EUROSTAT

Integration of geographical and statistical data in the environmental accounting framework; methodological development based on two case studies

Action 2 :
Integration of environmental accounts in coastal zones; case study of tourism

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The Development of Land Cover Accounts and Environmental Indicators for the Coastal Zone of Europe: Final Report

Part 1: Introduction

1.1 Background and Context for Study

The need to develop and apply systems of environmental accounting has been widely recognised by the international community. In the 1990s for example, *Agenda 21* highlighted the need for reform of national systems of economic accounting to ensure that the environmental impacts of economic activity are to be expressed clearly. As a result subsequent work has sought to develop different ways of 'taking the environment into account'.

A key stimulus to recent work has been that of the 'London Group' of the United Nations Statistical Division[1], which aims to provide an annual forum for leading countries and international organisations to exchange practical and conceptual expertise with respect to the development of environmental accounts linked to the System of National Accounts. Their goal is to play a leading role in defining international standards in the theory and practice of environmental accounting.

Reviews of approaches provided by the London Group and others broadly leads to the definition of environmental accounting as any method that records changes, directly or indirectly, in the quantity or quality of the environment where change is expressed in monetary or physical units. Thus two broad approaches can be recognised:

- Monetary Environmental Accounting (MEA), in which changes in the status of environmental assets or resources are given monetary value.
- Physical Environmental Accounting (PEA), in which changes in the status of environmental assets or resources are expressed in appropriate physical units, rather than in non-monetary terms.

This study focuses on one type of PEA, namely *Land and Ecosystems Accounts*[2] (LEAC). These accounts deal with changes in land cover and land use and seek to trace the wider implications environmental, social and economic implications of these transformations.

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1 http://unstats.un.org/unsd/environment/londongroup.htm

2 SEEA 2000, draft version, Chapter IX, section C, *London Group website and CBS of the Netherlands, papers of the London Group meeting, Voorburg, 7-11 May 2001* and Emission Structure Information System : Physical Accounts for Land cover /Land use and related Changes in Artificiality of Land and Biodiversity" *report for Eurostat by IFEN with contributions from StBA of Germany and the University of Nottingham, 1997.*

The methodology underlying PEA has been developed in a consistent way since mid-90's, as the result of a pilot study sponsored by the UNECE and published by IFEN[3] in 1995. The results were presented, the following year, with 3 communications at the IARIW Special Conference on *Environment accounting in theory and practice* in Tokyo[4].

The research continued in the context of a task force at Eurostat with a set of 3 case studies in France, UK and Germany[5]. These were designed to assess:

- the possibility of building up accounts on CORINE Land Cover (an assessment in Franche-Comté, France);
- the benefits for reporting in an accounting framework an the stratification of land requested (from the Countryside Survey, UK);
- the linkages of land accounts and sectors (Germany)

As a result of such work, the Eurostat working group[6] argued that *"... land accounting techniques, with linkages to both human activities and natural processes, can be regarded as a useful tool for responding to a number of issues set out by policy objectives"*. It was suggested that these included:

- Biodiversity and habitats
- Intensity of land use
- Urbanisation and, in general, changes in land use
- Linear features
- Spatial fragmentation and contiguity
- Soil sealing
- Tranquillity and resilience of ecosystems
- Possibly net primary production and climate change

Initial research on LEAC has led on to the drafting of the Section C (Land and ecosystem accounts) in Chapter VII (Specific resource accounts) of the new SEEA (System of Environmental and Economic Accounting, SEEA 2000, draft version)[7].

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3 Physical Environmental Accounting : Land Use/ Land Cover, Nutrients and the Environment, *UN-Economic Commission for Europe, Etudes et Travaux n°4, IFEN, Orléans, France, 1995.*

4 Jonathan Parker, Anton Steurer, Ronan Uhel and Jean-Louis Weber, A general model for land cover and land use accounting (Drafted from the report of the UN-ECE Task Force on Physical Environmental Accounting), Invited paper, IARIW Special Conference on « Environmental Accounting in Theory and Practice », Tokyo, March 5-8, 1996; Andrew Stott, Roy Haines-Young, Linking Land Cover, Intensity of Use and Botanical Diversity in an Accounting framework in the UK, Invited Paper, IARIW Special Conference...;Walter Radermacher, Land Use Accounting - Pressure Indicators for Economic Activities, Invited Paper, IARIW Special Conference...

5 Jean-Louis Weber (French Institute of Environment, IFEN), Philippe Cour & François-Pierre Tourneux (Unisfere-Besançon, France), Roy Haines-Young (University of Nottingham, UK), Elle Krack-Roberg & Dieter Schäfer, (Federal Statistical Office of Germany, StBA), Emission Structure Information System : Physical Accounts for Land cover /Land use and related Changes in Artificiality of Land and Biodiversity, Final Report of the Contract n°B4-3040/96/021, Eurostat, 1997

6 Land Accounting - Proposals for a Work programme, A preliminary report by Eurostat B1 for the joint meeting of the Environmental Statistics Working Group and the Environmental Accounts Working Party, 9-11 September 1998

7 SEEA, System of Environmental and Economic Accounts, rev. 2000, Chapter 8, Section F Land and Ecosystems Accounts, §8.336 to §8.399 – Draft prepared by the London Group on Environmental Accounting and submitted to the UN Statistical Commission in March 2001 – forthcoming publication by UN.

Despite such progress, while the usefulness of the overall approach to LEAC has been established, further empirical applications of the techniques is required to demonstrate the value of Europe-wide applications. When the Topic Centre on Terrestrial Environment of the EEA was created end of 2001, EUROSTAT proposed to test the draft "LEAC" methodology, in view of its possible implementation with CORINE land cover data and European statistics. Two case studies were agreed upon for two areas were CLC data on change were available: the European coast (LACOAST project of the JRC, 1975-1990) and 4 countries of Central Europe (Czech Republic, Slovakia, Hungary and Romania) which have made an assessment of CLC for 1975 for the EEA, and also have available the PHARE inventory of 1995.

This Report describes the LEAC approach can be useful in the context of understanding land use and land cover changes going on in the coastal zones of Europe. Some adjustments to these methodologies will be considered when the findings of the "4 countries" will be published in June 2003.

1.2 Justification and contribution of the project

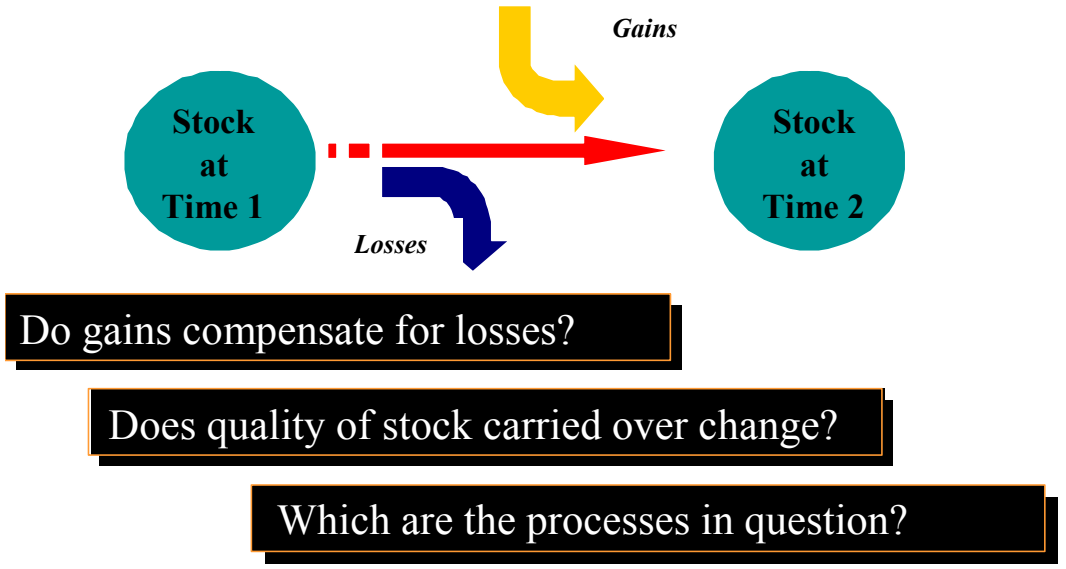
The justification for this project lies in the potential contribution of environmental accounts to tasks such as preparing 'state of the environment reports', and the development and appraisal of environmental policy. In general terms, the main purpose of preparing accounts is to draw up a 'balance sheet' for a set of environmental resources that shows both their current stock and how these stocks are changing over time. The analysis of these temporal changes is, however, particularly significant because accounts seek go beyond the simple plotting of the stocks of resources over time in a simple graphical manner to look at the processes that transform those resources. Thus the construction of 'flow accounts' is particularly significant in this context.

The idea of a flow account, as they might be applied to problem of understanding land cover change is illustrated in Figure 1.1. If the stocks (area) of a given land cover resource, such as woodland, are tracked over time, the change observed is determined by the balance of gains and losses to the initial stock. While in some contexts, an analysis of the net change in area of woodland may be important, it is clearly just as important to understand how the stock 'turns over', because the flux of land into and out of this land cover category may also affect the quality of the woodland resource that is carried forward over time. In terms of making a judgement about the sustainability of the net woodland change, for example, the quality of the woodland resource at the end of the accounting period would only be maintained if the new woodland gained compensated in some way for the woodlands lost.

Looked at in this way, flow accounts in particular provide a powerful set of tools for both monitoring environmental resources, and for evaluating different policy options. They can, for example, provide a systematic basis for the development of indicators of change. In the context of illustration provided by Figure 1.1, for example, the

proportion of the initial stock carried over from time 1 to time 2 could serve as a potential sustainable development indicator. In addition, by expressing the flows into and out of the different resource categories in a clear and consistent and comprehensive way, targets for future resource levels can be identified, together with the potential costs of encouraging or preventing certain types of transformation.

Figure 1.1: The concept of flow accounts



The application of environmental accounting techniques is particularly appropriate in the context of the coastal zones of Europe, which are dynamic but vulnerable environments. The major issues associated with such areas have recently been highlighted in the recommendations Integrated Coastal Zone Management (ICZM) of the European Parliament[8], which notes a continuing degradation of conditions in the coastal zones of Europe both in terms of the coasts themselves and the quality of coastal water, despite the great economic, social, cultural and environmental importance of such areas.

The key biophysical problems associated with this zone are[9]:

- widespread coastal erosion, often exacerbated by inappropriate human infrastructure and development too close to the shoreline
- habitat destruction, as a result of poorly planned building and land development, or sea exploitation;
- loss of biodiversity, including decline of coastal and offshore fish stocks as a result of damage to coastal spawning grounds
- contamination of soil and water resources, as pollution from marine or on-land sources, including landfills, migrates to the coastline

[8] Recommendation of the European Parliament and of the Council of 30 May 2002, concerning the implementation of Integrated Coastal Zone Management in Europe (2002/413/EC)

[9] Communication from the Commission to the Council and the European Parliament on Integrated Coastal Zone Management: A Strategy for Europe. Brussels, 27.09.2000 COM(2000) 547 final

- problems of water quality and quantity as demand exceeds supply or wastewater treatment capacity.

Which in turn have led a range of social and economic difficulties, including:

- unemployment and social instability resulting from the decline of traditional or environmentally-compatible sectors, such as small scale coastal fisheries;
- competition between users for resources;
- destruction of cultural heritage and dilution of the social fabric following uncontrolled development (especially of tourism);
- loss of property and development options, as the coast erodes;
- lost opportunities for durable employment, as resources are degraded;
- marginalization and emigration, compounded by a lack of appropriate infrastructure, including year-round communications and transport networks.

The need to understand patterns of land use and land cover change are recognised in the Recommendations as being essential elements of future strategies designed to overcome the problems of the coastal zones, which must, according to the recommendations of the European parliament, also include *'adequate systems for monitoring and disseminating information to the public about their coastal zone.'* It is suggested, that these systems *'should collect and provide information in appropriate and compatible formats to decision makers at national, regional and local levels to facilitate integrated management'*. **This project therefore represents one step towards the creation of the information base that is required for the future managements of these areas.**

1.3 Terms of reference and Aims

Given the background to this study outlined above the aims of the work are as follows:

i. To produce a set of environmental indicators based on CORINE Land Cover data using the concept of land cover accounting as a decision making and integrating framework for the coastal zone
ii. To investigate the feasibility of producing more general land cover account at the European scale
iii. To raise general awareness of land cover accounts concept as a framework for indicator development.

In evaluating the contribution of this study to the general development of LEAC, the outputs should be considered alongside those of a parallel study of forested landscapes in the Czech Republic, also funded by the present contract, which uses similar concepts, data and analytical methods to address a different set of environmental issues.

The structure of this report is as follows. In Part 2, the concepts underlying the construction of LEAC are descried in detail. The data sources used by the study are descried in Part 3. The analytical methods used to create the accounts presented here are summarised in Part 4, and the results provided in Parts 5 and 6. The outputs from this study and the implications of this project for subsequent work are considered in Parts 7 and 8.

Part 2: Concepts

2.1 Introduction

In this section of the report the methodologies underlying the development of LEAC as they may be applied to the coastal zone are described in detail. The different types of account and the relationships between them are described. The issues surrounding the classification methods used to characterise land cover and land use, and the processes that cause them to change over time are then considered. Finally the extent to which the different types of accounts can be disaggregated spatially to produce a set of 'zonal' accounts is considered.

2.2 Types of Account

2.2.1 Stock and change accounts for land cover and land use

For a given region or country there is a finite stock of land[10], the characteristics of which are determined by physical and ecological factors such as relief, geology, climate, vegetation and soils, together with a range of cultural and economic factors associated with the human use of those areas. However, the character of the land resource is not fixed, for with long term environment change, and changing patterns of human development, the character of the land resource can be transformed over time. **Stock accounts** are one way of describing what types of land resources exist, and what kinds of changes occur over time.

In order to understand some of the key the issues underlying the construction of stock accounts for land, it is important to make a distinction between ***land cover,*** which is a description of the physical or ecological state of a given parcel of land, and ***land use,*** which is determined more by the human activities that the land supports, or its wider cultural or historic value. The distinction is important to make, for it is clear that in describing land resources, there is no simple relationship between cover and use. Thus

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[10] *Locally or other long periods of time, this is not absolutely true and the LEAC will have to reflect these changes. Exceptions are of limited natural phenomena such as consequences of volcanic and seismic events. Coastal erosion and progradation or the creation of polders, some harbour or airport infrastructure or marinas reduce or expand land available for human use. The sea level rise predicted as a consequence of the climate change will generate a net loss of land in low islands and coastal zones. However, these changes have no consequences on the totals as long as "coastal water" is a class of CLC. This point should be discussed further when the results of the new CORINE coastal erosion will become available, as well as an "official" coastline of Europe.*

a single cover type, such as woodland, may have a number of uses. In one area, for example that woodland may have an economic use though forestry. In another, it may have a recreational use. Conversely, a particular type of land use many involve many different cover types. 'Agriculture', is for example, a specific type of land use that may include a range of different cover types. The complexity of the relationship between land cover and land use is increased further in those situations where a single cover type can have **multiple** uses. The analysis of **multifunctional land use** or **landscapes, and the compatibility and conflicts between different types of land uses,** has emerged as an important issue within the EU, and it is one that can clearly be addressed by the development of land accounting techniques.

Various schemes have been devised to classify different types of land cover and land use. We may therefore exploit and use them to construct a set of related land cover and use accounts, which ultimately map out how they change over time. A particularly valuable hierarchical classification scheme for land cover is the one devised for CORINE, which was developed as a result of the EU's need to provide up to date information on land cover at scale 1:100.000 for the whole Europe. The classification scheme at its more detailed level includes 44 categories of land cover based on a standard European nomenclature (level 3). These can be aggregated into 15, more general groups at level 2, or just five large groups at level 1, namely artificial surfaces, agricultural areas, forest and semi-natural areas, wetlands, water bodies.

In respect of land use, other classification schemes exist, including the Standard Statistical Classification of land use published by the Economic Commission for Europe (ECE). Such classifications are often problematic in that they often mix cover and use categories, and as a result they are often difficult to apply. For this project, a purpose-built classification of use was constructed, the details of which will be given below.

A conceptual schema showing how stock and change accounts for land cover and use can be constructed land cover is shown in Figure 2.1. A matrix (Figure 2.1a) can, for example, be used to show how the stock of land in each cover category changes over time. Such a device is particularly useful, because it records the transfers between categories as well as the overall change a given stock category exhibits over the 'accounting period'. Traditionally, such a change matrix has been used to present data on cover change from the analysis of satellite imagery or field survey data. Key features to note about the matrix are that the diagonal shows the proportion of each stock category that is stable over the monitoring period, while the row and column totals show the total initial and final stocks for each category.

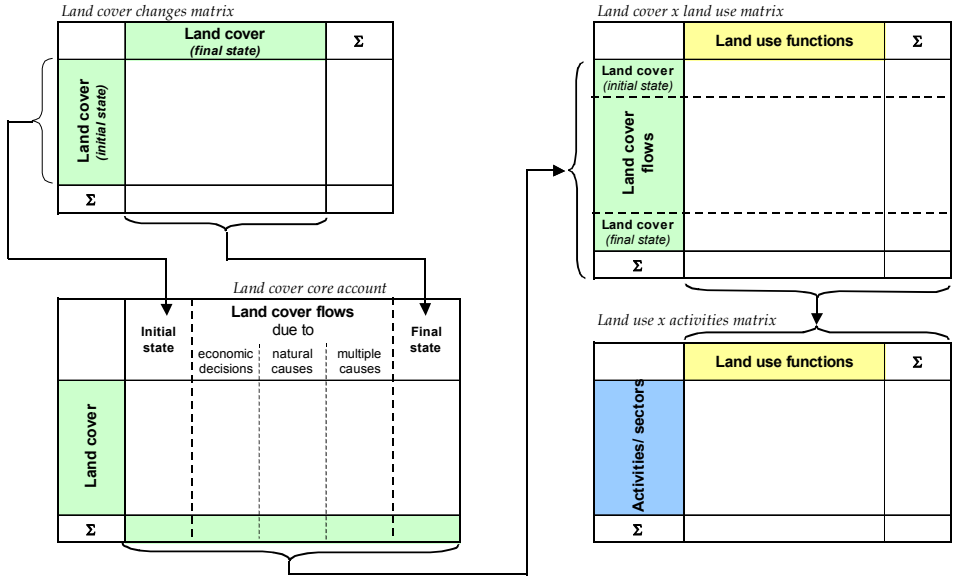
These transformations expressed in the change matrix can be presented more clearly by constructing the table shown in Figure 2.1 (down, left), which shows for each cover type the opening and closing balance, and the magnitude of the gains and losses due to various natural and economic factors. Such a Table is known as a **flow account**[11]. In the Table the (+) and the (-) values are explicit for each land cover, so that the final stock will equal the initial stock plus the algebraic sum of the flows into

[11] Also known as a 'screen account' in traditional accounting practice

and out of that category. The ability to classify and represent these different types of transformation is a particular advantage of this kind of table over the simple matrix approach shown in Figure 2.1 (up, left).

In order to trace some of the implications of the changes in stock shown in a table such as that shown in Figure 2.1(down, left), a further matrix can be constructed, showing the multiple relationships between land cover and land use (Figure 2.1, up, right). Such a matrix is particularly useful, because it represents the first step in relating land cover and use change to the various economic activity areas that are often a key aspect of any long term policy strategy.

Figure 2.1: Conceptual schema for the construction of stock accounts for land cover and land use



In the schema shown in Figure 2.1, the flow account has a particularly important role to play. Figure 2.2 shows an example of a real account constructed using data from the UK's Countryside Survey. In this account, the flows or types of change are classified into such processes as 'woodland creation', 'agricultural intensification', and 'development'. More generally, for the SEEA it has been accepted that the main flows that should be distinguished are “changes due to economic decisions”, “changes due to natural causes” and “changes due to multiple causes”. This approach has been applied here. As will be described below, it was implemented by classifying the flows represented by the 44x44 CLC (level 3) land cover change matrix. The detail of the method will be described below.

The classification of flows devised was based on a compromise between the types of information required to make an informed environmental assessment and what can be extracted most reliably from CLC data. When the flows are broken down by land cover class, they can have either a negative or positive value. In the first case, the flow is regarded as a *consumption of land cover* (or simply of cover), resulting from the given flow. In the second case, the flow is a *formation of land cover* (of cover). For each flow, the magnitude of the 'consumptions' and 'formations' of cover are equal.

2.2.2 Basic and Supplementary Accounts

The flow account described above represents what can be though of a 'basic account'. In the original UNECE and EUROSTAT work that led to development of the accounting concept, a distinction was made between such accounts and those

Figure 2.2: An example flow account derived from the UK Countryside Survey

Land cover account, Great Britain 1990 to 1998

Thousand hectares

		Types of changes in stock										
	1990 Stock	Woodland creation	Woodland rotation	Agricultural intensification	Agricultural rotation	Semi-natural creation	Semi-natural rotation	Water body creation	Development	Developed land recycling	Loss to unknown	1998 Stock
Broadleaved and mixed woodland	1 371.2	132,4	13,5	-22,2		-42,1		-0,8	-12,9		-0,4	1 438.7
Coniferous woodland	1 369.3	67,2	-13,5	-9		-48,3		-0,6	-5		0	1 360.2
Woodland sub-total	2 740.5	211,6	0	-31,2		-90,4		-1,4	-17,8		-0,4	2 798.9
Arable and horticultural	5 246.1	-28,8		59,2	118,2	-41,4		-1	-19,3		-0,2	5 332.9
Improved grassland	5 538.6	-34,1		341	-118	-232		-0,5	-53,9		-5,3	5 435.5
Intensive agriculture sub-total	10 784.7	-62,8		400,2	0	-273		-1,5	-73,2		-5,5	10 768.4
Neutral grassland	569,5	-24,4		-154		238,9	-18,2	-0,5	-33,2		-0,1	578,3
Calcareous grassland	81,4	-1,1		-13,3		3,7	-3,8	0	-0,2		0	66,7
Acid grassland	1 470.9	-24		-134		43,3	-34,7	0	-4,6		-0,7	1 316.5
Bracken	456,9	-21,8		-8,7		20,4	38,9	0	-0,5		0	485,1
Dwarf shrub heath	1 487.1	-24,5		-1,2		13,1	-41,4	0	-3,3		0	1 429.7
Fen, marsh, and swamp	456,4	-6,1		-25,1		61	71,3	-0,7	-1,2		-0,6	554,9
Bog	2 297.3	-17,9		-0,7		10,5	-10,1	-0,3	-0,2		-0,1	2 278.5
Montane	49,8	0		0		0	0	0	0		0	49,8
Coastal habitats	274,1	-0,3		-0,8		2,6	-2	-0,3	0		0	273,3
Semi-natural sub-total	7 143.3	-120,1		-337		393,5	0	-1,8	-43,2		-1,5	7 032.9
Standing open water and canals	208,4	-0,2		-1		-0,9		5,2	-1,2		0	210,3
Rivers and streams	66,7	-0,2		-0,1		-1,4		0,3	-0,1		0	65,2
Water bodies sub-total	275,1	-0,4		-1,1		-2,3		5,5	-1,2		-0,1	275,5
Inland rock	53,6	-0,6		-2,2		-7,6		0	13,2	3,8	0	60,2
Built up areas and gardens	1 230.4	-14,2		-12,3		-9,4		-0,7	100,4	-2,1	-1,2	1 291.0
Boundary and linear features	495	-1		-14,5		-7,8		-0,1	21,9	-1,7	-0,1	491,7
Developed sub-total	1 779.0	-15,9		-28,9		-24,8		-0,8	135,5	0	-1,3	1 842.9
Sea	298,5	0		0		-0,7		0	0		0	297,8
Unknown	73,9	-0,3		-1,8		-2		0	0		8,8	78,6
Unsurveyed urban land	463											463
Total	23 557.9	0	0	0	0	0	0	0	0	0	0	23 558.0

Source: Department for Environment, Food and Rural Affairs

Areas which are more than 75% built up were not covered by the survey.

constructed for more specific purposes, say, to describe a particular theme or issue. These accounts are known as 'supplementary' or 'targeted' accounts. In many cases such accounts are derived from these basic types of account, and present a more detailed view of the data.

One such type of supplementary account is those used to give a **geographical** or **zonal** breakdown of the data. These accounts are particularly useful in the context of land cover and land use policy, because they allow us to see what geographical contrasts and differences occur between different regions and environments. More importantly they can show how a global indicator is expressed spatially.

Ideally, the zonal breakdowns used should be specific to the phenomenon under study. However, when we examine cross cutting issues and/or interactions, it is useful to find some commonalities, including some common geographical pattern.

Pre-existing units such as administrative units, river basins or other types of geographical breakdowns can be used. A classification of potential Land Analytical and Reporting Units (LARU's) is shown in Table 2.1. Other approaches that are available include analysing the territory with a regular grid to which are associated attributes related to physical geography, vegetation and ecosystems and by human activities. Multi-criteria analysis can be used, to define a set of zones according to the combination of a specific set of characteristics (Figure 2.3).

Table 2.1 Nomenclature for Land Analytical and Reporting Units

A - Analytical Units

- Administrative Units
- Geographic Regions
- Geo-physical regions (River basins (small), Mountains areas (small…)
- Ecological regions (e.g. DMEER, Potential vegetation…)
- Other
- Land Analytical Units
- Geometric Units
- Grids
- Buffers

B - Reporting Units

- Administrative Regions, Countries
- Geographic Regions (e.g. River basins (large), Sea catchments, Mountain areas…)
- Bio-Geographic zones
- Geographic Sectors (grouping of LAU or Geometric Units according to proximity or to Landscape Types)

Other types of targeted or supplementary accounts include those which seek to place a monetary or relative value on the resources or types of change within the flow account. Such accounts many for example, provide an important opportunity for the future in terms of showing how the value of various ecosystem goods and services are affected by different types of lands cover change. Targeted accounts derived from the basic data flow data can also be used to construct various other economic, social and environmental indicators, by linking the flow data to information about demographic change or ecological characteristics of the land cover units, such as biodiversity.

