

The 'colour' of remotely sensed and GIS data in the sustainable management of tropical coastal biocomplexity

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The sustainable use and management of the very important ecological, social and economic values of tropical coastal ecosystems (mangrove forests, seagrass beds and coral reefs) cannot be advanced without understanding the direct and indirect impacts of man, without foreseeing the consequences of the latter (in terms of the ecosystem's lag-time, resilience and recovery capacity), or without considering mitigating measures. The study of these aspects in tropical coastal zones requires fundamental and applied research and merits a scientific approach from the viewpoint of marine and coastal changes (incl. changes in biotic population structure, in biodiversity and biocomplexity, and in ethnobiological uses) in order to assess or to predict the extent of anthropogenic impacts or changes. Remote sensing and geographic information systems (GIS) are excellent tools to do this.

This presentation is based on 'Dahdouh-Guebas, F. (Ed.), 2002. Remote sensing and GIS in the sustainable management of tropical coastal ecosystems, Kluwer Academic Publishers, Dordrecht, The Netherlands'. This publication reviews the state of the art and application of remote sensing and GIS tools in tropical coastal zones and highlights a selected number of remote sensing case-studies on land cover patterns and disasters, population structure and its dynamics, and stand characteristics from South-East Asia, Africa and South-America, with a particular emphasis on mangroves. It further shows how remote sensing technology and other scientific tools can be integrated in long-term studies, both retrospective and predictive, in order to anticipate degradation and take mitigating measures in an early stage.

These technical tools are essential elements in the spirit of sustainable development and management, particularly in developing countries. Not only do these countries lodge a large part of our planet's biodiversity (particularly from tropical coastal ecosystems), but also they are the most vulnerable to environmental degradation. Using case-studies as examples of current remote sensing applications, this paper shows how remote sensing and GIS can be applied, developed and integrated in a sustainability framework to fulfil the local and global aims and needs stated above. It is illustrated how air- and space-borne very-high-resolution imagery can help in identifying species or areas from a fundamental point of view, or for prioritizing areas for protection and conservation, for development, or for sustainable exploitation.

The paper also highlights the guidelines towards sustainable management that result from remote sensing and GIS studies, and identifies existing gaps and research priorities for the future. It should be emphasized that next to technological innovation and multidisciplinary integration there is also need for fundamental understanding of the biocomplexity (incl. human factors) of tropical coastal ecosystems.

Keywords: mangrove; seagrass; coral reef; biocomplexity; human ecology; spatial resolution; temporal resolution; spectral resolution.