GEO-PROSPECTIVE SIMULATION OF LAND COVER AND URBAN SPRAWL: THE CASE OF TANGIER CITY (MOROCCO) ON 2020

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ABSTRACT

Urban growth thus remains one of the main concerns of geography. This paper, with focus on the development of Tangier (Morocco) by 2020, asks two major questions. First, does satellite data address the question of how to understand the dynamics of change taking into account favorable factors as well as constraints that affect the status of land cover? Second, what model should be used for mapping changes and allowing simulation of urban sprawl through a geo-prospective?

This investigative approach is based on a methodology to evaluate potential evolutions and, finally, to determine possible ways to achieve geo-prospective mapping in regard to actual changes. To do so, we used the "Land Change Modeler"[1](LCM), because of the possibilities it offers for spatial analysis in associating data with multi-source and multi-temporal information. LCM is ideally suited to monitoring and simulating the spatiotemporal dynamics of land cover.

KEYWORDS

Urban sprawl, Land cover, Land Change Modeler, Remote sensing, Spatio-temporal analysis, Tangier, Morocco.

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1. INTRODUCTION

Since the second half of the 20th century, the demographic and spatial growths of cities have been presenting a large array of political, socio-economical, and environmental challenges. Urbanization requires particular attention to how the administrative, financial, sanitary, educational and recreational areas are chosen in the urban area, the purpose being to strengthen the economic, commercial and industrial opportunities, on one hand, and to contribute to the enhancement of the cities' attractiveness in general, on the other.

Models on the formation of a city, which focus on the spatial configuration and evolution of urbanized areas, have been the subject of numerous publications (Derycke *et al*., 1996; Pumain, 1997; Bailly, 1999, to name a few). The concentric pattern of Burgess dating from 1923 (Robert *et al*. 1925), the sector model of Hoyt (1939) and the model of the multicore city of Harris & Ullman (1945) are considered to be the first reference models on the growth of cities. Despite their relevance, these models do not integrate the constraints and barriers of urban sites' growth related to geo-environmental determinants. The Burgess model, for example, envisions urban sprawl without taking into account topographic constraints. Generally, the city remains a complex space in perpetual change, whose dynamics are based on geo-environmental and socio-economic criteria, urban planning policies, as well as historical and cultural heritages. In this, the city's morphology varies widely within many of these growth models. Contemporary approaches to urban growth in the world identify a variety of forms (Vanderschuren & Galaria, 2003).

In spatial analysis, remote sensing has been most commonly used to map land use / land cover including urban areas because of the possibility of regular surface state monitoring. Similarly, GIS has recently emerged as a new modelling system to analyse the development of urban sprawl. It favours an approach based on geo-spatial indices to evaluate and compare, on the basis of metric measurements, the development of urban housing in relation to land cover patterns, as well as to modes of transport and to environmental impacts (Hasse, 2004 and 2007; Dodane *et al*., 2014; Aguejdad, 2009; Aguejdad *et al*., 2016).

1. "Land Change Modeler" developed by Clark Labs, Clark University, USA, is included in Idrisi software (now called "TerrSet").