In this study the major type of supplementary account considered was that required to give a geographical breakdown of the data. The zonal units used to give this geographical breakdown are described below. Ultimately the aim is to develop such accounts to give a more detailed view of the important changes occurring in the coastal zone by the creation of an additional set of targeted accounts for themes such

as forestry and tourism. A provisional account for tourism is presented in this study. An overview of the relationship between the different types of basic and supplementary accounts is shown in Figure 2.4.

Figure 2.3: Methodology for the creation of spatial analytical units

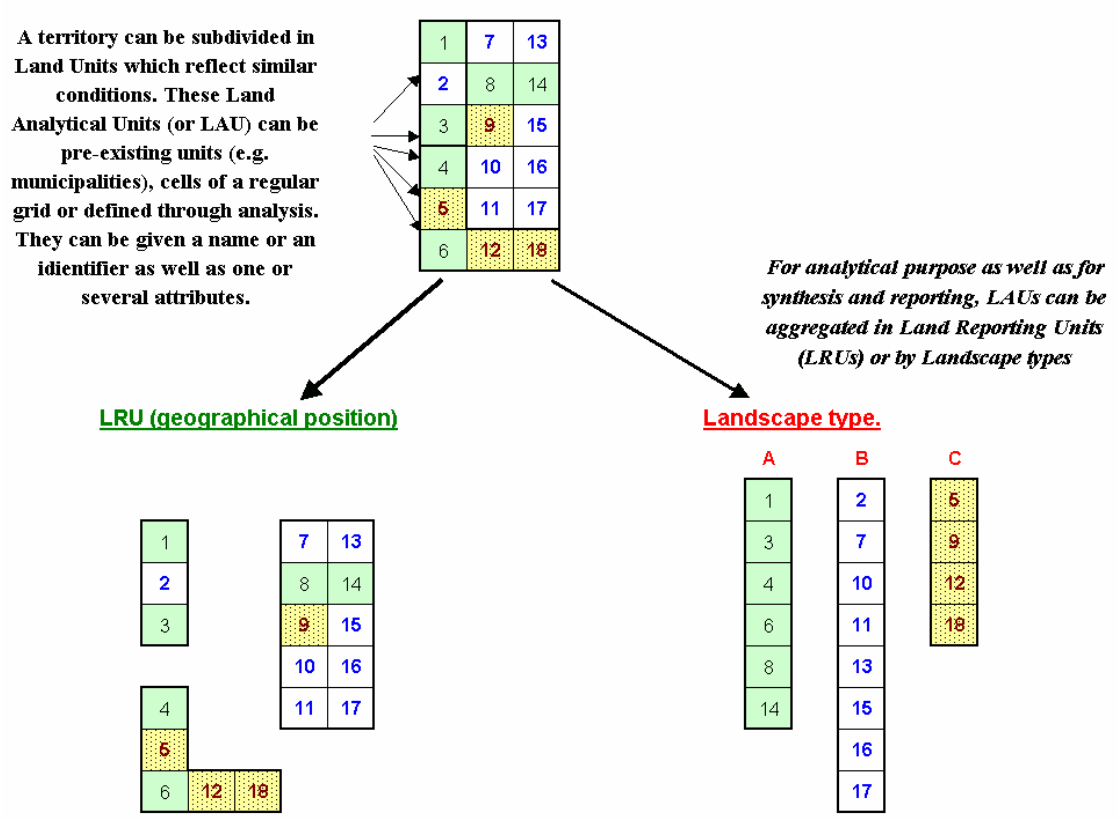


Figure 2.4: The relationship between basic and targeted accounts.

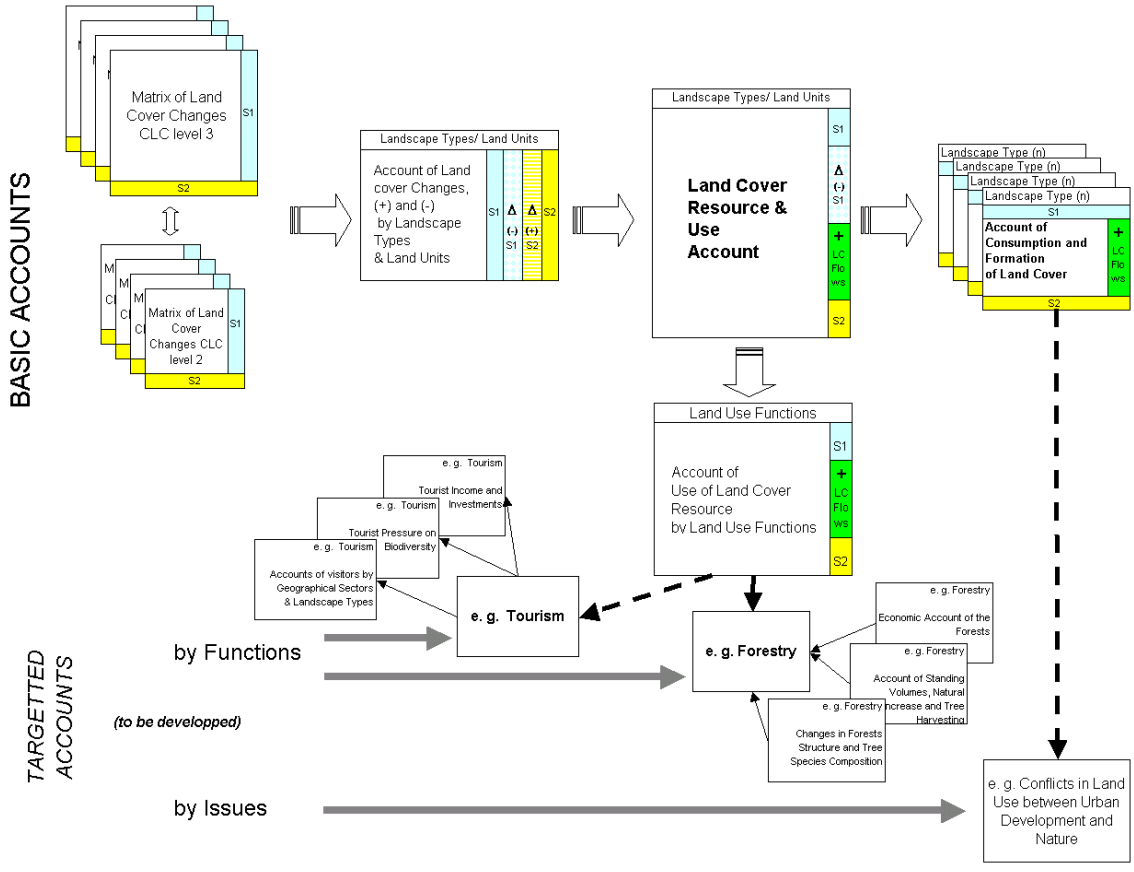


Table 2.1 CORINE Land Cover Aggregated Nomenclature (Level 1 bis)

1	Artificial surfaces
2.1+2.2	Arable Land & Permanent Crops
2.3+2.4	Pastures & Heterogeneous agricultural areas
3.1	Forests
3.2+3.2	Shrub and other semi-natural land
4	Wetlands
5	Water bodies

2.2.3 Main tables of the basic land accounts

- ***Matrix of land cover changes***
  This square matrix describes for each land cover type the changes between an initial situation (initial stock of land cover) and a final situation. When no change happens, the values are recorded in the diagonal. The difference between the final and the initial situation is the Net Change of land cover.

  The detail of the matrix depends on the database and on the information that is requested. Three complementary options are proposed, starting from CLC: a detailed matrix based on CLC level 3 (44 classes), a semi-detailed matrix based on CLC level 2 (15 classes) and an aggregated matrix based on CLC level 1 supplemented by some details (7 classes) (Table 2.1).

- ***Account of Land Cover Changes***
  This account is compiled by zones, regions or by landscape types. For one given land cover class, the changes are summarized in (+) and (-) values. Therefore, the final stock is defined by:

  Initial stock + algebraic sum of Changes = Final stock

- ***Account of Formation of Land Cover***
  This account presents, by zones, regions or by landscape types, the balance between the *Formation of land cover* which has lead to the present situation and the *Consumption of land cover* from the past situation. The flows of Formation of cover and Consumption of cover are detailed according to the nomenclature of land cover flows (see the level one of the Nomenclature of the Land Cover Flows used in the LEAC project for coasts, Table 2.2).
  In the account, each individual flow of consumption is balanced by a flow of formation of cover. For each Land cover class, the difference between Formation and Consumption is called “Net formation of cover”. It can be positive or negative. The equation of the account is:

  Formation - Consumption = Net Formation of land cover

  When the stocks of land cover are introduced, the equation is

  Initial stock + Formation =Consumption + Final stock

  Or

  Initial stock + Net Formation of land cover= Final stock

Table 2.2: Nomenclature of Land Cover Flows used (Level 1)

LCF1	Urban land management
LCF2	Urban sprawl
LCF3	Extension of economic sites and infrastructures
LCF4	Agricultural rotation and intensification
LCF5	Conversion of land to agriculture
LCF6	Forests creation and management
LCF7	Water body creation and management
LCF8	Changes of land cover due to natural and multiple causes

Accounting separately for the consumption and the formation has the advantage of presenting a total of flows which is identical, whatever the level of aggregation of land cover classes. This is different from the conventional matrixes of land cover change in which the aggregation leads to the consolidation of changes. This point and possible solutions are discusses in Part 7 of this Report.

The balance of the Formation of Land Cover Account, i.e. the Net Formation of Cover is computed from flows when Net Changes are computed from the Matrix of changes as the difference of two stocks. At the most detailed level, the two results are strictly equal. When the two are compiled with an aggregated Nomenclature, an additional element has to be introduced to reflect the fact that the total of Formation or Consumption remains identical when the Changes vary due to the aggregation that "hides" internal flows in the diagonal of the matrix. These "hidden changes" have to be added to the result of the comparison of the two stocks. The equation is therefore:

Final Stock of cover - Initial Stock of cover= Net Change (at a given scale)
= Net formation of cover -"hidden changes"(at a given scale)

The Formation of Cover Account can usefully be compiled by zones, region or landscape type.

- ***Land cover Resource and Use account***

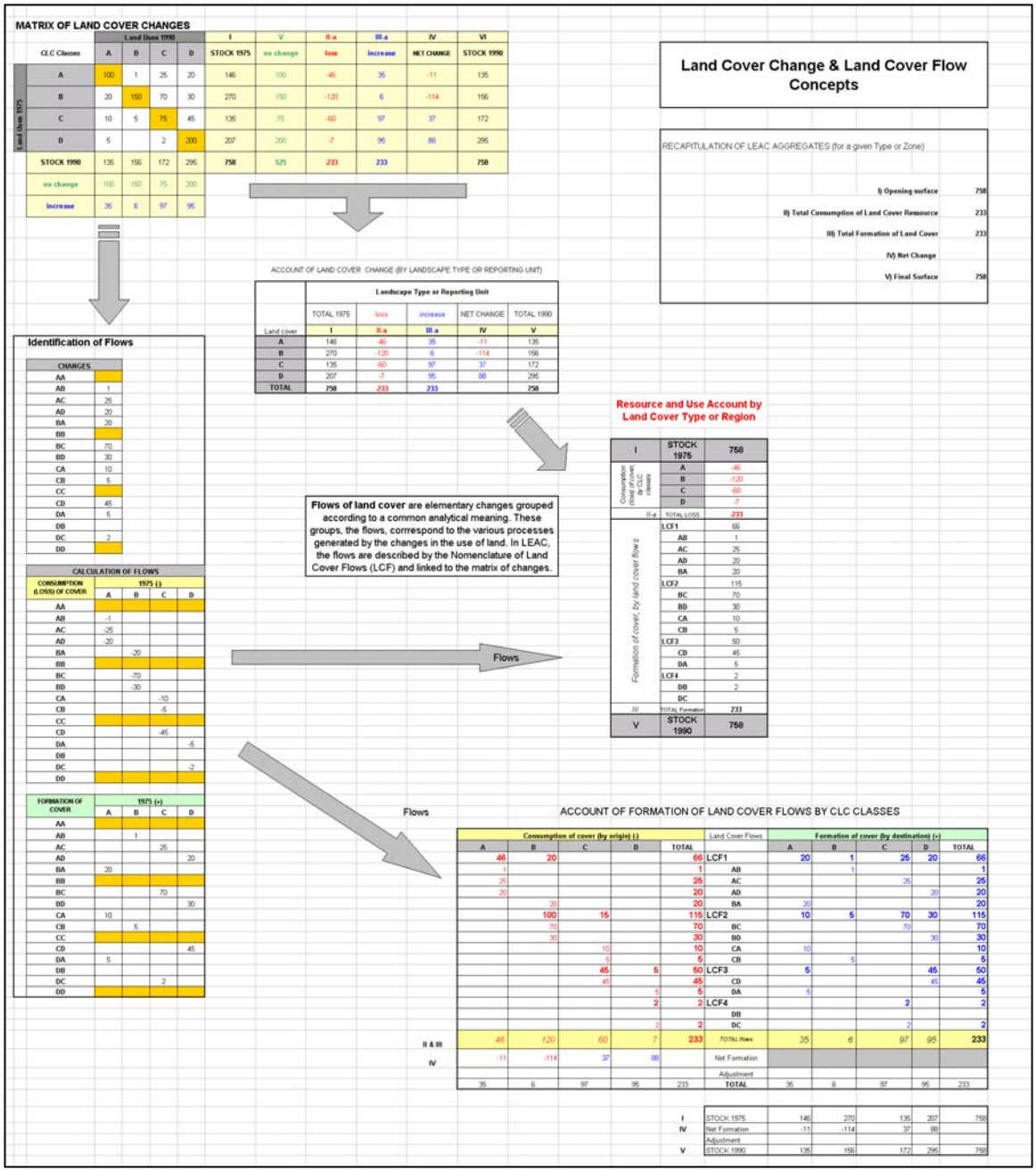
  This account aims at presenting a synthesis of stocks, changes (losses by Land Cover Classes) and Formation of cover by zones, regions or by landscape types, as the previous one. This presentation avoids redundancies (i.e. Formation and Consumption accounted with the same value, once + and once). The equation of the account is:

  Initial stock – Loss of land cover (by CLC class)
  + Formation of land cover (by flows type) = Final stock

  In most cases, the initial and final stocks are equal, however they may differ in the cases mentioned in 2.2.1 footnote 10.

  The concepts of land cover change and land cover flows as well as the relation between the basic accounts are explained with the following scheme with hypothetical numbers (Figure 2.5)

Figure 2.5: Land Cover Change & Land Cover Flow Concepts



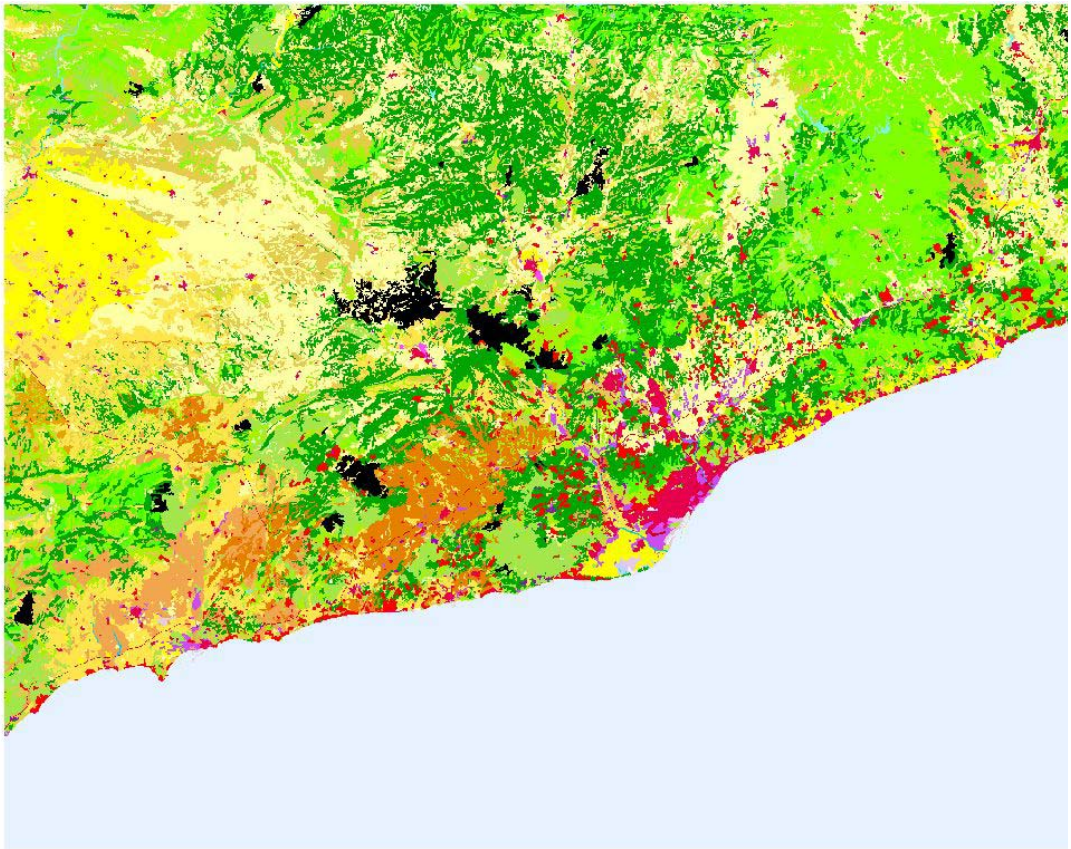
Part 3: Data Resources

3.1 CORINE Land Cover (1975 and 1990, and potential 2000)

CORINE Land Cover (CLC) is a geographic land cover/land use database encompassing most of the countries of the European Community[12]. It provides consistent land cover mapping at a scale of 1:100 000, with a minimum mapping unit of 25 ha. The information was derived from the visual interpretation of satellite imagery, although more recently automated classification methods are being applied to the analysis of these data[13]. The database classifies land cover hierarchically, using at the most detailed level (level 3) 44 standard classes (See Annex). More general representations of these data can be given using the 15-class aggregations at level 2, and 7 classes at level 1. An example of CLC mapping for an area in Catalonia is shown in Figure 3.1.

Currently the database is being updated every 10 years. The present revision cycle will provide a snapshot of land cover/use for the year 2000. The first Europe-wide assessment was made in 1990, although a CLC analysis has been made using 1975

Figure 3.1: Example of CLC mapping Catalonia



12 http://dataservice.eea.eu.int/dataservice/other/land_cover/lcsource.asp

data for the European coast and for 4 countries of Central and Eastern Europe (Czech Republic, Hungary, Romania & Slovakia)[14] (see below). For the purposes of mapping change, a minimum changes unit of 5 ha is used.

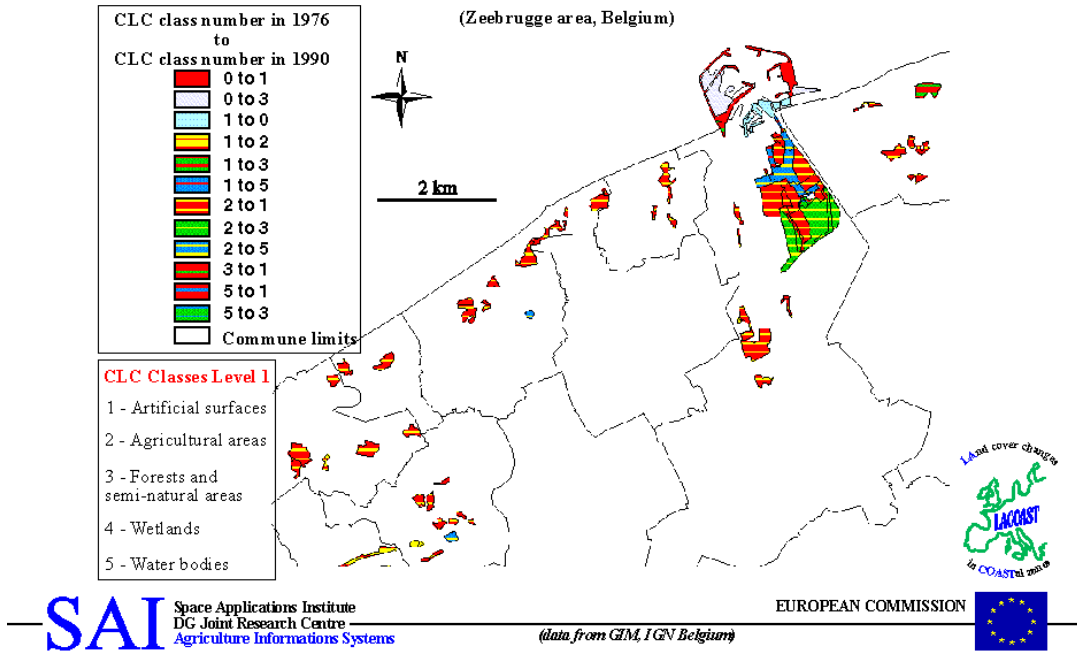
For the assessment of land cover changes, and in particular the problem of urban sprawl, the minimum mapping unit of 25 ha for stock, and 5 ha for change imposes certain limitations. A comparative study carried out on the French coast with aerial photographs at the scale of 1:25 000, shows the importance of a very diffuse urban sprawl, which is poorly detected by the satellite images and ignore in the CLC-type analysis before it reaches the minimum size of 25 ha. In fact, this sprawl is probably identified at a later stage of the process, in a following period, when the process finally generates the apparition of the CLC class "discontinuous urban fabric", i.e. where the constructions are, on the satellite image, more important than the vegetation. This limited sensitivity of CLC suggests that phenomenon such as urban sprawl should be monitored at a larger scale with high resolution satellites or aerial photos and with a periodicity of 3 to 5 years maximum.

3.2 LaCoast (LAnd cover changes in COASTal zones)

The LaCoast project of the Joint Research Centre was launched by the European Commission to improve the information systems for coastal environments with particular reference to the needs of the Integrated Coastal Zones Management

Figure 3.2

Land Cover/Land Use changes in Belgium coastal zone between 1976 and 1990 (derived from CORINE Land Cover classifications)



[13] M. Bossard, J. Feranec and J. Otahel (2000) CORINE land cover technical guide – Addendum 2000. Technical report No 40. EEA.

Programme (ICZM). The approach adopted was to use CORINE Land Cover data for around the year 1990 and to compare the results with earlier satellite images (Landsat MSS) of 1975 for a buffer zone stretching 10 km inland from the coastline. In addition to the baseline inventory of the changes of land cover, several case studies were planned to assess specific issues and problems. Use of the CLC standard methodology and standard inventory techniques meant that the data produced by LaCoast were of good quality. However, coverage was restricted because some countries of the EU had no data available for 1975, namely the UK, Finland and Sweden.

After an initial feasibility study in Belgium, the programme of mapping and database creation was carried out for the majority of EU countries, by the same teams who carried out the original CLC mapping. Thus the LaCoast database contains 2 temporal land cover classifications for a strip within 10 km of the coast for Denmark, Germany, The Netherlands, Belgium, Ireland, France, Spain, Portugal, Italy and Mainland Greece including Crete. The LaCoast data are available from the JRC[15]. An example of these data is shown in Figure 3.2.

3.3: Elevation data (Digital Elevation Model)

The digital elevation model (DEM) used in this project is the one from the GISCO database[16]. The resolution of this dataset is very coarse but is, nevertheless, sufficient for the purpose of mapping upland and lowland coasts throughout Europe, and for producing maps of major landscape types. For the purposes of this project, the 50 m elevation threshold was used for splitting the upland and lowland coasts (Figure 3.3). However, when the landscape types are implemented for the whole continent, another threshold will have probably to be adopted. In the UK Countryside Survey, for example a threshold of about 200m was used.

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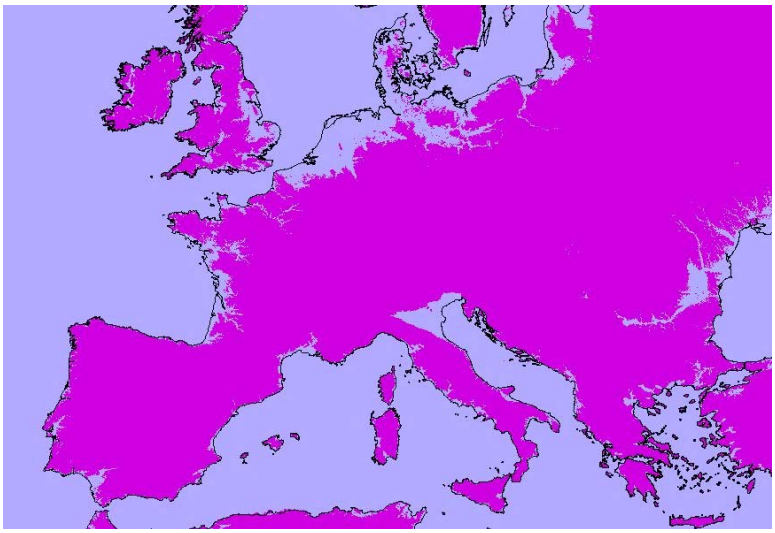
14 Image&CLC2000 project to be finalized by 2004

15 http://www.aris.sai.jrc.it/en/data-dist/#LACOAST

16 Geographic Information System of the Community, at Eurostat

Figure 3.3: DTM data from GISCO, showing land above and below 50m.



