The importance of Global Change research and Land-Use and Land-Cover Change (LUCC) studies reflects concerns about the need to understand the influence of human activities on the biogeochemical foundation of the biosphere as well as their impacts on climate change.

Nowadays, since 1995, it is assumed the importance of LUCC as a substantial agent of change with great significance in climate change, loss of biodiversity, use of natural resources, human health and quality of life.

Therefore we must perceive the influences of land-use and land-cover changes as a significant driving-force for Global Change.

LUCC is an interdisciplinary project designed to improve the understanding and projections of the dynamics of land-use and land-cover change as inputs to and consequences of global environmental change and sustainable development. The scientific framework of this core project of IGBP is defined by major strategies reflected in three interlocking research foci (Table 1):

Table 1 - Research Foci of LUCC

<table>
<thead>
<tr>
<th>Focus 1</th>
<th>Focus 2</th>
<th>Focus 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Use Dynamics</td>
<td>Land Cover Changes</td>
<td>Integrated Models</td>
</tr>
<tr>
<td>Comparative Analysis</td>
<td>Direct Observations and diagnostic models</td>
<td>Regional and Global Models</td>
</tr>
<tr>
<td><strong>Activities</strong></td>
<td><strong>Activities</strong></td>
<td><strong>Activities</strong></td>
</tr>
<tr>
<td>1. Land use decision making</td>
<td>1. Hot-spots and critical areas</td>
<td>1. Modelling review</td>
</tr>
<tr>
<td>2. Local land use and regional-global levels</td>
<td>2. Socialising the pixel</td>
<td>2. Scale issues</td>
</tr>
<tr>
<td></td>
<td>3. Patterns to processes</td>
<td>3. Urban / Rural and water issues</td>
</tr>
</tbody>
</table>
These three foci reflect the need to articulate the study of the patterns of land cover changes (Focus 2) with the analysis of land-use dynamics comparing local case studies (Focus 1), and also the need to elaborate regional and global models (Focus 3) for estimating future land-use and land-cover changes.

Each group of Focus activities is trying to answer the same science questions but from a different perspective and at different scales. Each research focus also incorporates activities that create the linkage with other perspectives and other scales of analysis. The importance of this scales issue is related to the need for searching answers at local level integrating the external driving forces in other levels of intervention, i.e. the regional and the global framework that influence the local or the individual level.

**Land-use change studies (FOCUS 1)**

Land-use change is a key research and policy issue, which provides the theme for significant amounts of cross-disciplinary research. Despite the existence of a large number of national and international research programmes aimed at assessing the sustainability of land-use systems, there are few programmes with the explicit task of developing integrated methodologies.

Given the growing and often conflicting pressures on land use systems, this area of research has been identified as a major point of focus for national and international policies. Generally speaking, the effects of the change in land use on global change are still little known in much the same way as the factors, which are behind those processes, are not fully understood. There are difficulties in defining methods of intervention in the regions and in obtaining support instruments for decision making which are fundamental to managing, understanding, monitoring and assessing the (environmental and social) changes resulting from modifications in land use.

Therefore, the land use study involves both the manner in which the biophysical attributes of the land are manipulated and the purpose for which the land is used: forestry, parks, livestock herding, urban areas, suburbia, and farmlands (IGBP Report No. 35:20). The chosen classes denote intent or purpose of use, so knowing this purpose and intent is a manner to understand the trends of change.

Some of the most profound changes in the landscape 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 food production. Land use decisions are based on opportunities and constraints affected by both biophysical and socio-economic drivers. Predicting future land use change requires methodologies that integrate understanding of the processes affected by these drivers. Because the dynamics of land use and land cover can have biophysical, social, economic or ecological drivers, we must use a cross-disciplinary approach to analyse the different problems. Nevertheless the work depart from the disciplinary perspective of traditional land use studies it must maintain the specificity of each science.
Aside from a more integrative approaches for human / environmental syntheses, which must put for a better understanding of the biophysical and social driving forces, we need to push further from land cover to land use in a way that we must understand the processes more then the patterns of occupation of a territory.

