

Coastal zone resource management: perceptions, models, and multi-criteria decision support

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Abstract

Coastal zones around the globe experience rapid development and change, and in the Mediterranean, and in particular the Southern and Eastern parts, are undergoing dramatic demographic and related socio-economic development with growing and conflicting demands on natural resources. This leads to often irreversible degradation of these resources including the littoral and sub-littoral zones and thus the very basis for development: continuing urbanization and the development of tourism are just two prominent examples. Conflicting objectives, multiple criteria, and perceptions resulting in often unrealistic expectations on the one hand, and the physical and often institutional constraints of an environment - in the most inclusive sense - under stress provide a challenging mix for a rational and efficient resource management. Two ongoing projects sponsored by the European Commission under the INCO framework address these issues with a combination of information technology, environmental sciences and engineering, and socio-economic analysis. The projects develop and explore methods and tools for long-term policy analysis and strategic decision support for integrated and sustainable coastal development with special emphasis on land use and water resources including coastal water quality. Parallel case studies in Turkey, Cyprus, Lebanon, Jordan, Egypt, Tunisia and Morocco are used to test the methodology. The approach is based upon close and direct cooperation with the local and regional stakeholders who define the problem issues, criteria, objectives, constraints and instruments for policy options. This provides the basic inputs for an integrated set of tools for quantitative analysis together with methods of environmental, socio-economic and policy impact assessment using both models and rule-based expert systems technology. Indicators and indices provide the common language between stakeholders and analysts, and are used to link a cascade of modeling tools including land use change modeling, water resources modeling, and coastal water quality modeling. The model system is used to obtain a realistic (including economic assessment) and detailed representation of spatially distributed and dynamic resource management strategies and development scenarios. The models generate feasible policy alternatives that meet the stakeholders *a priori* constraints or expectations. A discrete multi-criteria optimization methodology is used in an interactive and participatory policy and decision making process to identify acceptable compromise solutions on that basis.