3.4 Administrative boundaries

Administrative boundaries used in this project also came from the GISCO database. At this stage, only countries and NUTS3 have been considered. Further integration of population and other statistics at the local level requires the use of the NUTS5 database for there are presently problems of access and dissemination.

3.5 Physical boundaries

The major physical units used as the basis for this study were drawn from the Biogeographic Regions and Watersheds contained in the GISCO database. The 'Regional Seas Basins' layer was obtained as aggregation of watersheds.

3.6 Information from EUROSTAT

The socioeconomic statistics used in this pilot study are for Tourism only. These statistics can be linked to the administrative boundaries used in the project (NUTS0, NUTS2 and NUTS3).

Part 4: Methodologies for Creating Land Cover Accounts

4.1 Introduction

In order to implement the accounting concepts described in Part 2 schemes for the classification of land cover, land use and the types of change that can occur over time were created. The details of these classification methods are described in this Part of the Report, together with the data resources used to populate the accounts.

4.2 Classification and Nomenclature

A key data resource for land cover information used in this study was CORINE (see below). These data may be reported using a hierarchical classification system which, at its most detailed level (level 3), has 44 classes. These can be aggregated to level 2 (15 classes) or level 1 (7 classes). A summary of the classes at level 1 is given in Table 4.1, the detailed level being in Annex.

Table 4.1 CORINE Land Cover Aggregated Nomenclature (Level 1)

1	**Artificial surfaces**
2	**Agricultural areas**
3	**Forests and semi-natural areas**
4	**Wetlands**
5	**Water bodies**

A 44x44 land cover change matrix was created using the CLC data at its most detailed level (44 Classes). Although a few ambiguities existed, most of the changes could be interpreted in a clear way, and so a typology of transformations was created. In order to illustrate the nature of this typology part of the change matrix is shown in Figure 4.1.

At this stage, this is only a working table that has to be validated further. In particular, some details corresponding to very low values may have to be grouped with the purpose to establish a more simple linkage with CLC level 2. Nevertheless, the approach led to a systematic definition of the land cover flows in terms of clusters of land cover changes. The full table is presented in Annex, but part of it is presented here (Figure 4.2) for illustration. LCF is used for 'land cover flows' and the 3 digit codes refer to the CLC nomenclature. Tables 4.2 shows the full classification of flows at levels 1 and 2.

Figure 4.1

CORRESPONDANCE BETWEEN LAND COVER CHANGES (CLC LEVEL 3) AND THE LAND COVER FLOWS

		132	133	141	142	211	212	213	221	222	223
		Dump sites	Construction sites	Green urban areas	Sport and leisure facilities	Non-irrigated arable land	Permanently irrigated land	Rice fields	Vineyards	Fruit trees and berry plantations	Olive groves
243	Land principally occupied by agriculture with significant areas of natural vegetation	Extension of dumpsites	Construction	Development of green urban areas	Extension of sport and leisure facilities	Intensive conversion of marginal land to agriculture	Intensive conversion of marginal land to agriculture	Intensive conversion of marginal land to agriculture	Intensive conversion of marginal land to agriculture	Intensive conversion of marginal land to agriculture	Intensive conversion of marginal land to agriculture
244	Agro-forestry areas	Extension of dumpsites	Construction	Development of green urban areas	Extension of sport and leisure facilities	Intensification of agriculture	Intensification of agriculture	Intensification of agriculture	Planting of vineyards, fruit and olive trees over arable & pasture	Planting of vineyards, fruit and olive trees over arable & pasture	Planting of vineyards, fruit and olive trees over arable & pasture
311	Broad-leaved forest	Extension of dumpsites	Construction	Development of green urban areas	Extension of sport and leisure facilities	Intensive conversion of forest to agriculture	Intensive conversion of forest to agriculture	Intensive conversion of forest to agriculture	Intensive conversion of forest to agriculture	Intensive conversion of forest to agriculture	Intensive conversion of forest to agriculture
312	Coniferous forest	Extension of dumpsites	Construction	Development of green urban areas	Extension of sport and leisure facilities	Intensive conversion of forest to agriculture	Intensive conversion of forest to agriculture	Intensive conversion of forest to agriculture	Intensive conversion of forest to agriculture	Intensive conversion of forest to agriculture	Intensive conversion of forest to agriculture
313	Mixed forest	Extension of dumpsites	Construction	Development of green urban areas	Extension of sport and leisure facilities	Intensive conversion of forest to agriculture	Intensive conversion of forest to agriculture	Intensive conversion of forest to agriculture	Intensive conversion of forest to agriculture	Intensive conversion of forest to agriculture	Intensive conversion of forest to agriculture
321	Natural grassland	Extension of dumpsites	Construction	Development of green urban areas	Extension of sport and leisure facilities	Intensive conversion of marginal land to agriculture	Intensive conversion of marginal land to agriculture	Intensive conversion of marginal land to agriculture	Intensive conversion of marginal land to agriculture	Intensive conversion of marginal land to agriculture	Intensive conversion of marginal land to agriculture
322	Moors and heathland	Extension of dumpsites	Construction	Development of green urban areas	Extension of sport and leisure facilities	Intensive conversion of marginal land to agriculture	Intensive conversion of marginal land to agriculture	Intensive conversion of marginal land to agriculture	Intensive conversion of marginal land to agriculture	Intensive conversion of marginal land to agriculture	Intensive conversion of marginal land to agriculture

Figure 4.2: Part of Land Cover Change Definition Matrix

LCF11	*Urban development/ infilling*	112>111	14_>11_						
LCF12	*Developed land recycling*	111>112	12_>11_	13_>11_	13_>12_				
LCF13	*Development of green urban areas*	11_>141	12_>141	13_>141	142>141	21_>141	22_>141	23_>141	24_>141
LCF21	*Urban continuous sprawl*	21_>111	22_>111	23_>111	24_>111	31_>111	32_>111	331>111	332>111
LCF22	*Urban diffuse sprawl*	133>112	22_>112	23_>112	24_>112	31_>112	32_>112	331>112	332>112
LCF31	*Extension of industrial & commercial sites*	11_>121	122>121	123>121	124>121	13_>121	14_121	21_>121	22_>121
LCF32	*Extension of transport networks*	11_>122	121>122	123>122	124>122	13_>122	14_122	21_>122	22_>122
LCF33	*Extension of harbours*	11_>123	121>123	122>123	124>123	13_>123	14_123	21_>123	22_>123
LCF34	*Extension of airports*	11_>124	121>124	122>124	123>124	13_>124	14_124	21_>124	22_>124
LCF35	*Extension of mines and quarrying areas*	11_>131	12_>131	132>131	133>131	14_>131	21_>131	22_>131	23_>131
LCF36	*Extension of dumpsites*	11_>132	12_>132	131>132	133>132	14_>132	21_>132	22_>132	23_>132
LCF37	*Construction*	11_>133	12_>133	132>133	134>133	14_>133	21_>133	22_>133	23_>133
LCF38	*Extension of sport and leisure facilities*	11_>142	12_>142	13_>142	141>142	21_>142	22_>142	23_>142	24_>142
LCF41	*Recent extension of pasture, fallow land, set aside*	21_>23_	22_>23_	24_>23_	21_>242	241>242			
LCF42	*Planting of vineyards, fruit and olive trees over arable & pasture*	21_>22_	21_>241	23_>22_	241>22_	242>22_	244>22_		

Table 4.2 Detailed Nomenclatures of Land Cover Flows

LCF1 Urban land management
- *LCF11 Urban development/ infilling*
- *LCF12 Developed land recycling*
- *LCF13 Development of green urban areas*

LCF2 Urban sprawl
- *LCF21 Urban continuous sprawl*
- *LCF22 Urban diffuse sprawl*

LCF3 Extension of economic sites and infrastructures
- *LCF31 Extension of industrial & commercial sites*
- *LCF32 Extension of transport networks*
- *LCF33 Extension of harbours*
- *LCF34 Extension of airports*
- *LCF35 Extension of mines and quarrying areas*
- *LCF36 Extension of dumpsites*
- *LCF37 Construction*
- *LCF38 Extension of sport and leisure facilities*

LCF4 Agricultural rotation and intensification
- *LCF41 Recent extension of pasture, fallow land, set aside*
- *LCF42 Planting of vineyards, fruit and olive trees over arable & pasture*
- *LCF43 Rotation of annual crops*
- *LCF44 Rotation of permanent crops*
- *LCF45 Intensification of agriculture*

LCF5 Conversion of land to agriculture
- *LCF51 Intensive conversion of forest to agriculture*
- *LCF52 Intensive conversion of marginal land to agriculture*
- *LCF53 Diffuse conversion of forest to agriculture*
- *LCF54 Diffuse conversion of marginal land to agriculture*
- *LCF55 Conversion of wetlands to agriculture*
- *LCF56 Conversion of developed areas to agriculture*

LCF6 Forests creation and management
- *LCF61 Forests creation*
- *LCF62 Forests rotation*
- *LCF63 Recent felling and transition*

LCF7 Water body creation and management
- *LCF71 Water body creation*
- *LCF72 Water body management*

LCF8 Changes of land cover due to natural and multiple causes
- *LCF81 Semi-natural creation*
- *LCF82 Semi-natural rotation*
- *LCF83 Farmland abandonment without significant woodland creation*
- *LCF84 Farmland abandonment with woodland creation*
- *LCF85 Other land abandonment (other than farmland)*
- *LCF86 Forests and shrubs fires*
- *LCF87 Coastal erosion*
- *LCF88 Impacts of storms, floods…*
- *LCF89 Other changes and unknown*

4.3 Definition of Land Accounting Units & Landscape types using CORILIS

Basically, there are two possible solutions for the problem of defining land accounting units and landscape types. One is to define landscape types by a statistical analysis of land units that are defined a priori. This can be done only if a geographic pattern already exists, e.g. such as administrative units or river basins. This methodology is used, for example, for selecting representative monitoring stations in EuroWaternet; small river basins are classified according to their run off plus to cumulated pressure.

The other solution is to analyse the physical and the bio-physical (land cover) elements in a grid. This method has been used in the Countryside Survey of Great Britain[17] for defining the Landscape types used later on for sampling in the field, as well as for reporting the results.

A similar approach has been chosen for creating LEAC, with the modification of in replacing the raw CLC data by smoothed data, using the CORILIS methodology (from CORIne and LISsage – smoothing in French) at the European level. Using smoothed values creates a *de facto* zoning of the intensity (or potential) of a given land cover theme in one given cell and its surroundings.

The possibility of using CORILIS for a European-wide zoning (or zonings) has been examined by two technical workshops of the previous EEA ETC-LC held in Orleans in 1999 (about the IndiLac project) and 2000 (about the CORILIS potential applications)[18]. Subsequent work by IFEN and GIM-Luxembourg, lead to some practical proposals, which were the starting point of this study. Their common finding was that a good analysis of the dominant characteristics of the landscape can be made using the CORILIS methodology that resulted:

- in a high level of aggregation (statistical generalisation) of the data with a good coverage so that there were a very small number of holes or gaps in the data;
- the creation of sharpen contrasts between zones by referring to the relative local distribution of the classes in relation to their "mean value + standard deviation".

As a result the advantage of CORILIS is that the methodology delivers maps which indicate the intensity of a given land cover type in an area. It is therefore possible to combine these maps in a simple and transparent way in order to identify a dominant landscape type. The rules (as well as the parameters of the calculation) can be modified easily in order to come to an acceptable representation of the data for an area.

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17 www.cs2000.org.uk

18 A - Présentation et discussion des résultats préliminaires du projet « indicateurs environnementaux appliqués à la base de données LACOAST » (IndiLac) - Étude de GIM-Luxembourg et séminaire organisé dans le cadre du Centre thématique land cover de l'Agence Européenne pour l'Environnement - IFEN-Orléans, 25 et 26 mars 1999
B - Présentation et discussion des résultats préliminaires de l'application de la méthode de lissage CORILIS. Séminaire technique réalisé dans le cadre du Centre thématique land cover de l'Agence Européenne pour l'Environnement - IFEN-Orléans, 20 et 21 juin 2000

Box 4.1: CORILIS: Background

CORILIS is a methodology developed in France jointly by the Hypercarte Research Group, INSEE and IFEN (see the box, below). The purpose is to calculate “intensities” or “potentials” of a given theme on each point of a territory. The principle is based on the smoothing of the values in each cell of a grid with the values of the neighbouring cells (divided by the square of the distance between the centres of the corresponding cells). Use first with demographic statistics, this methodology has been tested successfully with CLC and named accordingly.

As compared to a traditional cartographic generalisation, CORILIS avoids the problem of eliminating the small values and increasing the large ones; the total “smoothed value” remains the same. When combining several themes to assess their relative intensity, CORILIS display homogenous zones which are intense in their centre and, logically, of low intensity in their periphery; these transitions constitute convenient borders. The intensities or potentials calculated in each cell for each theme allow many calculations.

A CORILIS map of Europe (in fact a set of 3 maps/databases, with different radius of smoothing) was computed by Ifen and GIM for the former EEA/ETCLC. The exercise was repeated by the ETCTE. This last version is used in LEAC.

CORILIS is one of the by-products of a research initiated by the Hypercarte Research Group in France. C. Grasland (UMR Géographie-Cités) is the actual coordinator of the project.

The *Hypercarte Research Group* is a network of geographers, statisticians and mathematicians which was established in 1996 for the answer of a call for tender (SUPCOM) proposed by EUROSTAT-GISCO. The aim of this call for tender was to find solutions to the problem of spatial heterogeneity of territorial divisions and related bias in cartographical representation. The answer of the *Hypercarte Research Group* was based on a general multiscalar smoothing method derived from a probabilistic reformulation of the concept of population potential (*The Hypercarte Project, Working Paper n°1*). Although not selected by Eurostat, the research has continued in several directions.

Interesting developments of the methodology were established by P.Chataignon (INSEE) which proposed an alternative function of neighbourhood (bi-weight function as finite approximation of Gaussian neighbourhood) and suggested some links with the theory of non-parametric estimators (kernel functions). P.Chataignon wrote also various SAS-Program for the computation of neighbourhood potentials and contribute to the diffusion of the methodology inside the INSEE but also other organisations like the *Institut Français de l'Environnement (IFEN)* which is part of the *European Environment Agency (EEA)*. In 1998-1999, M. Lacaze (IFEN) realised an application of smoothing methods to the Corine Land Cover database for the French territory and for the whole Europe.

At the same time, the links between multiscalar neighbourhood potential and related measures of accessibility was explored by C. Grasland and presented to an international working group in the framework of the *Study Program on European Spatial Development (SPESP)* coordinated by the DG XVI. A working paper by C. Grasland suggested the possibility to build *multiscalar curves of accessibility* based on the cumulative amount of population located at a given time or kilometric distance from any point of the European territory and to derive all indexes of accessibility from mathematical transformation or summaries of this curve.

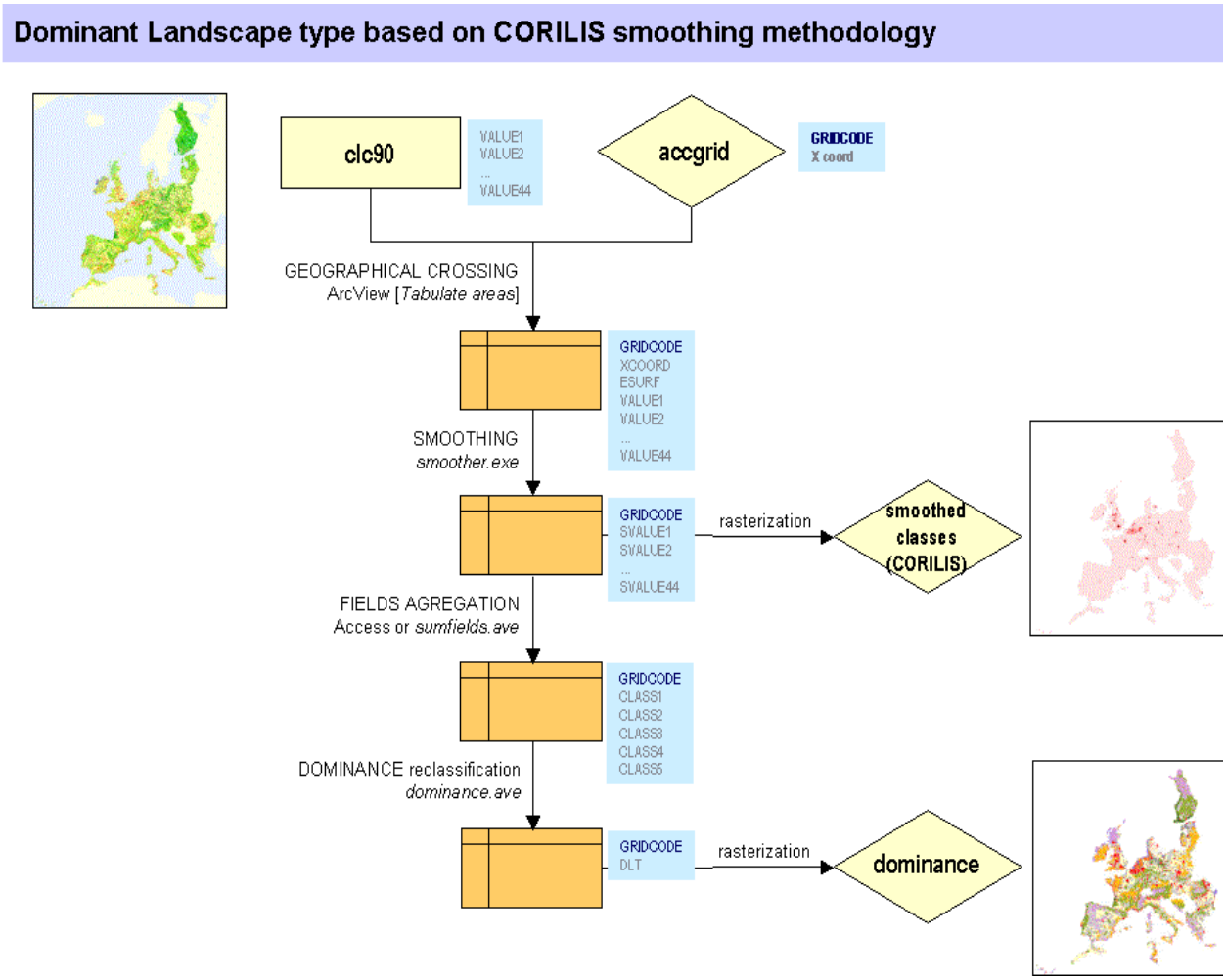
The main results and topics of the Hypercarte Project has been presented at the UNECE Conference of statisticians in Neuchâtel the 10-12 April 2000 (as invited paper from Eurostat). The resulting paper has been published in : *Grasland C., Mathian H., Vincent J.M., 2000,"Multiscalar Analysis and map generalisation of discrete social phenomena: Statistical problems and political consequences", Statistical Journal of the United Nations ECE, 17, IOS Press, 1-32.*

In Sept 2001, The Hypercarte Project has received a subvention from the French National Center for Scientific Research (CNRS) for the establishment of an operational version of the Hypercarte-Software which could be implemented on European territory. The results of this project called "Hypercarte-Europe" will probably be implemented in the framework of the ESPON Program 2001-2006.

More on: http://www.parisgeo.cnrs.fr/cg/hyperc/index.htm

In this study, therefore, CORINE land cover data were pre-processed using the CORILIS methodology[19] (see Box 4.1).

Figure 4.3



4.4 Definition of the accounting grid and land accounting units

Given the considerations outlined above the accounts were derived using the following steps:

Step 1: *Definition of the accounting grid*

For the purposes of this project, a spatial or geographical 'accounting grid' was used to overcome any spatial mis-adjustment between different data sources for different time periods. It was created using the CLC data using a regular 3x3 km grid, of the same spatial extent as the CORINE database. Once the grid was created it was intersected

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19 For a complete description of the methodology, see Michel Lacaze, Géostatistique « Grands traits de l'occupation des terres » (note interne) Ifen, février-novembre 1999 et Ces terres qui nous entourent... Données de l'environnement n° 51, Ifen, janvier 2000

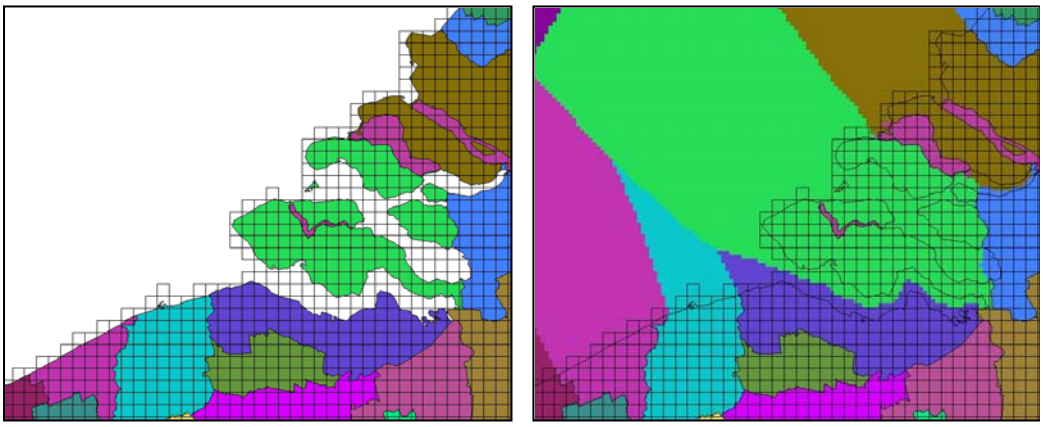
with a land-sea mask, so that the sea areas could be identified and excluded from subsequent analysis.

Step 2: *Input of attributes to the accounting grid*

Geographical attributes were assigned to the cells of the accounting grid, by intersecting it with other data sources, namely:

- **Land Cover and Land Cover Changes data derived from the 100m resolution CLC database.** For each grid cell the stock and change in hectares of each land cover class (Level 3) was recorded. These data were later used for processing using the CORILIS approach. The data on Land Cover Changes came from LaCoast layer, which covered the 10km coastal strip for 10 European countries. Due to the spatial mis-adjustment between LaCoast layer and the accounting grid, some LaCoast data were lost from the strip.
- **Analytical Units (Physical and Administrative boundaries)** for Biogeographic Regions, Regional Seas Basins, Watersheds and the breakdown Lowland/Upland zones derived form the reclassification of the DEM data. The Administrative boundaries were NUTS0 and NUTS3. Following the intersection, if a cell had more than one attribute then the one with the largest surface area within the cell was selected. Where empty cells occurred as a result of spatial mis-alignment, proximity criteria based on Thiessen polygons, were used to make an assignment (Figure 4.3).

Figure 4.3: Automatic filling of empty cells with the Thiessen method.



Step 3: *Definition of the coastal strip and the relief issue*

Two possibilities for the definition of the coastal strip were considered:

- The **geometric definition** of the coastal strip 10 km wide, corresponding to that used in the LaCoast Project.
- A **geographic definition** which takes coastal relief into account. The idea is that when coasts are flat, the influence of the sea will extend further inland, whereas, where the coastal relief is high, the coastal strip will be narrower. Such a distinction is commonly used in the mapping of coastal zones.

Table 4.4: Nomenclature of Landscape Types

A1	Urban dense areas	
A2	Dispersed urban areas	
B1	Broad pattern intensive agriculture	
B2	Composite rural landscape	
	B21	*Lowland composite rural landscape*
	B22	*Upland composite rural landscape*
C1	Forested landscape	
	C11	*Lowland forested landscape*
	C12	*Upland forested landscape*
C2	Open semi-natural or natural landscape	
	C21	*Lowland open semi-natural or natural landscape*
	C22	*Upland open semi-natural or natural landscape*
C3	Landscape with no dominant land cover character	
	C31	*Lowland with no dominant land cover character*
	C32	*Upland with no dominant land cover character*

The purposes of the present study the zoning of the coast was made using the geographical approach, the extent of the coastal strip made according to the following thresholds:

- 0-1 km: entirely within in the coastal strip
- 1-4.9 km: within the coastal strip if the altitude is <150 m
- 5-9.9 km: in the coastal strip when the altitude is <100 m
- 10-20 km: in the coastal strip when the altitude is <50 m

The full implementation of the definition of the coastal zone was not possible at this stage because of the limited resolution of the LaCoast inventory to a strip of 10 km. However, a more complete analysis will be possible following the release of CLC2000. In the present study a distinction was made between lowland and upland landscape types, using the threshold (depending on the available DEM) 50m[20].

