS and spatial modeling have been seldom applied to urban growth analysis in several studies to cite but a few (Li and Yeh 2000; Masek et al. 2000; White and Engelen 2000; Gluch 2002; Zhang et al. 2002; Herold et al. 2003; Cabral 2007). In this article we adapt the land-cover data infrastructure for measurement, modeling and analysis of land-cover change dynamics proposed by Aspinall (2002) specifically to urban growth studies that are based in remote sensing, GIS and spatial modeling. This methodological approach is an integrating concept of several elements that compose urban growth studies and is developed taking into account data and processes associated to it. Geographical data participates at several stages of the infrastructure. It is at its origin when multi-temporal and multiple source images are used as input and at its end when multiple scenarios of urban growth are generated. It is also used for assessing the classification of the input images with validation data and in the processes of calibration and modeling with diverse GIS data. This infrastructure differentiates five processes that are required to perform urban growth studies: image classification, classification assessment, change detection, calibration and modeling, model validation and projection of different urban growth scenarios. To illustrate the infrastructure, we describe its application with all its features to the study of the urban growth of the municipalities of Sintra and Cascais, Portugal, between 1989 and 2025. Simultaneously, extensive referencing to other urban growth studies is done for each part of the infrastructure. Although the description of the infrastructure is applied to a specific study area this is a general concept that can be adapted to any urban growth study based in GIS, remote sensing and spatial modeling.

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