

Understanding Territory Dynamics in Coastal Areas. A methodological approach to analyse socio-economic and biophysical interactions.

Nelson Lourenço
Centro de Investigação da Universidade Atlântica
Antiga Fábrica da Pólvora de Barcarena
2730-036 Barcarena
PORTUGAL
nelsonl@uatla.pt

Carlos Russo Machado
Centro de Investigação da Universidade Atlântica
Antiga Fábrica da Pólvora de Barcarena
2730-036 Barcarena
PORTUGAL
cmachado@uatla.pt

Keywords: Integrated analysis, coastal areas, territory dynamics, agents of change, interactions.

Abstract:

The study of territory dynamics (in coastal or non-coastal areas) is an essential contribution to understand Global Change. While the problems caused by these changes are diverse, all of them can put the sustainable development of a region at risk.

Some of the most profound changes in coastal areas have arisen from direct decisions by man concerning land use, and these have affected both the quality of environmental resources, such as soils and water and the sustainability of coastal ecosystems. Land use decisions in coastal areas are based on opportunities and constraints affected by both biophysical and socio-economic drivers, being land use and land use changes one of the main issues integrating the large debate on sustainable development. Some considerations on integrated analysis of natural and social sciences in coastal areas are presented below, in search for a scientific expression of the political need to develop an integrated coastal zone management policy. Decisions regarding natural resources and land use are based on opportunities and constraints conditioned by both biophysical and socio-economic drivers. Thus, a more integrative approach is needed for human/environmental syntheses, which contributes for a better understanding of the biophysical and social driving forces. Besides, we need to understand the processes, behind the patterns of occupation of a territory and the use of resources.

The importance of coastal areas as a study object has emerged in recent times. This increasing significance is due to the complex activities that are present in those regions. Moreover different scientific research domains contemplate this complexity. Integrated Coastal Zone Management (ICZM) is defined as a dynamic, continuous and iterative process, by which decisions are made for a sustainable use, development and conservation of the coast and its resources.

For the natural researchers, coastal areas are related to the influence of the presence of the sea. This conception of coastal areas frames a region, with variations in large of its limits that include the coastal plain, the coastal cliff and the coastal plateau. In the immerse area the limits could also comprehend the continental shelves. Therefore, it is a demarcation very related to the influence (present or past) of the sea in the shaping of these areas.

In the frame of this paper the coastal areas are considered as the regions, located near the sea, where we can notice **rapid** and **intense** socio-economic and environmental changes. These kinds of changes are demanding for **fast** and **appropriate** policy responses as well as they act as important driving forces over hinterland regions. They can be considered as "*Hot Spot*" areas in the sense that they are one of the most dynamic and intricate areas of the planet. This complexity involves significant process of population dynamics, which are expressed in population growth, demographic stress and in rapid and intense migrations (hinterland-coast, rural areas-coastal areas).

Therefore, the extent of the coastal zone is defined by the area in which terrestrial and marine processes (economic, ecologic, and socio-cultural) depend on and influence each other. A variety of demands for utilisation and protection collide in this area making it a zone of problems and potentials. This approach to coastal areas reflects a distinctive way of understanding these areas. In articulation with the relationships studied by physical researchers, which give more importance to the land-ocean interactions, the studies, which relate to the coast-hinterland interactions, are emerging.

This complexity involves significant processes of population dynamics, which are expressed in population growth, demographic stress and in rapid and intense migrations (hinterland-coast, rural areas-coastal areas). The importance of these areas also involves complex land-use and land-cover dynamics. These dynamics are shaped by different factors, which allow us to see the importance of physical drivers (such as geomorphologic, extreme events and natural hazards) and social drivers (population dynamics, industrialisation, external market forces, cultural and life style patterns and policies regulations).

The question is how this integration is possible, and how it can be best achieved. This paper presents the results of the integration of disciplines and it deals with the questions required in order to achieve a suitable integration. The methodology encompasses three main issues: (1) Analysis of the driving forces responsible for territory dynamics and review of policies (sector-based and cross sector-based) laws, rules and restrictions which govern the use, obligations and management of coastal resources; (2) Analysis of the interactions between the socio-economic system and the coastal ecosystems in selected locations; (3) identification of scenarios and alternatives to the sustainable management of coastal ecosystems.

For the study of territory dynamics, the Geographic Information Systems arises as crucial for the identification of the main driving forces and critical areas. Nevertheless, territory dynamics can only be understood in depth through the understanding of the decision-making processes of the various agents of change present in a given territory. In such a way, the analysis of the local, or individual, level attempts to find out how people make decisions. As such, the GIS has shown to be a powerful tool not only because it allows for the expression of large amounts of data of a diverse nature (biophysical, socio-economic, and institutional), but also for the survey of various levels of analysis, thus supporting integrated analyses.