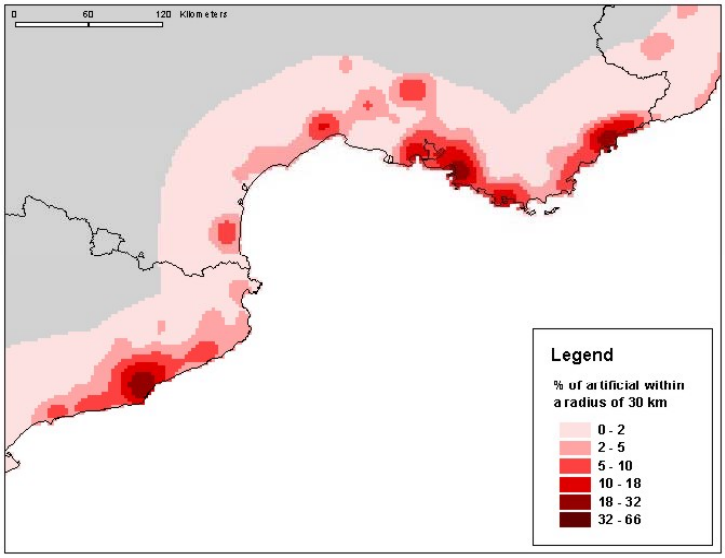
Step 4: *Definition of the coastal landscape types from CLC and CORILIS*

A - Statistical analysis

Following the conclusions of the previous applications worked out for the ETCLC, it was decided to base the assessment of cover change on an indicator of concentration of CLC themes in the cells of the regular grid. Figure 4.4 illuminates the kind of information obtained about the "intensity in the neighbourhood" or the "potential" of the "Artificial" land cover. This processing of CLC have been undertaken systematically.

[20] For the whole continent, we consider the possibility to use, instead, the threshold of 200m.

Figure 4.4: Example of result of CORILIS: Intensity of "artificial/urban" theme on a sector of the Mediterranean.



The calculations were made at the most aggregated level of the CLC data, using the classes Artificial (1), Broad agriculture (2.1+2.2), Heterogeneous agriculture and pasture (2.3+2.4), Forests (3.1), Shrub and other semi-natural land (3.2+4+5). The CORILIS smoothed values were calculated with a radius of 20 km (see the discussion of the methodological choice below). Finally, the values greater than the mean + one standard deviation of the class were selected.

It was found that, when compared to the others, this method tends to overweight the themes when they are concentrated spatially, in particular in the urban areas. However, it was felt that, as long as the typology of land units reflects the use of land, and as long as the intensity of the environmental pressure by urban is, by hectare, much more important than any over one, including intensive agriculture, this solution was appropriate for the purposes of constructing LEAC.

B - Classification of the cells of the grid in landscape types

Using the data available for the coastal strip, together with our wider understanding of conditions throughout Europe, a set of landscape types were defined for the coastal zone (Table 4.4). These types reflect the dominant character of the area.

Three of the landscape types correspond to dispersed or composite landscape patterns, which are considered as such. A2 describes landscape where urban agglomerations are present, although in minority, but which are nevertheless significant in terms of functioning and the possibility future urban change. B2 corresponds to traditional European landscapes where mixed agriculture has historically coexisted with forests and other natural habitats. C3 is a type of landscape where no dominant land cover character has been identified, i.e. neither urban is determinant nor the agriculture or forest/natural ones have been detected. Such areas may be open to a particular type of future change (which is not clear for the coast; see results below).

Having defined these landscape types, a correspondence was established between the aggregated CORILIS classes and the Landscape types (Table 4.5). Assignments were

made between cover and landscape type using the condition that the CORILIIS dominance value Vn>mean+σ (where Vn was the smoothed value of CLC class 'n' in a given cell). The CLC cover level 1 classes were assigned to landscape types as follows:

- ***A1 Urban dense areas*** ←→ *Artificial (CLC 1), with no co-dominance*
- ***A2 Dispersed urban areas*** ←→ *Artificial (CLC 1) when co-dominances exist in the same cell (all other CLC classes)*
- ***B1 Broad pattern intensive agriculture*** ←→ *Broad agriculture (CLC 2.1+CLC 2.2) with no co-dominance*
- ***B2 Composite rural landscape*** ←→ *Heterogeneous agriculture & Pasture (CLC 2.3+CLC 2.4), all co-dominances being possible, except Artificial (CLC 1)*
- ***C1 Forested landscape*** ←→ *Forests (CLC 3.1), with possible co-dominances of CLC 2.1+ 2.2 (Broad agriculture) & CLC 3.2+4+5 (Shrub and other ...)*
- ***C2 Open semi-natural or natural landscape*** ←→ *Shrubs and other (CLC 3.2+4+5) with possible co-dominance of CLC "Broad agriculture" only*
- ***C3 Landscape with no dominant land cover character****: No dominant character detected*

Table 4.5: Correspondence between aggregated CLC land cover and Landscape types

	Landscape types						
CORILIS based values (>mean+σ)	A1	A2	B1	B2	C1	C2	C3
Artificial							
Broad agriculture							
Heterogeneous agriculture & Pasture							
Forests							
Shrubs and other seminatural land							

Dominant LC character of the type
Possible co-dominance, considered as secondary
No co-dominance is possible

The influence of changing the territory used to compute the dominance assignment thresholds was tested by comparing the results using the whole European territory or the regional seas basins. The results are shown in Table 4.6, and Figure 4.5.

Table 4.6: Influence of area used to compute threshold [mean + std dev].

	WHOLE EUROPE	Baltic	North sea	Atlantic	Mediterranean
Artificial	10,0	6,4	17,5	7,1	8,0
Broad agriculture	53,6	51,0	62,9	50,1	44,0
Extensive agriculture	45,4	27,1	46,4	60,9	46,6
Forests	51,8	69,0	39,6	35,0	43,5
Non wooded nat. land	40,0	34,3	27,0	47,4	52,0

The table shows the possible consequences of the application of the criteria at the European level. For example, if we consider the "Artificial" class, which generates the

Landscape types A1 & A2 with a priority against all over classes, the average European value would have lead to classifying excessively large areas of the North sea region in the Urban type. Similarly, forests would have been widely mapped (against semi-natural and natural land) in Finland with a symmetric distortion in the Alps and southern Europe.

After comparison of the 2 results (see below) with the aggregated CLC map and with the map of the potential vegetation, it was decided to make the calculations by sea catchments.

Figure 4.3: Dominant land cover type maps using different thresholds in the reclassification process. A) Thresholds computed for the whole European territory and B) Thresholds computed for each regional sea basin.

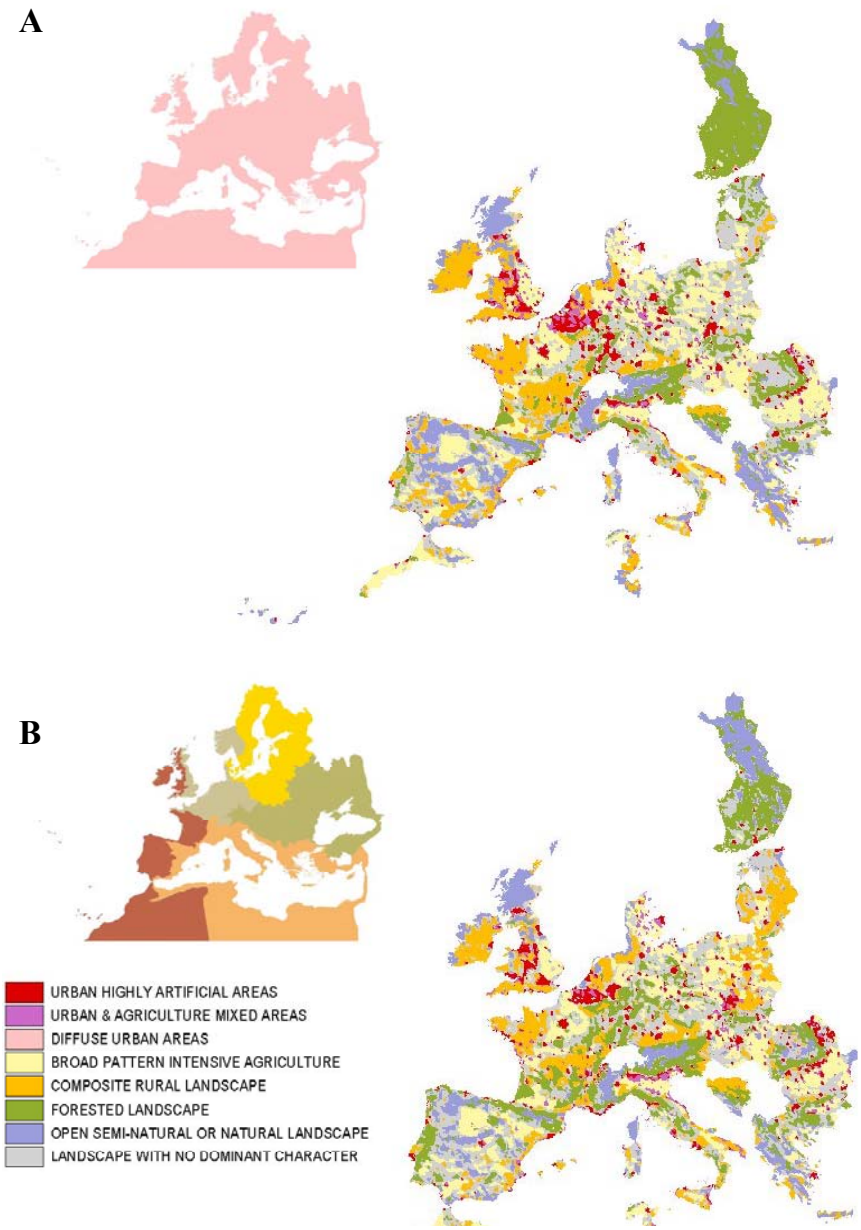
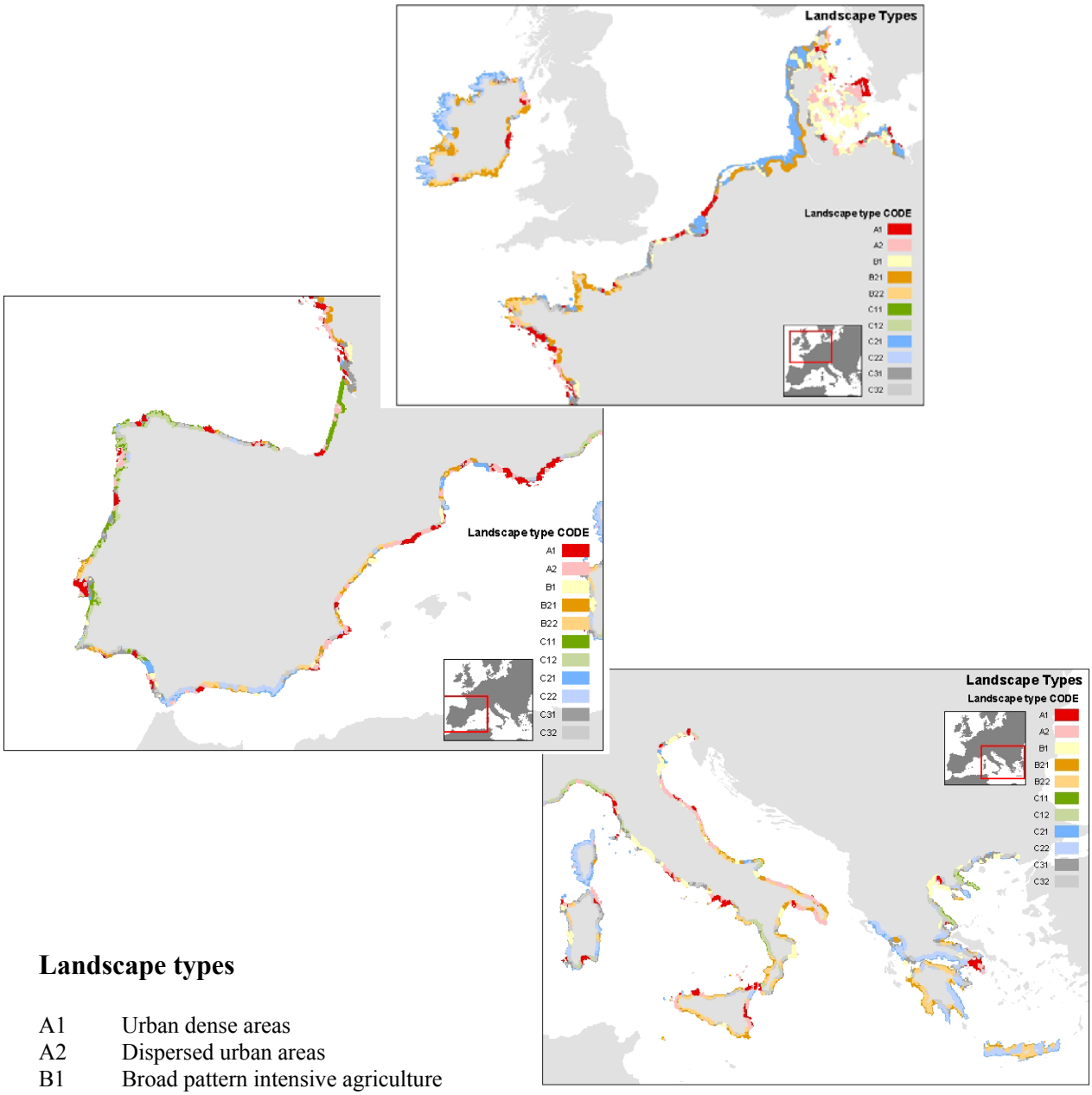


Figure 4.6 Landscape types of the Coastal Land Accounting Units



Landscape types

A1	Urban dense areas
A2	Dispersed urban areas
B1	Broad pattern intensive agriculture
B21	*Lowland composite rural landscape*
B22	*Upland composite rural landscape*
C11	*Lowland forested landscape*
C12	*Upland forested landscape*
C21	*Lowland open semi-natural or natural landscape*
C22	*Upland open semi-natural or natural landscape*
C31	*Lowland with no dominant land cover character*
C32	*Upland with no dominant land cover character*

4.5 Targeted Accounts

For the purposes of this study it was decided that to demonstrate the value of LEAC in the coastal zone, a set of supplementary or targeted accounts for tourism should be developed. Land use associated with Tourism is complex, and many involve many different land cover types. Even if we restrict the analysis to the specific areas of housing and recreation, tourism activities may be associated with many different types of land. However, the problems associated with tourism are to a large extent typical of those that one would have to face when dealing with any other major land use function. Thus it represented a good test case though which to explore the issues surrounding the construction and use of LEAC.

In order to develop the analysis for tourism, a special table has been created which links land cover stocks and flows (consumption) to land use functions. In this table the last column is an adjustment. Due to the multiple accounting of some land cover classes when they are used by different functions, the total of stocks, flows and other changes of the various functions may be larger than the surface of the area (region, country, river basin, coastal zone…) for which accounts are established. The total of the multiple uses has therefore to be subtracted.

The analysis was based on the classification of land use functions shown in Table 4.6.

Table 4.6: Nomenclature of Land Use Functions

UF1	*Residential, incl. services*
UF2	*Commercial*
UF3	*Transport*
UF4	*Industrial production*
UF5	*Energy production*
UF6	*Mining & quarrying*
UF7	*Waste dumping*
UF8	*Water management*
UF9	*Farming, food production*
UF10	*Forestry*
UF11	*Recreation & Tourism*
UF12	*Nature conservation*
UF13	*Other uses*

The purpose of developing the LEAC/Tourism account is to relate Tourism statistics and patterns to the analysis of the stocks and flows of land cover. The accounts should describe to the accommodation related to tourist activities (hectares, value of the estates), the tourist infrastructure, the natural landscape visited by tourists, the income generated by tourism, the seasonal increase of population.

Tourism statistics are only available at the European level by countries, and for NUTS2 & NUTS3 units. It was not, therefore, possible to match the coastal area as defined in LEAC. Some preliminary results are, however, presented as an illustration of the increase in tourism in the coastal zone.

4.6 Measurement units

As described in the introduction to this Report, LEACs are designed to highlight the relations between the economy and the environment in a geographical context. They aim at identifying the areas where the process take place or where they are the more intense, and to correlate them to economic and environmental conditions. These conditions may relate to the potential of a given piece of land, which can be identified by spatial analysis the analysis of the physical characteristics of the area. The power of the statistical and geographic analysis is increased by using these types of analysis to define broad landscape types, within which the impacts of land cover and land use changes can be explored in more detail.

For the construction of basic accounts, the analysis is generally made on the basis of stocks of resources measured in terms of area (hectares or km²). These accounts aim at providing a first picture (a first assessment) as well as structuring the whole system of accounts. The targeted accounts (called also "supplementary accounts") aim at taking the analytical process further. This means first giving new attributes to the geographical objects (land cover types landscape types) by assigning attributes using, say, population data, ecological characteristics, or monetary values. Unfortunately, the construction of these supplementary accounts is often limited by lack of data, in particular for linking the information to the basic land cover or land use tables.

When detailed and exhaustive information is not available for supplementary accounts, they have to be based on a statistical approach. Accounts of the land cover stocks and flows are established for the land reporting units for which statistics are generally computed (e.g. in Europe, NUTS 2 & 3). At this stage, the analysis by landscape types helps in overcoming the loss of information resulting of the aggregation process. To some extent, results from accounts based on regional socio-economic statistics can be compared with the regional picture of the land cover flows by landscape types. In domains where official statistics by regions are not compiled, the same stratification can be used with data collected by monitoring networks or survey by sampling. In the context of tourism, for example, statistics for the value of land and real estate could usefully be integrated in the Land Accounts. Several possibilities for doing this are potentially available, based on existing statistics on the price of urban, agriculture or forest land as well as on calculations of the economic value of ecosystems (e.g. by reference to the maintenance cost).

Part 5 Results: Basic Accounts

The detailed accounts are presented in annex. A first analysis of the results shows interesting points.

Figure 5.1 shows the proportions of the major land cover types within the European Coastal zone for 1990. The matrix showing the basic land cover change recorded between 1975 and 1990, using the aggregated CLC cover classes are shown in Table 5.1. Looking at the changes at the aggregated level, they are generally small, with the exception of the increase of artificial areas through development processes. This is partly due to compensations between sub-classes as well as to the uneven intensity of changes between landscape types. Figure 5.2 shows the proportions of the different landscape types within the European Coastal zone as defined by this study.

Figure 5.1: Coastal land cover, 1990

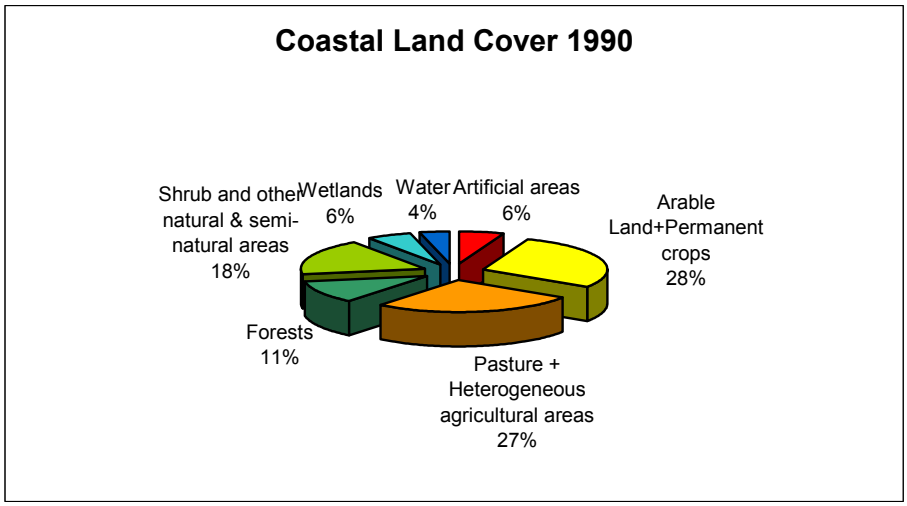
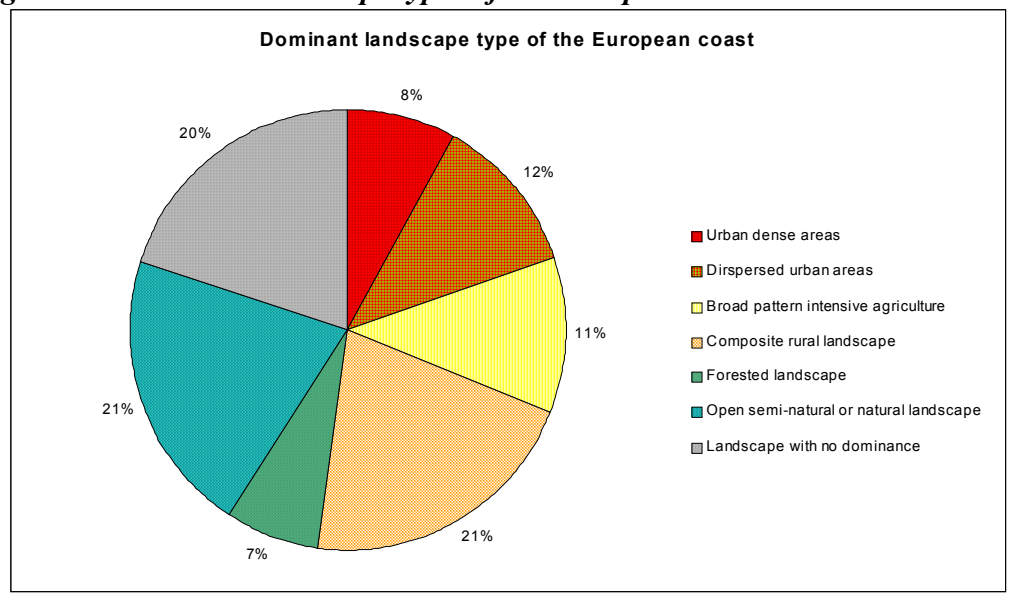


Table 5.1 Matrix of land cover change

Consolidated Matrix of Land Cover Change on the European coast 1975-1990; Aggregated CLC classification; ha

		1	2.1+2.2	2.3+2.4	3.1	3.2+3.3	4	5					
		Artificial areas	Arable Land + Permanent crops	Pasture + Heterogeneous agricultural areas	Forests	Shrub and other natural & semi-natural areas	Wetlands	Water	TOTAL OPENING YEAR	Increase (+)	Decrease (-)	*Net Changes 1975-1990*	TOTAL FINAL YEAR
1	Artificial areas	1264031	4813	8952	1454	4432	660	885	**1285227**	**186079**	**21196**	*164883*	**1450110**
2.1+2.2	Arable Land+Permanent crops	63830	6450313	219568	6578	45874	15191	2421	**6803775**	**401183**	**353462**	*47721*	**6851496**
2.3+2.4	Pasture + Heterogeneous agricultural areas	76048	316752	6160890	36559	51498	3040	1383	**6646170**	**291910**	**485280**	*-193370*	**6452800**
3.1	Forests	11391	18971	13962	2557291	111889	931	945	**2715380**	**225868**	**158089**	*67779*	**2783159**
3.2+3.3	Shrub and other natural & semi-natural areas	26945	57328	45677	171041	4148336	16343	8378	**4474048**	**227330**	**325712**	*-98382*	**4375666**
4	Wetlands	4052	2664	3429	10016	10942	1351530	122918	**1505551**	**79790**	**154021**	*-74231*	**1431320**
5	Water	3813	655	322	220	2695	43625	821027	**872357**	**136930**	**51330**	*85600*	**957957**
TOTAL FINAL YEAR		**1450110**	**6851496**	**6452800**	**2783159**	**4375666**	**1431320**	**957957**	**24302508**	**1549090**	**1549090**	*0*	**24302508**

Figure 5.2 Dominant landscape types of the European coast



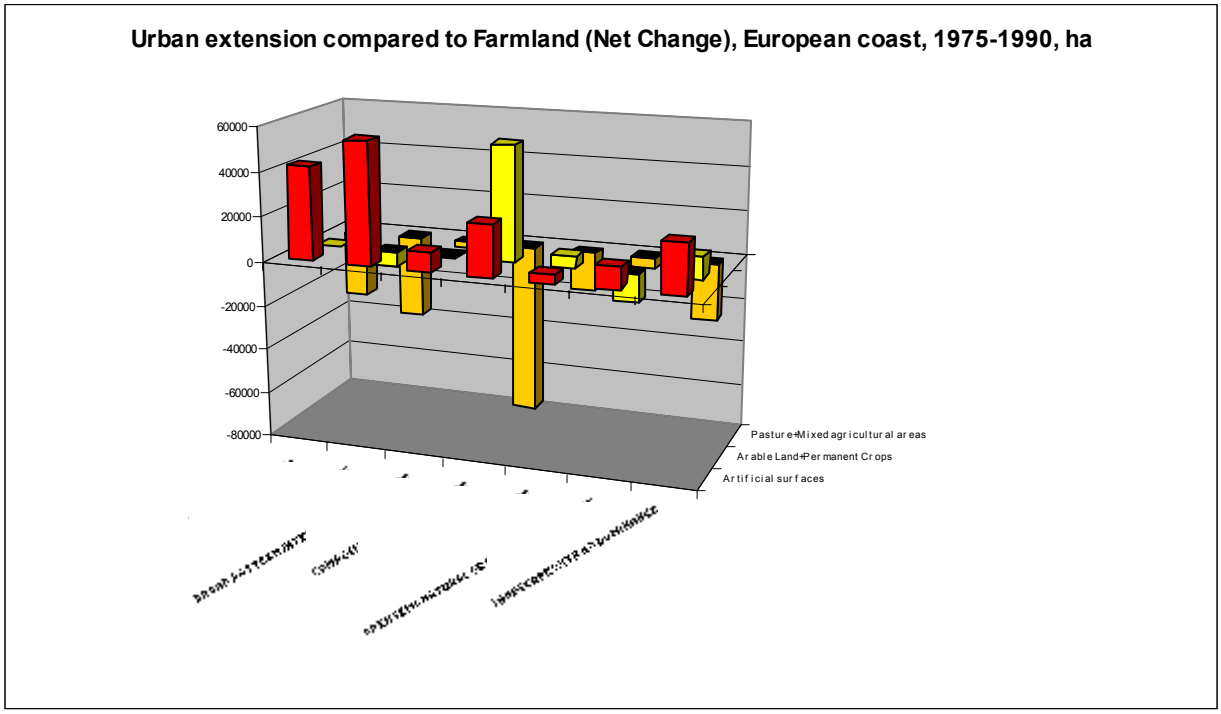
Analysing land cover changes by landscape types is useful in illustrating many of the processes of land cover change at work within the coastal zone. The basic changes account is shown in Table 5.2. Figure 5.3 is based on these data and shows the net changes of Urban/artificial areas and of Farmland between 1975 and 1990, and highlights the concentration of the urban sprawl in areas where Urban was dominant. This expansion has taken place by the consumption of pasture and mixed agriculture (CLC23+CLC24). In composite rural landscapes, urban areas have expanded as well ad arable land and permanent crops; mixed agriculture, by contrast, has suffered more severe losses.

