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4 Earth Observation Techniques and Geographic Information Systems as Tools for Assessing Land Use/Cover Changes in a Landscape Context

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Introduction

The terrestrial landscape consists of mosaics of different land cover/use types. Hence, land cover and uses cannot be satisfactorily described as isolated features: they need to be framed within the landscape context.

The need for spatial information, such as maps, in planning and management has long been recognized. This requires quantification of the spatial distribution of land cover/use patches at the landscape level. A patch is defined as a nonlinear surface area differing in appearance from its surroundings; in addition, patches are often embedded in a surrounding area or matrix that has a different composition (Forman and Godron, 1986).

In order to achieve efficient monitoring systems that focus on the understanding of land use/cover history and of their linkage to eco-biological and socio-cultural processes, a thoroughly detailed spatial knowledge of the landscape is needed. Efforts to quantify spatial structure of landscapes date back to the 1980s (e.g., Romme, 1982; Krummel et al., 1987), but have in

recent years accelerated in such a way that there are at present hundreds of indicators that allow some sort of quantification of various aspects of spatial characteristics at the landscape level (e.g., McGarigal and Marks, 1994; McGarigal et al., 2002).

Landscape structure is driven by the physical template (i.e. topography, climate, soil), as well as natural disturbances and human influences. One of the main objectives of landscape analysis is to develop quantitative methods to describe and monitor the structure of the landscape. This is not only from the perspective of assessing, reconstructing and modelling the history of land cover/uses, but also with the view (and with the assumption) that ecological and anthropogenic processes are linked to and can be predicted by patterns that are exhibited by coarse spatial scales (Gustafson, 1998). The level at which we can work will define the identification of patterns that will in tandem provide a decision framework that best describes underlying processes.

In this chapter the methodological framework and the technical tools are outlined to evaluate the land use/cover