Hence, the usefulness of this methodology lies in understanding the factors, their dynamics and interactions that are responsible for the dynamics of a given area. It provides also an understanding of the reality helpful to the definition of scenarios of change or vulnerability, by attempting to identify the critical areas of land use change (present or future), and understanding and evaluating the vulnerabilities of those areas relative to those changes.

The understanding and analysis of environmental issues requires integrated and interactive approaches that allow for the comprehension of the complex interactions of social and ecological systems, and to assume that although environment is one vital dimension for the sustainable development of societies, it should be considered in the frame of the balance with the social and economic dimensions of sustainability.

The different paths to achieve sustainable development must take into account the interactions of social and ecological systems, which have repercussions in the ways territories are organised. However, the reflexive responses of coupled social-ecological systems to key biophysical, technological and social drivers are charged with great uncertainty and complexity, turning arduous the task of forecasting and managing change. Actuality, as a consequence of the reflexive dimension of human action, social changes involve transformations on the territory, which reciprocate conditioning the ways in which the social systems adapt themselves to the new spatial realities.

At the moment, both the scientific community and the policy makers perceive the convergence between economic viability and environmental protection as being an important step towards sustainability. However, the accomplishment of this perception and its development into a coherent research strategy is not easy. To date the scientific community has yet to provide a robust framework and suite of methodologies within which such strategies can be developed. Mainstream research has adopted approaches only relevant to individual disciplines and the difference in methodologies between disciplines has tended to preclude effective integration of approaches within single research projects. Moreover, the majority of studies tend to concentrate on the effect and impact of man's actions on the environment, dedicating little attention to the consequences of those changes on human activity. Studies on the role which humanity plays in global change are often carried out within the concept of an *analysis of the human dimension*, and thus, losing the systemic perspective.

The coastal zone and its resources bring about multidimensional problems for the management of the various systems and subsystems in action. Understanding these complexities requires a thorough understanding of the issues and constraints involved – human, sociological, environmental, physical and economic, as well as local needs and aims. Planning and policy-making for coastal areas is difficult due to the conditions of uncertainty, complexity, and scale of ecosystems.

Coastal areas are undergoing a high human pressure. Anthropogenic activities have a growing impact on these areas, and the degree of impact varies according to the degree of use of natural resources and environmental loads. The multiple uses of coastal zones pose excessive and competing demands on the limited resources. Fundamentally, two types of conflicts can be observed: those between the natural and the socio-economic systems; and those within the economy itself, in terms of conflicts among the users of the limited available coastal resources.

Integration is the base for the success of the policy-making process, as well as it supports the definition of relevant research priorities in terms of policy decisions. The scientific basis of this perspective is the belief that integrating physical and socio-economic approaches in the study of coastal areas represents a conceptually correct means of addressing the unifying issue of economic and environmental sustainability.

References:

- Jorge, R.; Lourenço, N.; Machado, C.R.; Rodrigues, L. 2002. Measuring, monitoring and managing sustainability in Indian coastal areas: the socioeconomic dimension. *in Proceedings of the 6th Conference Littoral 2002: the changing coast*. Porto: EUROCOAST-Portugal. pp 237-247.
- Lourenço, N.; Jorge, R.; Machado, C.R.; Rodrigues, L. 1999. Land use change: Methodological approach to understand the interactions Nature/Society in coastal areas. Ed. Vanda Perdigão. Ispra: JRC/ARIS-SAI, European Commission, 105 p.
- Lourenço, N.; Jorge, R.; Machado, C.R.; Rodrigues, L. 2000. Methodological approach to understand the interactions Nature/Society in coastal areas. *in* Carvalho, G.S.; Gomes, F.V.; Pinto, F.T. (eds.). *A Zona Costeira do Alentejo*. Porto: EUROCOAST-Portugal. pp 81-101.
- Lourenço, N.; Machado, C. R.; Jorge, M. R. 2006. Tourism, environment and sustainable development. Local strategies for improving rural livelihoods in Bahia (Brazil) and Goa (India). In proceedings of the International Symposium on Environment Identities and Mediterranean Area. Corte – Ajaccio, France, July 10-13, 2006
- Machado, C.R.; Reisdorff, C.; Duriaviv, M. 2004. The challenge of sustainable ecosystem development in Cachoeira catchment (South Bahia, Brazil). Universidade Atlântica, Barcarena, 81 p.
- Rodrigues, L.; Lourenço, N.; Machado, C. R.; Jorge, M. R.; Jacinto, J. J. 2004. Modelos espaciais de pressão sobre os recursos naturais: O exemplo da Mata Atlântica no Sul da Bahia, Brasil. Proceedings of the VIII Encontro sobre Sistemas de Informação Geográfica (ESIG 2004).