Table 5.2 Land cover change account of the European coast, 1975-90

Land Cover Changes on the European coast, 1975-1990, km²

Summary table			1 Artificial surfaces	2.1+2.2 Arable Land+Permanent Crops	2.3+2.4 Pastures+Heterogeneous agricultural areas	3.1 Forests	3.2+3.3 Shrub and/or other natural land	4 Wetlands	5 Water bodies	TOTAL COAST
A1	URBAN DENSE AREAS	1975	443027	357559	463575	236710	293099	100112	82868	19769
		(-)	12312	26292	63728	16433	33166	20410	2878	1752
		(+)	54324	26810	33926	7985	31476	2935	17763	1752
		1990	485039	358077	433773	228262	291409	82637	97753	20079
A2	DISPERSED URBAN AREAS	1975	356018	1116486	681108	256757	246902	79387	71898	28085
		(-)	12798	67754	89278	11313	27495	8826	1908	2193
		(+)	67693	60826	52189	4965	23354	1130	9215	2193
		1990	410913	1109558	644019	250409	242761	71691	79205	28085
B1	BROAD PATTERN INTENSIVE AGRICULTURE	1975	82468	1868999	369732	174192	93510	71455	101342	27616
		(-)	1905	84251	45308	7494	24419	8176	2201	1736
		(+)	10430	84041	42387	4643	10614	14019	7620	1736
		1990	91093	1868789	366811	171341	79705	77298	106661	27616
B2	COMPOSITE RURAL LANDSCAPE	1975	142553	1360293	2649937	220760	524374	175730	48386	51220
		(-)	5289	97169	401739	14030	49724	11771	1201	6809
		(+)	28267	148987	325568	19904	45187	4572	8438	6809
		1990	165531	1412111	2573766	226634	519837	168531	55623	51220
C1	FORESTED LANDSCAPE	1975	32153	131463	318407	931545	285362	13284	29975	17421
		(-)	1842	10210	33957	71100	61841	658	770	1803
		(+)	6095	15433	16924	80722	59187	356	1661	1803
		1990	36406	136688	301374	941167	282708	12982	30866	17421
C2	OPEN SEMI-NATURAL OR NATURAL LANDSCAPE	1975	64612	532812	775080	282041	2082340	870943	391503	49993
		(-)	1940	58958	71517	38980	258576	87390	43612	6608
		(+)	11977	46128	67139	82932	223588	53653	75456	6608
		1990	74649	519982	770702	325993	2047352	837206	423447	49993
C3	LANDSCAPE WITH NO DOMINANT LAND COVER CHARACTER	1975	164396	1436163	1388331	613375	948461	194640	146386	48917
		(-)	7143	118460	158585	47593	169328	26458	6325	5338
		(+)	29226	128590	132609	73571	132761	12793	24342	5338
		1990	186479	1446293	1362355	639353	911894	180975	164402	48917
TOTAL COAST		1975	1285227	6803775	6646170	2715380	4474048	1506551	872367	243025
		(-)	43129	463094	864112	206943	624549	163689	58795	24243
		(+)	208012	510815	670742	274722	526167	89458	144395	24243
		Net Changes	164883	47721	-193370	67779	-98382	-74231	85600	
		1990	1120344	6756054	6839540	2647601	4572430	1579782	786757	243025

Figure 5.3: Urban extension compared to Net Change in Farmland



The analysis shown in Figure 5.3 is carried out at a very macroscopic level, and can in the future be improved by splitting Composite Rural Landscapes between upland and lowland zones. In addition, a regional approach would show different profiles and facilitate a more detailed commentary on the statistics.

Table 5.3 Account of Formation of Land Cover

Account of Formation of Land Cover - European coast, 1975-1990, ha

Consumption of land cover										*Formation of land cover*							
1	2.1+2.2	2.3+2.4	3.1	3.2+3.3	4	5				1	2.1+2.2	2.3+2.4	3.1	3.2+3.3	4	5	
Artificial surfaces	Arable Land & Permanent Crops	Pastures & Mixed agricultural areas	Forests	Shrub and other semi-natural land	Wetlands	Water bodies	Total		Land cover flows	Artificial surfaces	Arable Land & Permanent Crops	Pastures & Mixed agricultural areas	Forests	Shrub and other semi-natural land	Wetlands	Water bodies	Total
15403	259	302	48	99		41	16152	LCF1	Urban land management	16152							16152
	40584	51657	7502	16314	178	131	116366	LCF2	Urban sprawl	116366							116366
6530	22987	24089	3841	10532	3874	3641	75494	LCF3	Extension of economic sites and infrastructures	75494							75494
	288686	605684					894370	LCF4	Agricultural rotation and intensification		388641	505729					894370
13765		57770	32933	103005	6093	977	214543	LCF5	Conversion of land to agriculture		122174	92369					214543
1454	7108	586	155744	171041	10016	220	346169	LCF6	Forests creation and management			633	238646	106890			346169
600	1695	1115	532	990			4932	LCF7	Water body creation and management							4932	4932
4702	101417	122710	6299	322040	141747	48005	746920	LCF8	Changes of Land Cover due to natural and multiple causes			72011	36076	418982	87312	132539	746920
42454	**462736**	**863913**	**206899**	**624021**	**161908**	**53015**	**2414946**		**Sub/Total Flows**	**208012**	**510815**	**670742**	**274722**	**525872**	**87312**	**137471**	**2414946**
165558	***48079***	***-193171***	***67823***	***-98149***	***-74596***	***84456***			***Net Formation of Land Cover***								
675	*358*	*199*	*44*	*528*	*1781*	*5780*	*9365*		*Adjustment*					*295*	*2146*	*6924*	*9365*
208687	**511173**	**670941**	**274766**	**526400**	**89093**	**143251**	**2424311**		**TOTAL**	**208012**	**510815**	**670742**	**274722**	**526167**	**89458**	**144395**	**2424311**
									Land cover stock 1975	**1285227**	**6803775**	**6646170**	**2715380**	**4474048**	**1505551**	**872357**	**24302508**
									Net Formation of Land Cover	***165558***	***48079***	***-193171***	***67823***	***-98149***	***-74596***	***84456***	
									Net adjustment	*-675*	*-358*	*-199*	*-44*	*-233*	*365*	*1144*	
									Land cover stock 1990	**1450110**	**6851496**	**6452800**	**2783159**	**4375666**	**1431320**	**957957**	**24302508**

The Account of Formation of Land Cover presents the balance between Formation and Consumption. This account is established by CLC classes, their total being equal for each individual flow. The balance of the account is the Net Formation of Land Cover. An adjustment is added for some uncertainties in the initial matrix of changes. The Net Formation of Cover (plus adjustment) is at the same time the difference between the two stocks, Land Cover 1975 and Land Cover 1990.

The Land Cover Resource & Use account (Table 5.4) provides a more synthetic view of the land cover change data, by identifying both the processes of land cover change (that is the Formation of cover), as well as the losses, which are distributed by landscape type. Several important points are apparent in these data.

Table 5.4 Summary Land Cover Resource and Use Account

Land Cover Resource & Use Account on the European coast, 1975-1990, HA

Summary Account		Landscape Types							TOTAL
		A1	A2	B1	B2	C1	C2	C3	
		Urban dense areas	Dirspersed urban areas	Broad pattern intensive agriculture	Composite rural landscape	Forested landscape	Open semi-natural or natural landscape	Landscape with no dominance	
	A - OPENING SURFACE ~ 1975	**1976950**	**2808556**	**2761698**	**5122033**	**1742189**	**4999331**	**4891751**	**24302508**
Loss of Land Cover Resource									
1	Artificial surfaces	12312	12798	1805	5289	1842	1940	7143	43129
2.1+2.2	*Arable Land & Permanent Crops*	26292	67754	84251	97169	10210	58958	118460	463094
2.3+2.4	*Pastures & Heterogeneous agricultural areas*	63728	89278	45308	401739	33957	71517	158585	864112
3.1	*Forests*	16433	11313	7494	14030	71100	38980	47593	206943
3.2+3.3	*Shrub and other semi-natural land*	33166	27495	24419	49724	61841	258576	169328	624549
4	Wetlands	20410	8826	8176	11771	658	87390	26458	163689
5	Water bodies	2878	1908	2201	1201	770	43512	6325	58795
	B - TOTAL LOSS OF LAND COVER RESOURCE	**175219**	**219372**	**173654**	**580923**	**180378**	**560873**	**533892**	**2424311**
Consumption of Land Cover (Flows resulting from Changes in the Uses of Land)									
LCF1	Urban land management	3993	6454	706	2280	757	446	1516	16152
LCF2	Urban sprawl	30962	36367	6408	17422	3026	6572	15609	116366
LCF3	Extension of economic sites and infrastructures	19369	24872	3316	8565	2312	4959	12101	75494
LCF4	Agricultural rotation and intensification	44641	90815	100941	416326	9997	53907	177743	894370
LCF42	*Planting of vineyards, fruit and olive trees over arable & pasture*	*6366*	*14242*	*7431*	*47633*	*2010*	*4792*	*19777*	*103151*
LCF45	*Intensification of agriculture*	*20184*	*39012*	*39803*	*107305*	*5634*	*22735*	*89996*	*323569*
LCF5	Conversion of land to agriculture	14406	19681	22157	49734	18282	33213	57070	214543
LCF52+54	*Conversion of marginal land to agriculture*	*8471*	*12972*	*15277*	*42317*	*8665*	*30384*	*42606*	*160692*
LCF6	Forests creation and management	15929	7524	6083	21826	96909	106252	91646	346169
LCF7	Water body creation and management	452	967	579	498	926	290	1220	4932
LCF8	Changes of Land Cover due to natural and multiple causes	45241	32588	32627	63191	48157	350963	174153	746920
LCF83+LCF84	*Farmland abandonment*	*7691*	*8672*	*7573*	*35977*	*26814*	*58317*	*58800*	*203852*
LCF87	*Coastal erosion*	*16502*	*7110*	*4254*	*7908*	*56*	*69786*	*15870*	*121485*
LCF89	*Other changes and unknown*	*2486*	*1112*	*8175*	*937*	*183*	*47290*	*7236*	*67399*
N.A.		226	104	837	1081	12	4271	2834	9365
	C - TOTAL FORMATION OF LAND COVER 1975-1990	**175219**	**219372**	**173654**	**580923**	**180378**	**560873**	**533892**	**2424311**
	D - Final Surface ~ 1990 (D = A-B+C)	**1976950**	**2808556**	**2761698**	**5122033**	**1742189**	**4999331**	**4891751**	**24302508**

Figure 5.4 Urban extension of the European coast, surface by landscape types

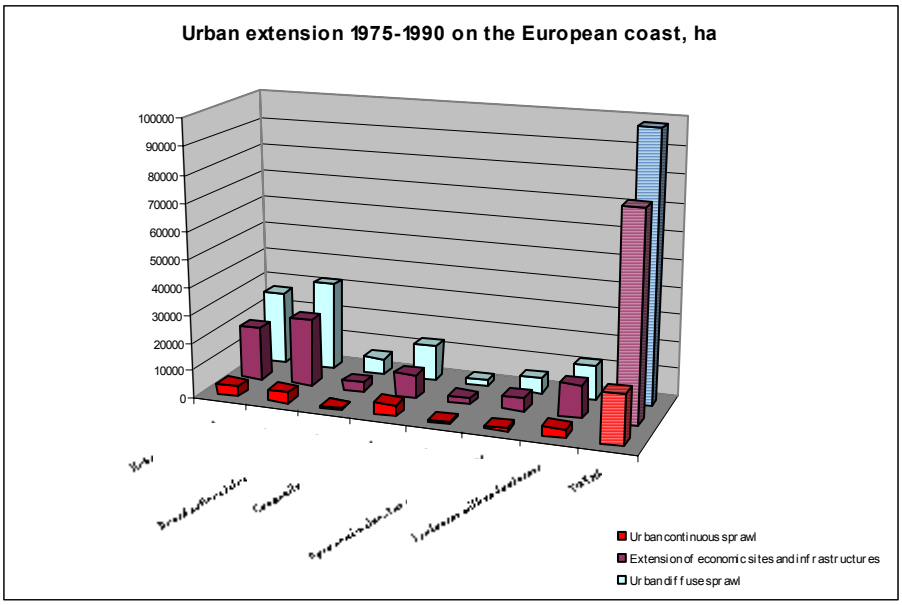
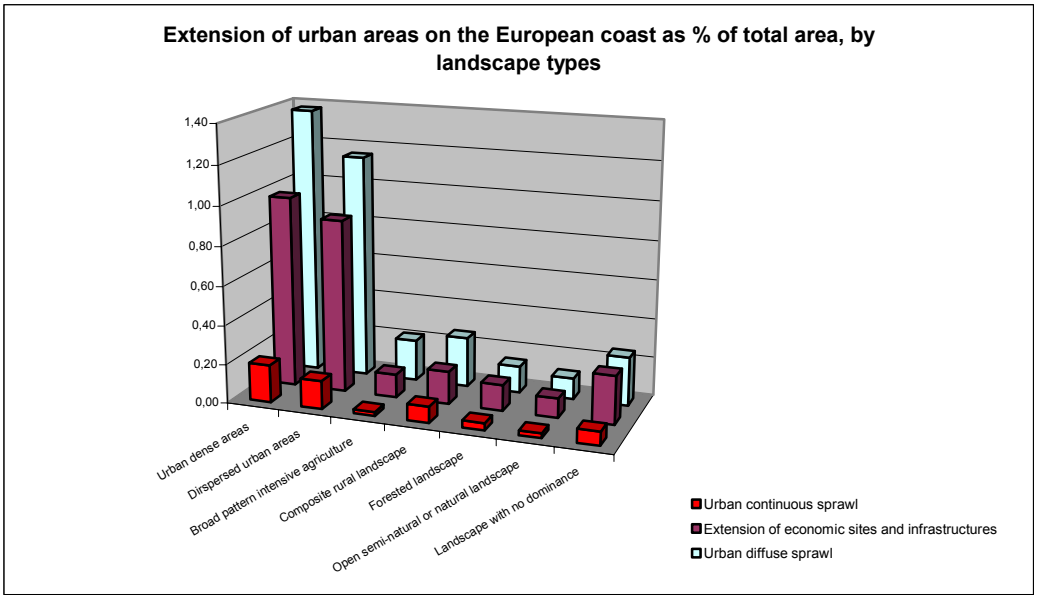


Figure 5.5 Urban extension of the European coast, % by landscape types



For example, there is extensive conversion of land to urban. Urban extension appears to take the form of diffuse sprawl and extension of activity areas and infrastructures, rather than as dense urban sprawl. The data in Table 5.4 suggest that expansion is more important in those areas already dominated by urban than elsewhere (Figure 5.4 and 5.5).

A second key feature of the data shown in Table 5.4 is that alongside the conversion to urban, an equally significant processes is the of conversion of marginal land to agriculture, intensification of agriculture and the planting of vineyards, fruit and olive trees. These changes are more or less balance by the abandonment of farmland abandonment and, to some extent by the extension of pasture, fallow land and set aside (Figure 5.6 and 5.7).

Figure 5.6 Extension and intensification of agriculture on the European coast, by landscape types

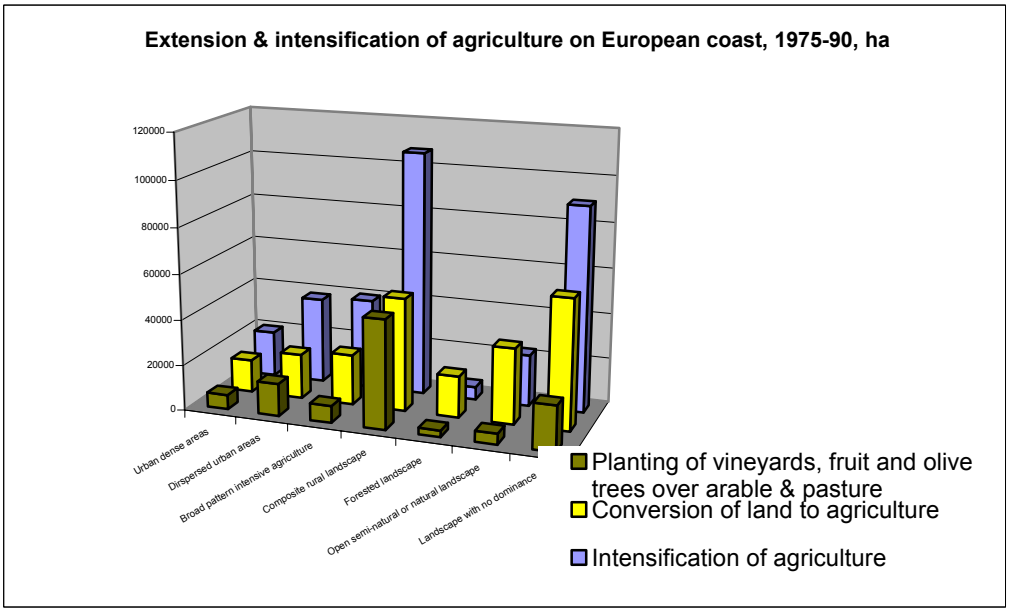
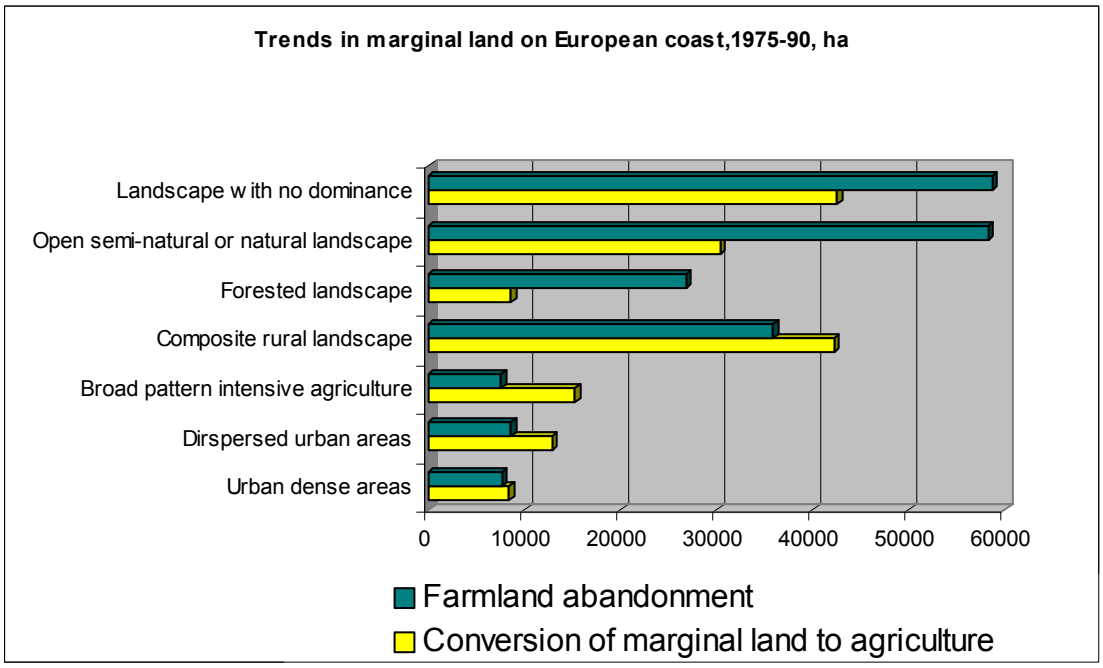


Figure 5.7 Trends in marginal land on European coast: Farmland abandonment vs. Conversion of marginal land to agriculture according to landscape types



The most important flows have occurred in the composite rural landscapes, the landscape with no dominance, and to a minor extent, in the dispersed rural landscapes. Conversion of land to agriculture is also important as in open semi-natural and natural areas, which suggests the more intensive use of marginal land. When we consider the relative values, it is apparent that the trend towards more intensive agriculture is important in all areas.

The extension of agricultural areas has to be assessed in relation to farmland abandonment, which is clearly an important process in European coastal areas. For example, farmland abandonment occurs on a similar scale to the conversion of marginal land. On the coast (and on the average) these two processes combined are the most important ones affecting open natural landscape, landscape with no dominance and composite rural landscapes.

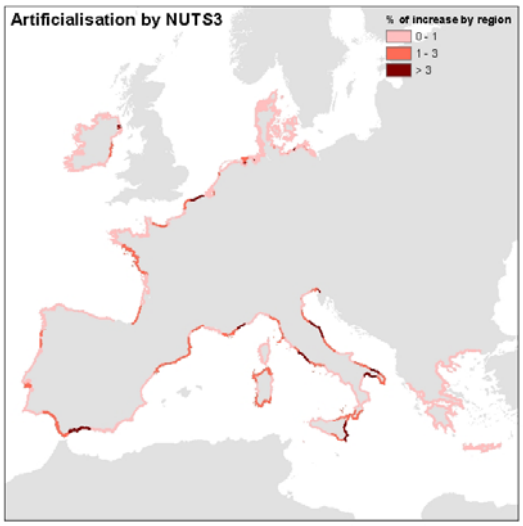
The extent of coastal erosion shown in Table 5.4 should be treated with caution because of the uncertainties associated with photo interpretation using satellite data for these localities (tide effects, etc.). It is likely that more reliable data would be obtained from the CORINE Coastal Erosion study, and it is suggested that these could be exploited more fully in a future survey.

The interest of a zonal approach can also be put in evidence by mapping accounting results. Some tests have been done in reference to NUTS3 coasts (Figure 5.8).

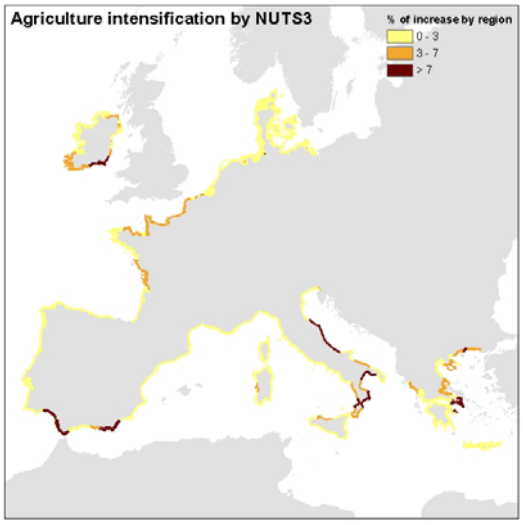
All these preliminary results will be developed in the future, in particular in the context of extending the zonal approach by providing an analysis by sea catchments, NUTS2 or 3 regions or other geographical sectors.

Figure 5.8 Three indicators derived from LEAC

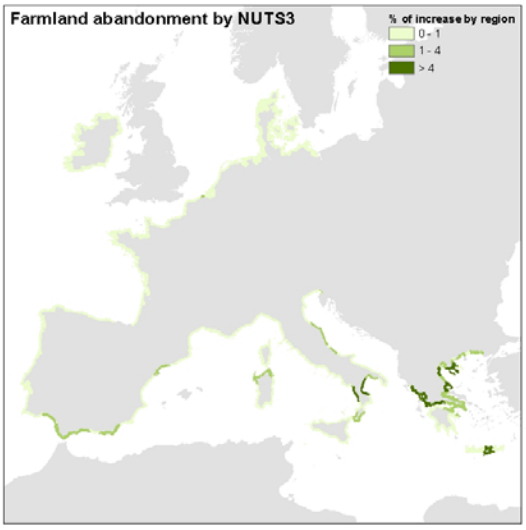
LCF12+LCF13



LCF45+LCF5



LCF83+LCF84



Part 6: Targeted Accounts

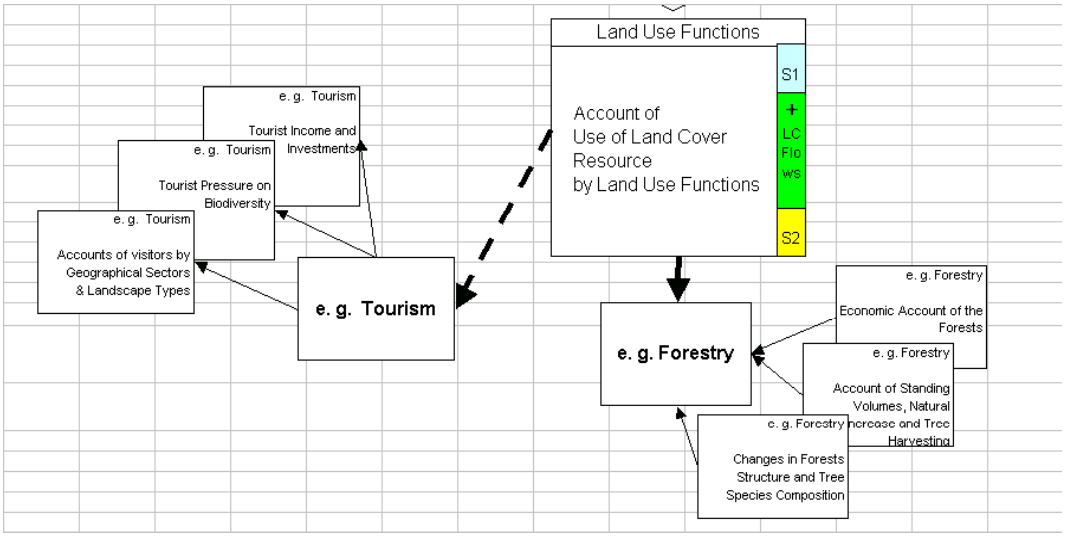
Targeted (or Supplementary) accounts are a set of accounting tables connected to the LEAC basic accounts via the Land Use Functions account (Figure 6.1). Such accounts can incorporate detailed information on land such themes as biotopes and small linear features that occur in the landscape (hedgerows, lanes, walls…), rivers, buildings or transport networks, as well as data such for human population, vegetation, wildlife, crops. Such accounts can express stock and change in physical units, such as area or numbers, or there can be some attempt to monetarise the account if this is appropriate.