**The coastal areas**

The importance of coastal areas as a study object has emerged in recent times. This rising of importance is due to the complex activities that are present in those regions. Moreover different scientific research domains contemplate this complexity. Therefore it is of great importance to fix the limits of what is considered as Coastal Areas.

For the physical researchers the 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 includes 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 kind of studies the coastal areas should be considered as the regions, located near the sea, where he can notice rapid and intense socio-economic and environmental changes. These sort of changes are demanding for fast and appropriate policy responses as well as they act as important driving forces over hinterland regions.

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).

Also the importance of these areas involves complex land-use and land-cover dynamics. These dynamics are shaped by different factors, where we can 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).

This approach to the coastal areas reflects a distinctive way of understanding these areas. In articulation to the relations studied by physical researchers, which give more importance to the land – ocean interactions, these studies are emerging related to the coast – hinterland interactions.

So these studies are emerging as a quite new topic of research inside the Land Use and Land Cover Change scientific network. The approach should be the analysis of different case studies that must provide methodological tools to the divers users of the land. Therefore it is very important the development of methodological approaches to the study of land use change in coastal areas.

These methodological approaches must apply to the capacity of the remote sensing and geographical information systems techniques in order to develop and support the research in those areas.

**A case study in Portugal: The Alentejo Litoral**
In the study "Land Use Change: Methodological Approach to Understand the Interactions Nature / Society in Coastal Areas\textsuperscript{1}", the coastal area of Alentejo will be the territorial unit of research. This fact is justified by two main reasons. In the same region we can identify a great diversity of activities and uses of the territory: the agriculture at north and south; the industry in Sines county; and the tourism related with the existence of small beaches.

It is also a region where the environmental degradation is, for the time being, restricted to the areas near the industrial harbour of Sines. Nevertheless the increasing pressure over the land towards a higher tourist expansion could, if not well planed, damage the environmental balance expressed by the existence of the Natural Park of Alentejo Coast.

With regard to land use, the largest part of the county's area is covered by montado, essentially with cork trees, with a more or less extensive use of the soil. Along the coast and in the two irrigated areas more intensive land use is possible, namely for the production of vegetables and fruit.

The application of the proposed methodology to the monitoring and managing of changes in coastal areas make possible the articulation of demographic, economic and social data with information of physical nature (soils and land cover).

These two groups of data will be introduced into the Geographic Information System making for a spatial reading of the information. The effort of compatibility between the different kinds of data will make possible the integrated analysis.

The GIS software makes possible the quick adaptation of the analysis to the questions that will rise during the course of the research.

This procedure would require the characterisation of the region based on indicators (censuses, annual statistics, and data obtained by remote sensing techniques). The use of Corine and Lacoast information will be an important source to the identification of the land use changes.

At regional level the analysis should, therefore, be based on information obtained with instruments for remote detection (satellite pictures and aerial photographs) which permit the collection of information on land use in the coastal area. These instruments also make it possible to obtain data for different periods and to carry out an evaluative analysis of the main changes in land use. On this level, official statistics can also be analysed to collect socio-economic information, which is fundamental for describing the region's general framework. These two types of information are complementary and fundamental for the identification of the main problems, which affect the region studied.

Simultaneously, it is necessary to study the main participants in the land's use. Is therefore, fundamental for understanding the motivation of these agents when they use the land.

In this way, the study is carried out on two levels of analysis. On a regional scale, it is possible to describe the region, and use official statistics and remote detection to identify the main problems to be dealt with and the main changes in land use. At local level, a study is made of the social actors, and of the factors for change identified at regional level.

\textsuperscript{1} This study is funded by the Space Applications Institute of the Joint Research Centre and will be developed during 1999 by the research team from Centro de Investigação da Universidade Atlântica.
The study will identify and highlight three fundamental dimensions, which define a systemic articulation that structures the processes of change in coastal areas: the change in land use; the intervention of the different actors in the territory; and the regional and local dynamics.

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LUCC (1999). Implementation Plan for Land Use and Cover Change, draft for review prepared by the Scientific Steering Committee of LUCC