The formal relationship of targeted accounts and basic accounts can be made at the level of land analytical units, where detailed and continuous statistics exist, as for population. More often, however, only more general information is available and more aggregated reporting units have to be created. Such accounts could, for example, be developed for large reporting units like Administrative Regions or River Basins when statistics are collected at this level.

The aggregation and linking process required to produce targeted accounts can be made either statistically or, as in the case of the present project, by landscape types, or be specific landscape characteristics derived from CORILIS, or from multi-variate statistical analysis of grids or of pre-established land units (as in the case of EuroWaternet.

The value of targeted accounts is that they allow the calculation of a wider rage of indicators that can describe the potential or value or quality of particular resources, such as nature, or of the of intensity of pressure upon them. As a result, they allow the wider use of environmental accounts in decision making processes.

Figure 6.1: Relationship between basic and targeted accounts, linked by land use functions



6.1 The Use of Land Cover by Functions

Table 6.1 shows the Supply & Use of Land Cover Resource by Land Use Functions. This describes the use of land by the function and the way it expands or shrinks over the accounting period.

These changes may result in formation of a new land cover, e.g. the expansion of farming resulting in Conversion of land to agriculture. But it is not always the case and the change in the area of a function may take place without any modification of land cover. For example, the expansion of cattle husbandry may as well simply use "CLC321 Natural pasture" without any land cover change (at least, during the accounting period). More generally, the possible multiple uses of a given land cover requires a separate accounting of changes in use that does not result in the formation of a new cover. Extensive Tourism (e.g. camping in forests) does not lead to major changes in cover. The new protection of a forest (an extension of the Use Function "Nature protection") does not generate loss of forests, although it may have consequences on the function "Forestry". Consequently, the total allocation of land to these functions is important in environmental and economic assessment and in policy making, in particular when multiple uses result in possible conflicts of use.

The basic equation of the Supply & Use of Land Cover Resource by Land Use Functions (Figure 6.1) is:

Initial surface
+ Net Formation of Land Cover by Use
+ Net Extension of Use without Formation of Cover
= Final surface

This equation is valid for each individual function. When addressing several functions, overlaps generally happen due to possible multiple uses. Therefore, an additional column is necessary to adjust the total by deducing the multiple uses and maintain a formal identity between the sum total of land use and of land cover.

This last point is disputable when considering the Change in Use without Formation of Cover. As long as the total surface depends on the number of functions identified, it seams reasonable not to present results for this total. However, the land used by each individual function is presented and can always be added to others for specific analysis.

Figure 6.1: Supply & Use of Land Cover Resource by Land Use Functions

	Supply & Use of Land Cover Resource by Land Use Functions	UF1 Residential, incl. services	UF2 Commercial	UF3 Transport	UF4 Industrial production	UF5 Energy production	UF6 Mining & quarrying	UF7 Waste dumping	UF8 Water management	UF9 Farming, food production	UF10 Forestry	UF11 **Recreation & Tourism**	UF12 Nature conservation	UF13 Other uses	*ADJUSTMENT FOR MULTIPLE USES*	TOTAL
Initial surface																
1	Artificial surfaces															
2.1+2.2	*Arable Land & Permanent Crops*															
2.3+2.4	*Pastures & Mixed agricultural areas*															
3.1	*Forests*															
3.2+3.3	*Shrub and other semi-natural land*															
4	Wetlands															
5	Water bodies															
A - TOTAL INITIAL SURFACE ~1975																
Net Formation of Land Cover by Use																
LCF1	Urban land management															
LCF2	Urban sprawl															
LCF3	Extension of economic sites and infrastructures															
LCF4	Agricultural rotation and intensification															
LCF5	Conversion of land to agriculture															
LCF6	Forests creation and management															
LCF7	Water body creation and management															
LCF8	Changes of Land Cover due to natural and multiple causes															
B - TOTAL Net Formation of Land Cover																**0**
Net Extension of Use without Formation of Cover																
1	Artificial surfaces															
2.1+2.2	*Arable Land & Permanent Crops*															
2.3+2.4	*Pastures & Mixed agricultural areas*															
3.1	*Forests*															
3.2+3.3	*Shrub and other semi-natural land*															
4	Wetlands															
5	Water bodies															
C - TOTAL Net Extension of Use without Formation of Cover																
Final Surface																
1	Artificial surfaces															
2.1+2.2	*Arable Land & Permanent Crops*															
2.3+2.4	*Pastures & Mixed agricultural areas*															
3.1	*Forests*															
3.2+3.3	*Shrub and other semi-natural land*															
4	Wetlands															
5	Water bodies															
D - TOTAL FINAL SURFACE ~1990 (D = A+B+C)																

As suggested by the column of Recreation and Tourism, the functions can be in turn detailed for analytical purpose. It corresponds to the concept of "Targeted Accounts" introduced earlier in the report. These accounts present, first, details of land cover flows related to specific zones, landscape types, and environmental issues. Second, they organise the information on a given function in the framework of Accounts of Land Use Functions.

6.2 Framework of a targeted account for Tourism

In the pilot studies on the feasibility of LEAC with Corine Land Cover, 2 issues have been identified for tests: Tourism on the coastal zone and Forestry for the Czech Republic. The second test is presently carried out by GISAT.

In the case of Tourism, the test has been twofold: methodology and statistical implementation. Due to difficulties in collecting statistics, the methodological framework has not been tested and has to be considered as a very preliminary proposal. However, it shows clearly how the various sub accounts match and what is the interest in bridging them together.

Table 6.1 Land Use functions of Tourism

- *Housing & accommodation of tourists*
- *Hotels and similar*
- *Tourist campsites*
- *Holiday dwellings and other collective accommodation*
- *Second homes*
- *Accommodation by family and friends*
- *Transport of Tourists*
- *Shopping and retauration areas*
- *Airports in Tourism areas*
- *Other airports*
- *Specific transport infrastructure of Tourism areas*
- *General transport infrastructure*
- *Organised recreation*
- *Recreation parks and resorts*
- *Marinas*
- *Golf courses and other sport grounds*
- *Countryside recreation*

First, a classification of sub-functions has been established for Tourism. This classification takes into account the categories commonly used in Tourism statistics and Indicators (Table 6.1)

The framework is composed of 5 accounts:

- Supply & Use of Land Cover Resource for Recreation & Tourism
- Population Account of Tourism areas (no. of persons)
- Supply & Use of Water in tourist areas (to be detailed), Quarterly accounts
- Tourism and Nature: Tranquillity Accounts (to be detailed)
- Tourism economic accounts (satellite account)
    - Account of specific tourism parameters (physical units)
    - Expenditures of the tourists (in €)
    - Investments in tourist areas (in €)
    - Tourism Balance of Payments (in €)

Their linkage is presented in Figure 6.2 to 6.6.

The account of Supply & Use of cover (Figure 6.2) details Recreation and Tourism by sub-functions. A column for adjustment of multiple accounts is incorporated in order to have totals equal to the specific column of Recreation & Tourism.

Figure 6.2 Supply & Use of Land Cover Resource for Recreation & Tourism

	Supply & Use of Land Cover Resource for Recreation & Tourism	Housing & accomodation of tourists						Transport of tourists				Organised recreation			Countryside recreation		Site seeing		ADJUSTMENT FOR MULTIPLE USES	TOTAL
		Hotels and similar	Tourist campsites	Holiday dwellings and other collective accomodation	Second homes	Accomodation by family and friends	Shoping and retauration areas	Airports in Tourism areas	Other airports	Specific transport infrastructure of Tourism areas	General transport infrastructure	Recreation parks and resorts	Marinas	Golf courses and other sport grounds	Rest and excursion	Fishing and hunting	Cultural sites	Natural sites		
Initial surface																				
1	Artificial surfaces																			
2.1+2.2	*Arable Land & Permanent Crops*																			
2.3+2.4	*Pastures & Mixed agricultural areas*																			
3.1	*Forests*																			
3.2+3.3	*Shrub and other semi-natural land*																			
4	Wetlands																			
5	Water bodies																			
A - TOTAL INITIAL SURFACE ~1975																				
Net Formation of Land Cover by Use																				
LCF1	Urban land management																			
LCF2	Urban sprawl																			
LCF3	Extension of economic sites and infrastructures																			
LCF4	Agricultural rotation and intensification																			
LCF5	Conversion of land to agriculture																			
LCF6	Forests creation and management																			
LCF7	Water body creation and management																			
LCF8	Changes of Land Cover due to natural and multiple causes																			
B - TOTAL Net Formation of Land Cover																				**0**
Net Extension of Use without Formation of Cover																				
1	Artificial surfaces																			
2.1+2.2	*Arable Land & Permanent Crops*																			
2.3+2.4	*Pastures & Mixed agricultural areas*																			
3.1	*Forests*																			
3.2+3.3	*Shrub and other semi-natural land*																			
4	Wetlands																			
5	Water bodies																			
C - TOTAL Net Extension of Use without Formation of Cover																				
Final Surface																				
1	Artificial surfaces																			
2.1+2.2	*Arable Land & Permanent Crops*																			
2.3+2.4	*Pastures & Mixed agricultural areas*																			
3.1	*Forests*																			
3.2+3.3	*Shrub and other semi-natural land*																			
4	Wetlands																			
5	Water bodies																			
D - TOTAL FINAL SURFACE ~1990 (D = A+B+C)																				

Figure 6.3 Population Account of Tourism areas (number of persons)

	Population Account of Tourism areas (nb of persons and equivalent calculated from night spent in hotels, campings, secondary homes…) - Monthly account, Maximum (& Average)	Housing & accomodation of tourists						Transport of tourists				Organised recreation			Countryside recreation		Site seeing		ADJUSTMENT FOR MULTIPLE USES	TOTAL
		Hotels and similar	Tourist campsites	Holiday dwellings and other collective accomodation	Second homes	Accomodation by family and friends	Shoping and retauration areas	Airports in Tourism areas	Other airports	Specific transport infrastructure of Tourism areas	General transport infrastructure	Recreation parks and resorts	Marinas	Golf courses and other sport grounds	Rest and excursion	Fishing and hunting	Cultural sites	Natural sites		
a	**Permanent population, year T1**																			
b	**Maximum Tourists Frequentation, T1**																			
b1	*Tourists Frequentation year T1/ M 1*																			
b2	*Tourists Frequentation year T1/ M 2*																			
b3	*Tourists Frequentation year T1/ M …*																			
b4	*Tourists Frequentation year T1/ M 12*																			
c	**Maximum Cumulated Population of the Area, T1 (= a+b)**																			
c1	*Cumulated Population of the Area, T1/ M 1*																			
c2	*Cumulated Population of the Area, T1/ M 2*																			
c3	*Cumulated Population of the Area, T1/ M …*																			
c4	*Cumulated Population of the Area, T1/ M 12*																			
d	**Net change in permanent population**																			
e	**Net change in Tourists Frequentation in Maximum M**																			
e1	*Net change in Tourists Frequentation M 1*																			
e2	*Net change in Tourists Frequentation M 2*																			
e3	*Net change in Tourists Frequentation M …*																			
e4	*Net change in Tourists Frequentation M 12*																			
f	**Net Change in Max. Cumulated Population (=d+e)**																			
f1	*Net change in Cumulated Population of the Area, T1/ M 1*																			
f2	*Net change in Cumulated Population of the Area, T1/ M 2*																			
f3	*Net change in Cumulated Population of the Area, T1/ M …*																			
f4	*Net change in Cumulated Population of the Area, T1/ M 12*																			
g	**Permanent population, year T2**																			
h	**Maximum Tourists Frequentation, T2**																			
h1	*Tourists Frequentation year T2/ M 1*																			
h2	*Tourists Frequentation year T2/ M 2*																			
h3	*Tourists Frequentation year T2/ M …*																			
h4	*Tourists Frequentation year T2/ M 12*																			
i	**Maximum Cumulated Population of the Area, T2 (= a+b)**																			
i1	*Cumulated Population of the Area, T2/ M 1*																			
i2	*Cumulated Population of the Area, T2/ M 2*																			
i3	*Cumulated Population of the Area, T2/ M …*																			
i4	*Cumulated Population of the Area, T2/ M 12*																			

The Population account (Figure 6.3) aims at measuring the total pressure in each Tourist zone. A distinction is made between the permanent and seasonal populations. The total of the two is the Maximum Cumulated Population of the Area. The assessment of the seasonal population needs to be discussed further. As long as the intensity matters, even if limited in time, a maximum value could be preferred to an average value (although the two might easily be presented in the same table). If an exhaustive statistic of visitor frequency is not available, the tourist pressure might be assessed by the arrivals in the area. This probably makes sense if the period of time is not too long, maybe a month (or the maximum month in the quarter or in the year). This question has to be discussed further, bearing in mind feasibility and issues of the availability of data.

Figure 6.4 Supply & Use of Water in tourist areas (to be detailed), Quarterly accounts

	Housing & accomodation of tourists						Transport of tourists				Organised recreation			Countryside recreation		Site seeing			
Supply & Use of Water in tourist areas (to be detailed), Quarterly accounts	Hotels and similar	Tourist campsites	Holiday dwellings and other collective accomodation	Second homes	Accomodation by family and friends	Shoping and retauration areas	Airports in Tourism areas	Other airports	Specific transport infrastructure of Tourism areas	General transport infrastructure	Recreation parks and resorts	Marinas	Golf courses and other sport grounds	Rest and excursion	Fishing and hunting	Cultural sites	Natural sites	ADJUSTMENT FOR MILTIPLE USES	TOTAL
Total supply of water to tourist uses																			
Total return of waste water from tourist use																			
to sewerage																			
to the natural environment																			
Evapotranspiration related to tourism																			
irrigation of gardens, parks, golf courses																			
other																			

The account of Supply & Use of Water in tourist areas aims at identifying possible stress (and even water shortages). As in the population account, it needs to be set up on a seasonal basis.

Figure 6.5 Tourism and Nature: Tranquillity Accounts (to be detailed)

	Housing & accomodation of tourists						Transport of tourists				Organised recreation			Countryside recreation		Site seeing			
Tourism and Nature: Tranquillity Accounts (to be detailed)	Hotels and similar	Tourist campsites	Holiday dwellings and other collective accomodation	Second homes	Accomodation by family and friends	Shoping and retauration areas	Airports in Tourism areas	Other airports	Specific transport infrastructure of Tourism areas	General transport infrastructure	Recreation parks and resorts	Marinas	Golf courses and other sport grounds	Rest and excursion	Fishing and hunting	Cultural sites	Natural sites	ADJUSTMENT FOR MILTIPLE USES	TOTAL
Consumption of high nature value areas related to tourism																			
Noisy areas in the proximity of zones of tourist activity																			
Noisy areas in the proximity of roads, seasonal transport																			
Frequentation of natural areas by tourists																			

Extent of 'Nature' is an attraction for tourists. It can turn to be a severe cause of damage to the natural environment due to urban sprawl as well as to transport and even walks and the subsequent noise disturbing wildlife. A summary account could capture the main aspects of this important issue.

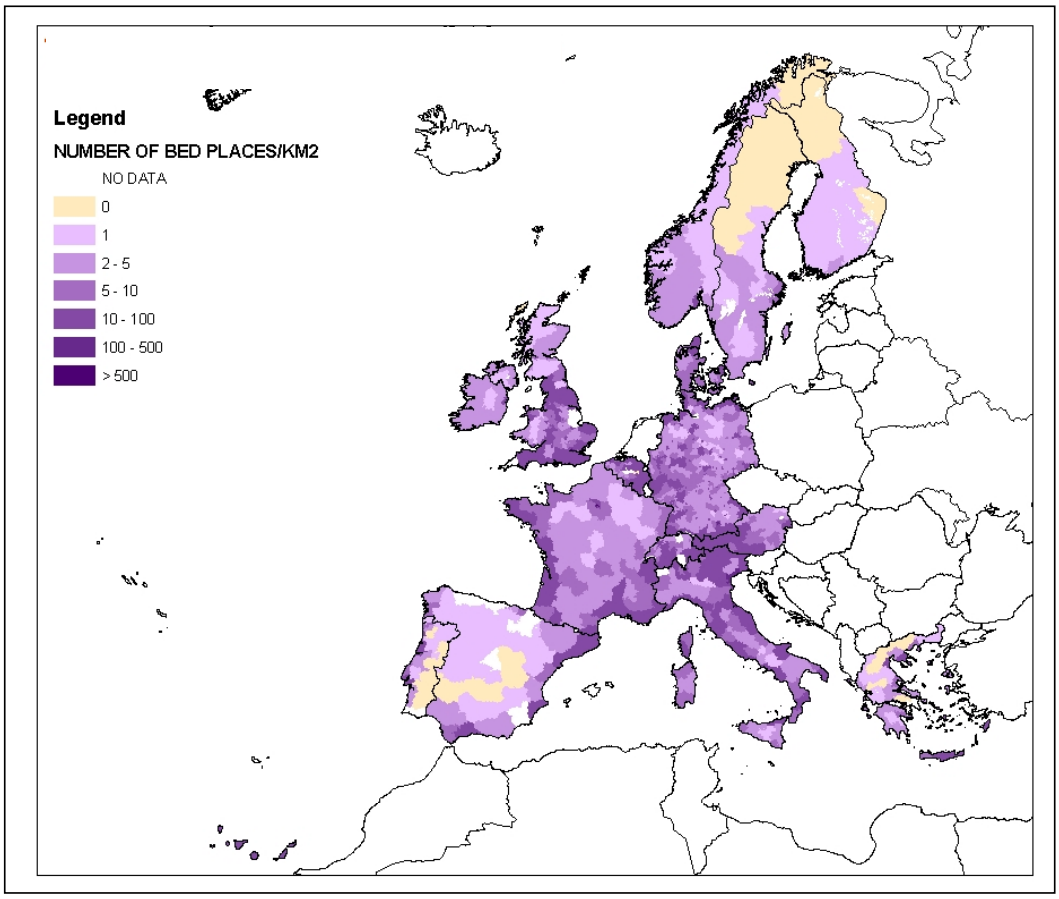
Figure 6.6 Tourism economic accounts (satellite account)

	Tourism economic accounts (satellite account)	Housing & accomodation of tourists						Transport of tourists				Organised recreation			Countryside recreation		Site seeing		ADJUSTMENT FOR MULTIPLE USES	TOTAL
		Hotels and similar	Tourist campsites	Holiday dwellings and other collective accomodation	Second homes	Accomodation by family and friends	Shoping and retauration areas	Airports in Tourism areas	Other airports	Specific transport infrastructure of Tourism areas	General transport infrastructure	Recreation parks and resorts	Marinas	Golf courses and other sport grounds	Rest and excursion	Fishing and hunting	Cultural sites	Natural sites		
	Account of specific tourism parameters (physical units)																			
	Employment in the tourist sector																			
	Hotels and similar establishments (nb)																			
	Bedrooms (nb)																			
	Bed places (nb)																			
	Night spent/ non-redidents																			
	Night spent/ redidents																			
	Expenditures of the tourists (in €)																			
	Hotel & other accomodations																			
	Fictitious rent																			
	Fictitious rent of owners of second homes																			
	Free accomodation																			
	Restaurant services																			
	Transport																			
	Leisure, entertainment																			
	Tour operators services																			
	Food																			
	Other consumption																			
	Investments in tourist areas (in €)																			
	Dwellings																			
	Other Buildings																			
	Urban infrastructure																			
	Transport infrastructure																			
	Other investments																			
	Tourist balance of payments (in €)																			
	Tourist Expenditure of non-residents in the EU/country/region/tourist area																			
	Tourist Expenditure of EU/national residents outside EU/abroad																			

The Tourism Economic Account exists or under development in 8 EU countries and its main features are commonly surveyed in tourism statistics. It is a "satellite account" of the National Accounts. The purpose in LEAC is to bridge this account to the Tourism functions.

Although in designing of the framework attention has been paid to existing data sources, it was not possible at this stage to compute accounts for the project on coasts. The reasons are basically linked to the availability of Tourism statistics at the European level for NUTS2 and NUTS3 regions only (see Annex). In addition, NUTS3 data are only available for most countries from 1990 onwards. It was, therefore difficult to match the statistics with the narrow coastal strip as well as with the period of LaCoast. Things will be easier for the recent period when CLC will be updated for 2000. In addition, the possibility of using tourism statistics in the context of LEAC will be higher for the whole Europe, as shown with the map of "Tourism intensity" computed by the ETCTE.

Figure 6.7: Tourism intensity in Europe, ~1999, bed-places / km²



(NB: Data for Nl are available at NUTS2 only; considering their size, they will be integrated in the database as quasi-NUTS3 and the map will be reprocessed accordingly).

An attempt has been made to use NUTS2 statistics available from 1980 to calculate changes in "tourism intensity" for coastal regions and have a rough idea of the possible linkage with indicators of intensity of land cover. It was unfortunately not possible due to a mix of difficulties linked to the incompleteness of the database for many regions, problems of aggregation of small and large regions in the calculation of the indicator and possible other inconsistencies. This idea was therefore abandoned.

Solutions to overcome the real difficulty of using Tourism statistics in an environmental perspective are discussed in the last Part of this report.

7. Discussion of results, limitation of the study and implications for further work

The analysis of the data has shown a number of gaps in available data sources.

First, Lacoast 1975, clearly has to be completed for the countries or regions not currently available. The problem of the maritime accession countries (except Romania) will therefore have to be examined. A step in this direction will be achieved in the context of the Eurosion project, which is expected to deliver missing elements for the EU coast. In addition, some revisions are still necessary, in particular due to some problems of limited geometry.

Conversely, the forthcoming CLC2000 will deliver a 3rd temporal snapshot of land cover in the coast zone. The full implementation is expected for 2004, and this will make it possibile to cover the coastal zone on a geographical basis, in line with the first ICZM report and the recommendations of the IndiLac project of the EEA's former ETCLC. The final revision of CLC1975 will have probably to be made when integrating 1990 and 2000, to have a consistent database. This database will have to take into consideration the updating of Corine Coastal Erosion presently ongoing within Eurosion. The results provide a single, unique coastline, a common definition and location of the estuaries and deltas (little needs to be done on this specific point) and some geomorphological attributes for the coastal units. It is also expected that a more precise DEM will be available and this will help to give a more precise definition of the coastal units. When this information will be available, a second generation of LEAC basic accounts for the EU coast will be possible.

Other types of data have been missing for the full development of LEAC. For example, a Nature targeted account was envisaged, starting from a database on protected sites used for 2 purposes:

- To give an attribute of "natural value" to the CLC forest and natural areas
- To establish an account of the sites disturbed by the noise of human activities (including tourism)

Neither has been possible due to the difficulty to access the Natura2000 database at the date of the completion of the report.

Considering the issue of Tourism, limitations of the accounting approach have been mentioned above. Probably, they will not be solved in the near future. Therefore, it may be necessary to collect local statistics on tourism the National or even Local levels. This is not an easy task and perhaps it should be combined with other more simple ways to get useful information. One possibility is to apportion the regional statistics to local parameters. The urban areas of CLC have been used in this respect for population statistics. In the case of Tourism, we propose to use the Postal Address Files, such as those available in the UK, to calculate the number of Hotels, tourist dwellings, campsites, restaurants, clubs, etc… and the proportion of the tourist infrastructure within the coastal zone. Other sources of information can be combined if necessary, for example, the comparison of the light observed at night on the coast by a satellite in winter and in summer (this methodology being probably restricted to the South of Europe).

An additional problem with local statistics is the difficulty of exchanging and disseminating the data in a geographic format (by NUTS5) because of problems of copyright. This is a serious shortcoming, considering the many groups of researchers and organisations involved. A solution presently discussed would be to use a unique km grid for Europe. The advantages are many, from the storage of local information to the facility of overlays and multi-variate studies. Solutions to these issues could come from the Inspire Project of the European Commission, which has identified the gaps and difficulties in the use of geographical information.

In the near future, LEAC will benefit from the study carried out by GISAT/Prague for the “4 countries”. The targeted accounts will address forestry issue.

In the longer term, three additional ways of development the accounting approach can be envisaged.

The first one is the compilation of targeted accounts for new functions. Possibilites include “Nature protection”, “Farming, food production”, “Water management”, “Residential” and “Transport”.

A second way relates to the local and/or regional levels, if LEAC are considered relevant for them. The implementation can made on a systematic basis or, more probably, for selected areas belonging to a common network with similar interests. Such networks do exist along the coast and could be interested, in order to have comparable data. Of course, in this case, the framework of LEAC should be adapted to the local scale in terms of specification and identification of users needs.

The final way to develop LEAC is for scenario development. Two aspects are to be considered. The first is the structured dataset of accounts presenting consistent flows of changes. All or part of them can be used as an input to modelling. In addition, the spatial analysis techniques used for defining the Land Analytical and Reporting Units can be used as well in the perspective of scenarios in which the influence, the access or the attractiveness are important parameters. In addition, the representation of the European landscape can be used in other types of modelling in order to assess potential impacts of scenarios of urban or transport development or scenarios of impacts of the CAP on the most natural territories (for example). This point has to be considered in particular in the development of scenarios at the EEA as well as in programme such as ESPON, of DG REGIO and modelling activities in the JRC (fires, storms and floods). Last, considering the coastal zone, the accounts can contribute in assessing the impacts of scenarios of climate change, in order to identify which areas will be the more impacted and in which way. These scenarios are developed in various arenas, and some of them will be proposed in the context of the Eurosion project of DG ENV.

ANNEXES

ANNEXES

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Nomenclature of Land Cover Flows
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ANNEX 9: Availability of Regional Tourism Statistics at the European level

ANNEX 1 - Nomenclatures

CORINE Land Cover nomenclature, Levels 1, 2, 3.

1. Artificial surfaces
    - 1.1 Urban fabric
        - *1.1.1 Continuous urban fabric*
        - *1.1.2 Discontinuous urban fabric*
    - 1.2 Industrial, commercial and transport units
        - *1.2.1 Industrial or commercial units*
        - *1.2.2 Road and rail networks and associated land*
        - *1.2.3 Port areas*
        - *1.2.4 Airports*
    - 1.3 Mines, dump and construction sites
        - *1.3.1 Mineral extraction sites*
        - *1.3.2 Dump sites*
        - *1.3.3 Construction sites*
    - 1.4 Artificial non-agricultural vegetated areas
        - *1.4.1 Green urban areas*
        - *1.4.2 Sport and leisure facilities*
2 Agricultural areas
    - 2.1 Arable Land
        - *2.1.1 Non-irrigated arable land*
        - *2.1.2 Permanently irrigated land*
        - *2.1.3 Rice fields*
    - 2.2 Permanent Crops
        - *2.2.1 Vineyards*
        - *2.2.2 Fruit trees and berry plantations*
        - *2.2.3 Olive groves*
    - 2.3 Pastures
        - *2.3.1 Pastures*
    - 2.4 Heterogeneous agricultural areas
        - *2.4.1 Annual crops associated with permanent crops*
        - *2.4.2 Complex cultivation patterns*
        - *2.4.3 Agriculture land with significant areas of natural vegetation*
        - *2.4.4 Agro-forestry areas*
3 Forests and semi-natural areas
    - 3.1 Forests
        - *3.1.1 Broad-leaved forest*
        - *3.1.2 Coniferous forest*
        - *3.1.3 Mixed forest*
    - 3.2 Shrub and/or herbaceous vegetation associations
        - *3.2.1 Natural grassland*
        - *3.2.2 Moors and heathland*
        - *3.2.3 Sclerophyllous vegetation*
        - *3.2.4 Transitional woodland shrub*

3.3 Open spaces with little or no vegetation
3.3.1 Beaches, dunes and sand plains
3.3.2 Bare rock
3.3.3 Sparsely vegetated areas
3.3.4 Burnt areas
3.3.5 Glaciers and perpetual snow

4 Wetlands
4.1 Inland wetlands
411 Inland marshes
412 Peat bogs
4.2 Coastal wetlands
421 Salt marshes
422 Salines
423 Intertidal flats

5 Water bodies
5.1 Inland waters
511 Water courses
512 Water bodies
5.2 Coastal waters
521 Coastal lagoons
522 Estuaries
523 Sea and ocean

CORINE Land Cover Aggregated nomenclature used in LEAC

1	Artificial surfaces
2.1+2.2	Arable Land & Permanent Crops
2.3+2.4	Pastures & Mixed agricultural areas
3.1	Forests
3.2+3.3	Shrub and other semi-natural land
4	Wetlands
5	Water bodies

Nomenclature of Land Cover Flows

LCF1 Urban land management
- LCF11 Urban development/ infilling
- LCF12 Developed land recycling
- LCF13 Development of green urban areas

LCF2 Urban sprawl
- LCF21 Urban continuous sprawl
- LCF22 Urban diffuse sprawl

LCF3 Extension of economic sites and infrastructures
- LCF31 Extension of industrial & commercial sites
- LCF32 Extension of transport networks
- LCF33 Extension of habours
- LCF34 Extension of airports
- LCF35 Extension of mines and quarrying areas
- LCF36 Extension of dumpsites
- LCF37 Construction
- LCF38 Extension of sport and leisure facilities

LCF4 Agricultural rotation and intensification
- LCF41 Recent extension of pasture, fallow land, set aside
- LCF42 Planting of vineyards, fruit and olive trees over arable & pasture
- LCF43 Rotation of annual crops
- LCF44 Rotation of permanent crops
- LCF45 Intensification of agriculture

LCF5 Conversion of land to agriculture
- LCF51 Intensive conversion of forest to agriculture
- LCF52 Intensive conversion of marginal land to agriculture
- LCF53 Diffuse conversion of forest to agriculture
- LCF54 Diffuse conversion of marginal land to agriculture
- LCF55 Conversion of wetlands to agriculture
- LCF56 Conversion of developed areas to agriculture

LCF6 Forests creation and management
- LCF61 Forests creation
- LCF62 Forests rotation
- LCF63 Recent felling and transition

LCF7 Water body creation and management
- LCF71 Water body creation
- LCF72 Water body management

LCF8 Changes of Land Cover due to natural and multiple causes
- LCF81 Semi-natural creation
- LCF82 Semi-natural rotation
- LCF83 Farmland abandonment without significant woodland creation
- LCF84 Farmland abandonment with woodland creation
- LCF85 Other land abandonment (other than farmland)
- LCF86 Forests and shrubs fires
- LCF87 Coastal erosion
- LCF88 Impacts of storms, floods…
- LCF89 Other changes and unknown

Nomenclature of Land Units

A - Analytical Units
Administrative Units (NUTS5, NUTS3…)
Geographic regions
    Geo-physical regions (river basins, mountains areas…)
    Ecological or bio-geographic regions (DMEER…)
    Other
Land Analytical Units (produced by spatial analysis)
Geometric Units
    Grids
    Buffers

B - Reporting Units
Administrative Regions (NUTS2, NUTS3), Countries
Geo-physical regions (river basins, sea catchments, mountains areas…)
Bio-geographic regions
Geographic Sectors (grouping of LAU or Geometric Units according to proximity or according to Landscape Types)

Nomenclature of Landscape Types used in LEAC

A1 Urban dense areas
A2 Dispersed urban areas
B1 Broad pattern intensive agriculture
B2 Composite rural landscape
    B21 Lowland composite rural landscape
    B22 Upland composite rural landscape
C1 Forested landscape
    C11 Lowland forested landscape
    C12 Upland forested landscape
C2 Open semi-natural or natural landscape
    C21 Lowland open semi-natural or natural landscape
    C22 Upland open semi-natural or natural landscape
C3 Landscape with no dominant land cover character
    C31 Lowland with no dominant land cover character
    C32 Upland with no dominant land cover character

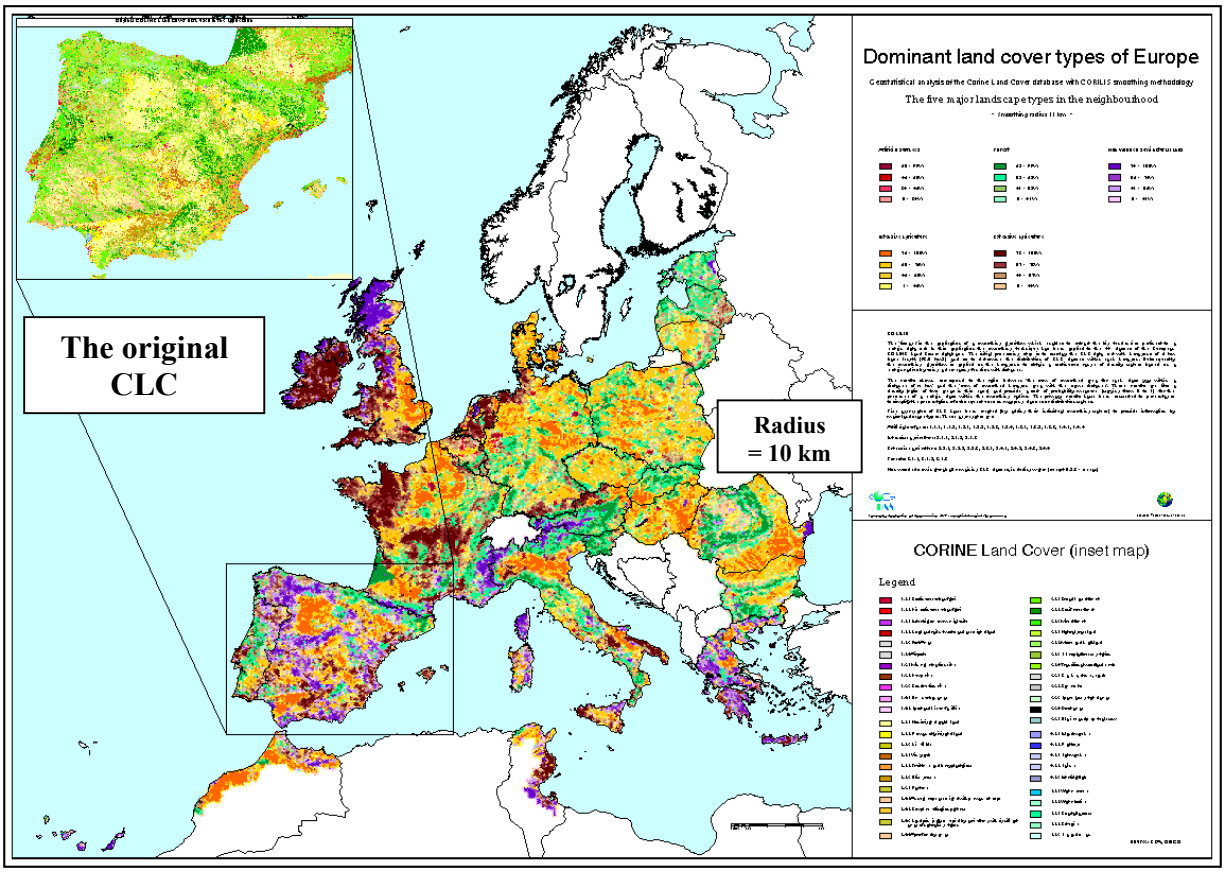
Nomenclature of Land Use Functions proposed for LEAC

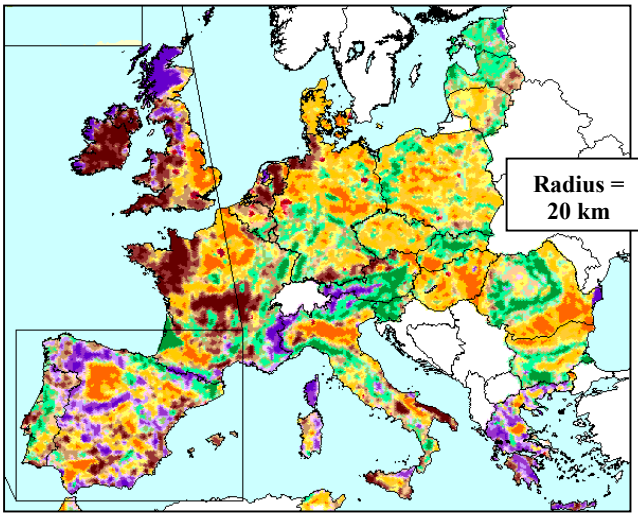
UF1 Residential, incl. services
UF2 Commercial
UF3 Transport
UF4 Industrial production
UF5 Energy production
UF6 Mining & quarrying
UF7 Waste dumping
UF8 Water management
UF9 Farming, food production
UF10 Forestry
UF11 Recreation & Tourism
UF12 Nature conservation
UF13 Other uses

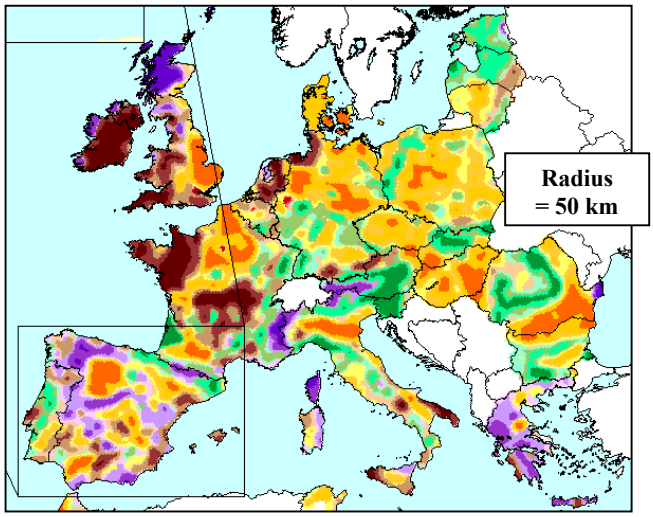
Land Use functions of Tourism proposed for LEAC

- Housing & accommodation of tourists
  - *Hotels and similar*
  - *Tourist campsites*
  - *Holiday dwellings and other collective accommodation*
  - *Second homes*
  - *Accommodation by family and friends*
- Transport of Tourists
  - *Shopping and restaurant areas*
  - *Airports in Tourism areas*
  - *Other airports*
  - *Specific transport infrastructure of Tourism areas*
  - *General transport infrastructure*
- Organised recreation
  - *Recreation parks and resorts*
  - *Marinas*
  - *Golf courses and other sport grounds*
  - *Countryside recreation*

ANNEX 2: CORILIS: Comparison of various radiuses for smoothing Corine Land Cover







Test of CORILIS have been carried out by the EEA former Topic centre on Land Cover, IFEN and GIM being in charge of the project. The sensitivity of the results to the smoothing radius chosen is a well known characteristic of the methodology, broadly used for spatial analysis (e.g. the Hypermap project). The 3 maps above are based on the selection of the most important land cover class in the grid. The intensity of the colour reflects the CORILIS value of the given class. After comparison of the test-maps it has been decided 1) to adopt for LEAC, in first instance, the radius of 20 km 2) to modify the rule of selection in order to given more emphasis to the Artificial them which is covering less land than other but which is far more impacting the environment. See **4.3 Definition of Land Accounting Units & Landscape types using CORILIS.**

ANNEX 3 - CORRESPONDANCE BETWEEN LAND COVER CHANGES (CLC LEVEL 3) AND THE LAND COVER FLOWS

FINAL YEAR ⇊ / INITIAL YEAR ⇉		111 Continuous urban fabric	112 Discontinuous urban fabric	121 Industrial or commercial units	122 Road and rail networks and associated land	123 Port areas	124 Airports	131 Mineral extraction sites	132 Dump sites	133 Construction sites	141 Green urban areas	142 Sport and leisure facilities	211 Non-irrigated arable land	212 Permanently irrigated land	213 Rice fields	221 Vineyards	222 Fruit trees and berry plantations	223 Olive groves	231 Pastures	241 Annual crops associated with permanent crops	242 Complex cultivation patterns	243 Land principally occupied by agriculture with significant areas of natural vegetation	244 Agro-forestry areas	311 Broad-leaved forest	312 Coniferous forest	313 Mixed forest	321 Natural grassland	322 Moors and heathland	323 Sclerophyllous vegetation	324 Transitional woodland shrub	331 Beaches, dunes and sand plains	332 Bare rock	333 Sparsely vegetated areas	334 Burnt areas	335 Glaciers and perpetual snow	411 Inland marshes	412 Peatbogs	421 Salt marshes	422 Salines	423 Intertidal flats	511 Water courses	512 Water bodies	521 Coastal lagoons	522 Estuaries	523 Sea and ocean
111	Continuous urban fabric		LCF12	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF61	LCF61	LCF61	LCF85	LCF85	LCF85	LCF85	LCF85	LCF85	LCF85	LCF86	NA	NA	NA	NA	NA	LCF87	LCF88	NA	NA	LCF87	LCF87
112	Discontinuous urban fabric	LCF11		LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF61	LCF61	LCF61	LCF85	LCF85	LCF85	LCF85	LCF85	LCF85	LCF85	LCF86	NA	NA	NA	NA	NA	LCF87	LCF88	NA	NA	LCF87	LCF87
121	Industrial or commercial units	LCF12	LCF12		LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF61	LCF61	LCF61	LCF85	LCF85	LCF85	LCF85	LCF85	LCF85	LCF86	NA	NA	NA	NA	NA	LCF87	LCF88	NA	NA	LCF87	LCF87
122	Road and rail networks and associated land	LCF12	LCF12	LCF31		LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF61	LCF61	LCF61	LCF85	LCF85	LCF85	LCF85	LCF85	LCF85	LCF86	NA	NA	NA	NA	NA	LCF87	LCF88	NA	NA	LCF87	LCF87
123	Port areas	LCF12	LCF12	LCF31	LCF32		LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF61	LCF61	LCF61	LCF85	LCF85	LCF85	LCF85	LCF85	LCF85	LCF86	NA	NA	NA	NA	NA	LCF87	LCF88	NA	NA	LCF87	LCF87
124	Airports	LCF12	LCF12	LCF31	LCF32	LCF33		LCF35	LCF36	LCF37	LCF13	LCF38	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF61	LCF61	LCF61	LCF85	LCF85	LCF85	LCF85	LCF85	LCF85	LCF86	NA	NA	NA	NA	NA	LCF87	LCF88	NA	NA	LCF87	LCF87
131	Mineral extraction sites	LCF12	LCF12	LCF31	LCF32	LCF33	LCF34		LCF36	LCF37	LCF13	LCF38	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF61	LCF61	LCF61	LCF85	LCF85	LCF85	LCF85	LCF85	LCF85	LCF86	NA	NA	NA	NA	NA	LCF87	LCF88	LCF71	LCF71	LCF87	LCF87
132	Dump sites	LCF12	LCF12	LCF31	LCF32	LCF33	LCF34	LCF35		LCF37	LCF13	LCF38	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF61	LCF61	LCF61	LCF85	LCF85	LCF85	LCF85	LCF85	LCF85	LCF86	NA	NA	NA	NA	NA	LCF87	LCF88	LCF71	NA	LCF87	LCF87
133	Construction sites	LCF12	LCF12	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36		LCF13	LCF38	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF61	LCF61	LCF61	LCF85	LCF85	LCF85	LCF85	LCF85	LCF85	LCF86	NA	NA	NA	NA	NA	LCF87	LCF88	LCF71	NA	LCF87	LCF87
141	Green urban areas	LCF11	LCF11	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37		LCF38	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF61	LCF61	LCF61	LCF85	LCF85	LCF85	LCF85	LCF85	LCF85	LCF86	NA	NA	NA	NA	NA	LCF87	LCF88	LCF71	NA	LCF87	LCF87
142	Sport and leisure facilities	LCF11	LCF11	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13		LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF56	LCF61	LCF61	LCF61	LCF85	LCF85	LCF85	LCF85	LCF85	LCF85	LCF86	NA	NA	NA	NA	NA	LCF87	LCF88	LCF71	NA	LCF87	LCF87
211	Non-irrigated arable land	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38		LCF45	LCF43	LCF42	LCF42	LCF42	LCF41	LCF42	LCF41	LCF83	LCF61	LCF61	LCF61	LCF61	LCF61	LCF83	LCF83	LCF83	LCF83	LCF83	LCF83	LCF86	NA	LCF89	LCF89	LCF89	LCF89	LCF87	LCF88	LCF71	NA	LCF87	LCF87
212	Permanently irrigated land	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF43		LCF43	LCF42	LCF42	LCF42	LCF41	LCF42	LCF41	LCF83	LCF61	LCF61	LCF61	LCF61	LCF61	LCF83	LCF83	LCF83	LCF83	LCF83	LCF83	LCF86	NA	LCF89	LCF89	LCF89	LCF89	LCF87	LCF88	LCF71	NA	LCF87	LCF87
213	Rice fields	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF43	LCF43		LCF42	LCF42	LCF42	LCF41	LCF42	LCF41	LCF83	LCF61	LCF61	LCF61	LCF61	LCF61	LCF83	LCF83	LCF83	LCF83	LCF83	LCF83	LCF86	NA	LCF83	LCF83	LCF83	LCF83	LCF87	LCF88	LCF71	LCF83	LCF87	LCF87
221	Vineyards	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF45	LCF45	LCF45		LCF44	LCF44	LCF41	LCF45	LCF45	LCF83	LCF61	LCF61	LCF61	LCF61	LCF61	LCF83	LCF83	LCF83	LCF83	LCF83	LCF83	LCF86	NA	LCF89	LCF89	LCF89	LCF89	LCF87	LCF88	LCF71	NA	LCF87	LCF87
222	Fruit trees and berry plantations	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF45	LCF45	LCF45	LCF44		LCF44	LCF41	LCF45	LCF45	LCF83	LCF61	LCF61	LCF61	LCF61	LCF61	LCF83	LCF83	LCF83	LCF83	LCF83	LCF83	LCF86	NA	LCF89	LCF89	LCF89	LCF89	LCF87	LCF88	LCF71	NA	LCF87	LCF87
223	Olive groves	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF45	LCF45	LCF45	LCF44	LCF44		LCF41	LCF45	LCF45	LCF83	LCF61	LCF61	LCF61	LCF61	LCF61	LCF83	LCF83	LCF83	LCF83	LCF83	LCF83	LCF86	NA	LCF89	LCF89	LCF89	LCF89	LCF87	LCF88	LCF71	NA	LCF87	LCF87
231	Pastures	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF45	LCF45	LCF45	LCF42	LCF42	LCF42		LCF45	LCF45	LCF83	LCF61	LCF84	LCF84	LCF84	LCF83	LCF83	LCF83	LCF83	LCF83	LCF83	LCF83	LCF86	NA	LCF81	LCF81	LCF81	LCF89	LCF87	LCF88	LCF71	NA	LCF87	LCF87
241	Annual crops associated with permanent crops	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF45	LCF45	LCF45	LCF42	LCF42	LCF42	LCF41		LCF41	LCF83	LCF61	LCF61	LCF61	LCF61	LCF61	LCF83	LCF83	LCF83	LCF83	LCF83	LCF83	LCF86	NA	LCF89	LCF89	LCF89	LCF89	LCF87	LCF88	LCF71	NA	LCF87	LCF87
242	Complex cultivation patterns	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF45	LCF45	LCF45	LCF42	LCF42	LCF42	LCF41	LCF45		LCF83	LCF61	LCF84	LCF84	LCF84	LCF83	LCF83	LCF83	LCF83	LCF83	LCF83	LCF83	LCF86	NA	LCF83	LCF81	LCF81	LCF89	LCF87	LCF88	LCF71	NA	LCF87	LCF87
243	Land principally occupied by agriculture with significant areas of natural vegetation	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF52	LCF52	LCF52	LCF52	LCF52	LCF52	LCF41	LCF52	LCF54		LCF54	LCF84	LCF84	LCF84	LCF83	LCF83	LCF83	LCF83	LCF83	LCF83	LCF83	LCF86	NA	LCF83	LCF81	LCF81	LCF89	LCF87	LCF88	LCF71	NA	LCF87	LCF87
244	Agro-forestry areas	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF45	LCF45	LCF45	LCF42	LCF42	LCF42	LCF41	LCF45	LCF45	LCF83		LCF84	LCF84	LCF84	LCF83	LCF83	LCF83	LCF83	LCF83	LCF83	LCF83	LCF86	NA	LCF83	LCF89	LCF89	LCF89	LCF87	LCF88	LCF71	NA	LCF87	LCF87
311	Broad-leaved forest	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF51	LCF51	LCF51	LCF51	LCF51	LCF51	LCF53	LCF51	LCF53	LCF53	LCF53		LCF62	LCF62	LCF63	LCF63	LCF63	LCF63	LCF63	LCF63	LCF63	LCF86	NA	LCF89	LCF89	LCF89	LCF89	LCF87	LCF88	LCF71	NA	LCF87	LCF87
312	Coniferous forest	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF51	LCF51	LCF51	LCF51	LCF51	LCF51	LCF53	LCF51	LCF53	LCF53	LCF53	LCF62		LCF62	LCF63	LCF63	LCF63	LCF63	LCF63	LCF63	LCF63	LCF86	NA	LCF89	LCF89	LCF89	LCF89	LCF87	LCF88	LCF71	NA	LCF87	LCF87
313	Mixed forest	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF51	LCF51	LCF51	LCF51	LCF51	LCF51	LCF53	LCF51	LCF53	LCF53	LCF53	LCF62	LCF62		LCF63	LCF63	LCF63	LCF63	LCF63	LCF63	LCF63	LCF86	NA	LCF89	LCF89	LCF89	LCF89	LCF87	LCF88	LCF71	NA	LCF87	LCF87
321	Natural grassland	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF52	LCF52	LCF52	LCF52	LCF52	LCF52	LCF41	LCF52	LCF54	LCF54	LCF54	LCF61	LCF61	LCF61		LCF82	LCF82	LCF82	LCF82	LCF82	LCF82	LCF86	NA	LCF82	LCF82	LCF82	LCF89	LCF87	LCF88	LCF71	NA	LCF87	LCF87
322	Moors and heathland	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF52	LCF52	LCF52	LCF52	LCF52	LCF52	LCF41	LCF52	LCF54	LCF54	LCF54	LCF61	LCF61	LCF61	LCF82		LCF82	LCF82	LCF82	LCF82	LCF82	LCF86	NA	LCF82	LCF82	LCF82	LCF89	LCF87	LCF88	LCF71	NA	LCF87	LCF87
323	Sclerophyllous vegetation	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF52	LCF52	LCF52	LCF52	LCF52	LCF52	LCF41	LCF52	LCF54	LCF54	LCF54	LCF61	LCF61	LCF61	LCF82	LCF82		LCF82	LCF82	LCF82	LCF82	LCF86	NA	LCF82	LCF82	LCF82	LCF89	LCF87	LCF88	LCF71	NA	LCF87	LCF87
324	Transitional woodland shrub	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF52	LCF52	LCF52	LCF52	LCF52	LCF52	LCF41	LCF52	LCF54	LCF54	LCF54	LCF61	LCF61	LCF61	LCF82	LCF82	LCF82		LCF82	LCF82	LCF82	LCF86	NA	LCF82	LCF82	LCF82	LCF89	LCF87	LCF88	LCF71	NA	LCF87	LCF87
331	Beaches, dunes and sand plains	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF52	LCF52	LCF52	LCF52	LCF52	LCF52	LCF41	LCF52	LCF54	LCF54	LCF54	LCF53	LCF61	LCF61	LCF82	LCF82	LCF82	LCF82		LCF82	LCF82	LCF86	NA	LCF82	LCF82	LCF82	LCF89	LCF87	LCF88	LCF71	NA	LCF87	LCF87
332	Bare rock	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF52	LCF52	LCF52	LCF52	LCF52	LCF52	LCF41	LCF52	LCF54	LCF54	LCF54	LCF53	LCF61	LCF61	LCF82	LCF82	LCF82	LCF82	LCF82		LCF82	LCF86	LCF82	NA	NA	NA	LCF89	LCF87	LCF88	LCF71	NA	LCF87	LCF87
333	Sparsely vegetated areas	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF52	LCF52	LCF52	LCF52	LCF52	LCF52	LCF41	LCF52	LCF54	LCF54	LCF54	LCF53	LCF61	LCF61	LCF82	LCF82	LCF82	LCF82	LCF82	LCF82		LCF86	LCF82	LCF82	LCF82	LCF82	LCF89	LCF87	LCF88	LCF71	NA	LCF87	LCF87
334	Burnt areas	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF52	LCF52	LCF52	LCF52	LCF52	LCF52	LCF41	LCF52	LCF54	LCF54	LCF54	LCF53	LCF61	LCF61	LCF81	LCF81	LCF81	LCF81	LCF81	LCF81	LCF81		NA	LCF81	LCF81	LCF81	LCF89	LCF87	LCF88	LCF71	NA	LCF87	LCF87
335	Glaciers and perpetual snow	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	LCF38	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	LCF89	LCF89	LCF89	NA		LCF82	LCF82	LCF82	LCF89	LCF87	LCF82	LCF82	NA	LCF89	LCF89
411	Inland marshes	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF61	LCF61	LCF61	LCF82	LCF82	LCF82	LCF82	LCF89	LCF89	LCF89	NA	NA		LCF82	LCF82	LCF89	LCF87	LCF88	LCF82	LCF82	LCF87	LCF87
412	Peatbogs	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF61	LCF61	LCF61	LCF82	LCF82	LCF82	LCF82	LCF89	LCF89	LCF89	LCF86	NA	LCF82		LCF82	LCF89	LCF87	LCF88	LCF82	LCF82	LCF87	LCF87
421	Salt marshes	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF61	LCF61	LCF61	LCF82	LCF82	LCF82	LCF82	LCF89	LCF89	LCF89	NA	NA	NA	LCF82		LCF89	LCF87	LCF88	LCF82	LCF82	LCF87	LCF87
422	Salines	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF61	LCF61	LCF61	LCF85	LCF85	LCF85	LCF85	LCF85	NA	LCF85	NA	NA	NA	NA	LCF85		LCF87	LCF88	LCF71	LCF85	LCF87	LCF87
423	Intertidal flats	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF61	LCF61	LCF61	NA	NA	NA	NA	LCF89	LCF87	LCF89	NA	NA	NA	LCF82	LCF82	LCF89		LCF88	LCF89	LCF87	LCF87	LCF87
511	Water courses	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF61	LCF61	LCF61	LCF89	LCF89	LCF89	LCF89	LCF89	LCF89	LCF89	NA	NA	LCF82	LCF82	LCF82	NA	NA		LCF82	LCF82	LCF87	LCF87
512	Water bodies	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF61	LCF61	LCF61	LCF89	LCF89	LCF89	LCF89	LCF89	LCF89	LCF89	NA	NA	LCF82	LCF82	LCF82	LCF89	LCF87	NA		NA	LCF87	LCF87
521	Coastal lagoons	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF61	LCF61	LCF61	LCF89	LCF89	LCF89	LCF89	LCF89	LCF89	LCF89	NA	NA	LCF82	LCF82	LCF82	LCF89	LCF87	NA	NA		LCF87	LCF87
522	Estuaries	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF61	LCF61	LCF61	LCF89	LCF89	LCF89	LCF89	LCF89	LCF89	LCF89	NA	NA	LCF82	LCF82	LCF82	LCF89	LCF87	NA	NA	LCF89		LCF87
523	Sea and ocean	LCF21	LCF22	LCF31	LCF32	LCF33	LCF34	LCF35	LCF36	LCF37	LCF13	LCF38	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF55	LCF61	LCF61	LCF61	LCF89	LCF89	LCF89	LCF89	LCF89	LCF89	LCF89	NA	NA	LCF82	LCF82	LCF82	LCF89	LCF89	NA	NA	LCF82	LCF82	

ANNEX 4 - MATRIX OF LAND COVER CHANGES 1975-1990; CLC Level 3 (Source: JRC, LaCoast)

FINAL YEAR ⇊ / INITIAL YEAR ⇉		111 Continuous urban fabric	112 Discontinuous urban fabric	121 Industrial or commercial units	122 Road and rail networks and associated land	123 Port areas	124 Airports	131 Mineral extraction sites	132 Dump sites	133 Construction sites	141 Green urban areas	142 Sport and leisure facilities	211 Non-irrigated arable land	212 Permanently irrigated land	213 Rice fields	221 Vineyards	222 Fruit trees and berry plantations	223 Olive groves	231 Pastures	241 Annual crops associated with permanent crops	242 Complex cultivation patterns	243 Land principally occupied by agriculture with significant areas of natural vegetation	244 Agro-forestry areas	311 Broad-leaved forest	312 Coniferous forest	313 Mixed forest	321 Natural grassland	322 Moors and heathland	323 Sclerophyllous vegetation	324 Transitional woodland shrub	331 Beaches, dunes and sand plains	332 Bare rock	333 Sparsely vegetated areas	334 Burnt areas	335 Glaciers and perpetual snow	411 Inland marshes	412 Peatbogs	421 Salt marshes	422 Salines	423 Intertidal flats	511 Water courses	512 Water bodies	521 Coastal lagoons	522 Estuaries	523 Sea and ocean	TOTAL INITIAL YEAR ~1975	*Increase (+)*	*Deacrease (-)*	*Net change in land cover*	TOTAL FINAL YEAR ~ 1990
111	Continuous urban fabric	200258	623	97	30	5		4		62	23	7	60	12		10	85	91		79	209	27			4	17	16	10	3	14			9										11	201757	26862	1499	25363	227120
112	Discontinuous urban fabric	8192	746828	632	19	14	5	8		440	29	124	497	32		206	247	513	36	45	2294	428		16	269	24	140		268	176	123		9					11	68			2		4	761699	104855	14871	89984	851683
121	Industrial or commercial units	217	142	109306	19	36		99	35	177		25	563		2	169	40	93	24	59	316	33		13	25	12	100		144	115	40		5			18		395			2	12			112236	30675	2930	27745	139981
122	Road and rail networks and associated land	16	6	9	10398	5				23																																1			10458	4313	60	4253	14711
123	Port areas	13	859	33	175	33164				20																		8			37							5		19				63	34396	5292	1232	4060	38456
124	Airports		177	8			31507						65					145	93	5	5	2632					4									19									34660	1928	3153	-1225	33435
131	Mineral extraction sites		44	103		2		23594	137	24		44	484	46		41	33	212	195		491	548	11	339	104	108	175	32	368	413	3	26	48							5	296				27926	12004	4332	7672	35598
132	Dump sites			21				38	4070								10		45	19						18	18									36									4275	3310	205	3105	7380
133	Construction sites	372	4202	1402	1207	605	288	34	94	15812		284	520	3		601	3	25	451		674	156	11	247	158	118	340	900	309	481						61		6	13			304		4	162	29847	10263	14035	-3772	26075
141	Green urban areas	43	135								21660	21									59						41			3															21962	801	302	499	22461
142	Sport and leisure facilities	46	264	36		79						45501	5						2		5							40		5								28							46011	7709	510	7199	53210
211	Non-irrigated arable land	2614	22218	6923	959	304	522	1787	132	1738	259	1435	4402411	14234	330	9906	4261	7318	32079	8463	64149	15443	476	1612	956	485	5553	269	5369	3503	637	657	860	121		677	9	3172	86	7	128	1038	251		44	4623395	280723	220984	59739	4683134
212	Permanently irrigated land	763	1459	1035	21	21	202	85		686		141	41212	355443	3680	1483	1733	100		3	39803	2011		71	115	100	674		565	167	2		518	107		230		10762			86	189	86	1		463554	74460	108111	-33651	429903
213	Rice fields			63									429	107	58288		127				333						614		25	20	129		2							87				60224	6169	1936	4233	64457
221	Vineyards	246	2444	231	58		22	274	8	72		117	5896	1070		383711	886	609	242	187	8973	1900	54	233	154	108	446	13	150	104	14	12	4			116		47				10				408411	34278	24700	9578	417989
222	Fruit trees and berry plantations	1334	3629	864	283			247					2106	1425		103	363666	1484	20	380	6142	756		207	15	301	456	19	640	191	148	27	303			79					22	22				384869	43590	21203	22387	407256
223	Olive groves	3392	2485	3048	88			1490		131			6862	587		1837	1847	777162	429	1120	16731	19874		1034	76	1111	879	39	21269	1049	12	56	54	197				6			436	21				863322	71595	86160	-14565	848757
231	Pastures	988	6419	1812	259	105	112	245	876	942	89	638	43592	573		799	184	954	1766204	486	39372	1808		1956	390	305	309	207	8	609	10		1			82	31	5	11	46		321	133		21	1870902	315870	104698	211172	2082074
241	Annual crops associated with permanent crops	919	695	386	100		122	166		164			1667	173		620	2676	1623	73	257656	2621	276		267	166	50	15	1		49	12			89							5				270591	21335	12935	8400	278991
242	Complex cultivation patterns	3735	28817	7120	330	316	200	2032	35	1110	178	1692	141925	20187	374	12406	23841	23199	268104	5486	2295560	24061	103	2695	1291	1604	2512	346	4760	1458	1063	121	343	260		319		1268	14	30	33	331	35		3	2879297	218804	583737	-364933	2514364
243	Land principally occupied by agriculture with significant areas of natural vegetation	1222	8828	1567	211	375	201	1145	73	539	35	1098	10243	8711	103	2991	2021	13674	7273	1896	17796	1384304	335	19257	3378	3978	4569	1001	12435	13086	275	162	1862	990		118	293	621	108	77	2	407	31		5	1527296	111107	142992	-31885	1495411
244	Agro-forestry areas	31	3	34				43		41			761			351	956	2148		514	2746	5882	78334	260	310	652	365		3270	516			514	280					17			56				98084	3626	19750	-16124	81960
311	Broad-leaved forest	188	758	242	3			305	13	29	48	13	2608	3994	45	58	96	3312	363	54	1424	3521	327	896732	2050	4953	2273	328	8855	25100	108	406	774	738		181		209	5		331	258				960702	97328	63970	33358	994060
312	Coniferous forest	163	5178	668	83	8	38	359	57	370		676	2112	1958		576	313	272	490	526	1516	1908	92	2798	954483	8090	2449	957	12266	15937	624	320	1373	3214			472	48	3		23	274	44		6	1020744	76730	66261	10469	1031213
313	Mixed forest	85	1130	502	192	11	5	155	43	6		63	674	1155		144	32	1622	343	102	1521	1667	108	22734	8229	657222	741	1333	4352	27473	553	96	572	1047			13				3				6	733934	100664	76712	23952	757886
321	Natural grassland	353	3543	1407	5	43		1065	182	153		124	8376	6757	90	799	1001	848	815	49	2301	4092	1093	2041	5117	2878	808399	2745	48073	8277	426	451	3861	1256		876		5652	47	6		124	22		23	923370	88061	114971	-26910	896460
322	Moors and heathland	27	1525	369	32	117	37	379	100	124	42	309	546			20		65	529		502	1054	29	607	3178	1434	7526	437608	10048	1888	216	180	953	260			37	143			2	22	34		99	470041	19997	32433	-12436	457605
323	Sclerophyllous vegetation	495	4632	337	54	55	37	935	137	895		391	2867	1349		329	572	5851		160	3406	13869	407	5545	15412	56535	29418	5725	1426609	76784	26	585	4843	8822		119		842	14			52	50		4	1668163	164419	241554	-77135	1591028
324	Transitional woodland shrub	656	2758	322	4	38		337	18	84	27	130	3051	1069		578	187	5639	1262	1089	2901	5945	489	31493	22035	14111	8339	1115	16333	577807	585	612	2951	1730		43	917	41			97	210	47		30	705080	189274	127273	62001	767081
331	Beaches, dunes and sand plains	399	762	83		281		200	329	104	10	29	1700	1316		214	1979	1424	595	364	1040	812		812	1494	375	309	323	344	4122	140601	5612	592			28	196	1492	300	3093	103	107	275	60	6419	178298	11220	37697	-26477	151821
332	Bare rock	34	287	1				4					19			2	19	36	59		9			134	104	441	605	117	781	119	43	67951	889	50												71704	10847	3753	7094	78798
333	Sparsely vegetated areas	293	550	470		28		434	78	89	20	182	627	9201			432	176	164	123	657	1191		2133	420	1142	14537	3309	9510	2838	299	1050	383050	1052		163		2308	11	15		475	100		23	437150	22136	54100	-31964	405186
334	Burnt areas												46					143	112	8	198	270	83	348	1917	1335	1126	775	3701	2039		331	336	7474												20242	20213	12768	7445	27687
335	Glaciers and perpetual snow																																																
411	Inland marshes		58	137	11	25	22	90	191	8		7	202	32					137	106	172	50		152	17	117			11	77		39	32			79324		1625			190	228	105		8	83173	5085	3849	1236	84409
412	Peatbogs		17										4	158					762			366		144	9278	108	1749	118		2549						487321	915				41			18	503548	1968	16227	-14259	489289
421	Salt marshes		79	300		16			501	881		130	489	199	1449	16			598		357	408		54			1295	102	395	39	603	93	305			884		185635	2691	1345	104	1065	10515	29551	787	240886	34454	55251	-20797	220089
422	Salines		23	94	31	4				64			40	33			9		154		16										11						514	67795				56				68844	3473	1049	2424	71268
423	Intertidal flats		1	146	47	210		13	224	722			33						303							146	198	79	7		3230		10			602		1092		521787		1797	188	4798	73467	609100	44478	87313	-42835	566265
511	Water courses			1		31					4	10	78		73			10		10	16	40		52	6	15		2		61	225							128			42045	1	77		8	42893	1346	848	498	43391
512	Water bodies			10		40		15		8		18	288	68	4			6	118		5	39	8	64	21	11	223	40	25	5	52					331		205				161067	290			162961	13462	1894	11568	174529
521	Coastal lagoons		6	8	3	23	14	16				1	62	9	19	12				2	26	11		10	9		42	7	54	3	91					30		2391	79	10	99	15	476247		347	479646	12765	3399	9366	489012
522	Estuaries			29		48							4									10			5		19		19	3	80		24					470	21	684	5			85718	12	87151	35252	1433	33819	120970
523	Sea and ocean	26	99	125	89	2447	101		47	557	37		10	2		7		3			18	19			27		27	18	22	9	1546		98			73		36	2	39165		5371	402	838	48485	99706	81570	51221	30349	130055
TOTAL FINAL YEAR ~ 1990		**227120**	**851683**	**139981**	**14711**	**38456**	**33435**	**35598**	**7380**	**26075**	**22461**	**53210**	**4683134**	**429903**	**64457**	**417989**	**407256**	**848757**	**2082074**	**278991**	**2514364**	**1495411**	**81960**	**994060**	**1031213**	**757886**	**896460**	**457605**	**1591028**	**767081**	**151821**	**78798**	**405186**	**27687**		**84409**	**489289**	**220089**	**71268**	**566265**	**43391**	**174529**	**489012**	**120970**	**130055**	**24302508**	**2424311**	**2424311**	**0**	**24302508**

ANNEX 5 a: ACCOUNT OF LAND COVER CHANGES 1975-1990 BY LANDSCAPE TYPES - CLC Level 3 - European coast, 1975-90, ha

Landscape types	A1 URBAN DENSE AREAS				A2 DISPERSED URBAN AREAS				B1 BROAD PATTERN INTENSIVE AGRICULTURE				B2 COMPOSITE RURAL LANDSCAPE				*B21 LOWLAND COMPOSITE RURAL LANDSCAPE*				*B22 UPLAND COMPOSITE RURAL LANDSCAPE*				C1 FORESTED LANDSCAPE				*C11 LOWLAND FORESTED LANDSCAPE*			
Land Cover (Corine Land Cover level 3)	1975	(-)	(+)	1990	1975	(-)	(+)	1990	1975	(-)	(+)	1990	1975	(-)	(+)	1990	1975	(-)	(+)	1990	1975	(-)	(+)	1990	1975	(-)	(+)	1990	1975	(-)	(+)	1990
1 Artificial surfaces	**443027**	**12312**	**54324**	**485039**	**356018**	**12798**	**67693**	**410913**	**82468**	**1805**	**10430**	**91093**	**142553**	**5289**	**28267**	**165531**	**94566**	**2995**	**16803**	**108374**	**47987**	**2294**	**11464**	**57157**	**32153**	**1842**	**6095**	**36406**	**20138**	**1290**	**4162**	**23010**
1.1 Urban fabric	*325499*	*3648*	*34695*	*356546*	*262659*	*6126*	*42433*	*298966*	*69491*	*1089*	*7041*	*75443*	*110746*	*2431*	*19661*	*127976*	*72787*	*1096*	*11884*	*83575*	*37959*	*1335*	*7777*	*44401*	*25466*	*887*	*3783*	*28362*	*15762*	*528*	*2426*	*17660*
111 Continuous urban fabric	82963	371	5297	87889	49524	674	7420	56270	6315	29	1067	7353	24054	128	6239	30165	14770	64	3068	17774	9284	64	3171	12391	5544	142	1243	6645	3534	97	676	4113
112 Discontinuous urban fabric	242536	3277	29398	268657	213135	5452	35013	242696	63176	1060	5974	68090	86692	2303	13422	97811	58017	1032	8816	65801	28675	1271	4606	32010	19922	745	2540	21717	12228	431	1750	13547
1.2 Industrial, commercial and transport units	*69674*	*2736*	*11057*	*77995*	*59733*	*1296*	*15107*	*73544*	*7458*	*134*	*2127*	*9451*	*18298*	*786*	*4390*	*21902*	*13074*	*438*	*2509*	*15145*	*5224*	*348*	*1881*	*6757*	*4304*	*565*	*1407*	*5146*	*3015*	*562*	*1019*	*3472*
121 Industrial or commercial units	40402	760	7087	46729	37572	539	12447	49480	4329	119	1606	5816	8961	443	3157	11675	6408	434	1699	7673	2553	9	1458	4002	3467	558	1052	3961	2575	558	823	2840
122 Road and rail networks and associated land	3605	47	1114	4672	3242	5	809	4046	145		138	283	1621		771	2392	1164		418	1582	457		353	810	226	4	306	528	169	4	147	312
123 Port areas	14269	438	2174	16005	10978	745	1557	11790	867	15	300	1152	2342	4	307	2645	2299	4	307	2602	43			43	271	3	20	288	219		20	239
124 Airports	11398	1491	682	10589	7941	7	294	8228	2117		83	2200	5374	339	155	5190	3203		85	3288	2171	339	70	1902	340		29	369	52		29	81
1.3 Mines, dump and construction sites	*18709*	*5585*	*6401*	*19525*	*16575*	*5059*	*7492*	*19008*	*1761*	*521*	*840*	*2080*	*6783*	*2044*	*3417*	*8156*	*3351*	*1442*	*1881*	*3790*	*3432*	*602*	*1536*	*4366*	*1405*	*388*	*475*	*1492*	*438*	*198*	*305*	*545*
131 Mineral extraction sites	5109	350	1799	6558	8803	1536	4065	11332	1252	71	502	1683	4385	727	1773	5431	1507	347	536	1696	2878	380	1237	3735	976	168	243	1051	188	48	98	238
132 Dump sites	1734	116	775	2393	1575	1	730	2304	29		44	73	386	14	777	1149	248	10	731	969	138	4	46	180	26		48	74	26		23	49
133 Construction sites	11866	5119	3827	10574	6197	3522	2697	5372	480	450	294	324	2012	1303	867	1576	1596	1085	614	1125	416	218	253	451	403	220	184	367	224	150	184	258
1.4 Artificial non-agricultural vegetated areas	*29145*	*343*	*2171*	*30973*	*17051*	*317*	*2661*	*19395*	*3758*	*61*	*422*	*4119*	*6726*	*28*	*799*	*7497*	*5354*	*19*	*529*	*5864*	*1372*	*9*	*270*	*1633*	*978*	*2*	*430*	*1406*	*923*	*2*	*412*	*1333*
141 Green urban areas	14067	155	260	14172	4910	125	388	5173	1142	21	73	1194	531		41	572	511		41	552	20			20	171			171	167			167
142 Sport and leisure facilities	15078	188	1911	16801	12141	192	2273	14222	2616	40	349	2925	6195	28	758	6925	4843	19	488	5312	1352	9	270	1613	807	2	430	1235	756	2	412	1166
2 Agricultural areas	**821134**	**90020**	**60736**	**791850**	**1797594**	**157032**	**113015**	**1753577**	**2238731**	**129559**	**126428**	**2235600**	**4010230**	**498908**	**474555**	**3985877**	**1877981**	**226712**	**215286**	**1866555**	**2132249**	**272196**	**259269**	**2119322**	**449870**	**44167**	**32357**	**438060**	**144107**	**10432**	**11206**	**144881**
2.1 Arable Land	276275	18931	17624	274968	853729	47808	40991	846912	1835931	80260	76569	1832240	568598	59061	79849	589386	337470	34329	38985	342126	231128	24732	40864	247260	90673	5728	9946	94891	46975	3587	5515	48903
211 Non-irrigated arable land	251240	16732	15272	249780	783481	32903	35977	786555	1626540	40331	53682	1639891	515107	50810	71864	536161	298246	29858	35170	303558	216861	20952	36694	232603	79162	4843	3290	77609	37499	2785	2071	36785
212 Permanently irrigated land	20033	2188	2352	20197	62730	14823	5000	52907	185250	39641	17507	163116	50727	7852	7648	50523	36548	4072	3581	36057	14179	3780	4067	14466	2495	308	6608	8795	1733	225	3435	4943
213 Rice fields	5002	11		4991	7518	82	14	7450	24141	288	5380	29233	2764	399	337	2702	2676	399	234	2511	88		103	191	9016	577	48	8487	7743	577	9	7175
2.2 Permanent Crops	81284	7361	9186	83109	262757	19946	19835	262646	33068	3991	7472	36549	791695	38108	69138	822725	246673	8830	26139	263982	545022	29278	42999	558743	40790	4482	5487	41795	10309	913	1172	10568
221 Vineyards	28165	1754	3377	29788	69057	4287	6982	71752	13447	1728	3581	15300	186983	3891	10345	193437	74406	2581	5278	77103	112577	1310	5067	116334	9687	737	1360	10310	4972	219	484	5237
222 Fruit trees and berry plantations	31285	2765	4167	32687	88058	4181	6191	90068	6459	694	2847	8612	176578	5201	20963	192340	84475	2861	14998	96612	92103	2340	5965	95728	6935	1361	1222	6796	1905	324	546	2127
223 Olive groves	21834	2842	1642	20634	105642	11478	6662	100826	13162	1569	1044	12637	428134	29016	37830	436948	87792	3388	5863	90267	340342	25628	31967	346681	24168	2384	2905	24689	3432	370	142	3204
2.3 Pastures	96697	10723	13913	99887	109279	6860	15190	117609	76065	6495	3162	72732	972513	45913	243378	1169978	638669	28192	112575	723052	333844	17721	130803	446926	12207	1818	564	10953	4933	397	144	4680
231 Pastures	96697	10723	13913	99887	109279	6860	15190	117609	76065	6495	3162	72732	972513	45913	243378	1169978	638669	28192	112575	723052	333844	17721	130803	446926	12207	1818	564	10953	4933	397	144	4680
2.4 Heterogeneous agricultural areas	366878	53005	20013	333886	571829	82418	36999	526410	293667	38813	39225	294079	1677424	355826	82190	1403788	655169	155361	37587	537395	1022255	200465	44603	866393	306200	32139	16360	290421	81890	5535	4375	80730
241 Annual crops associated with permanent crops	11239	274	1270	12235	51483	3843	1445	49085	4013	877	2061	5197	108667	3462	10431	115616	39472	1667	6233	44038	69195	1815	4198	71578	29562	1778	2496	30280	7356	243	486	7599
242 Complex cultivation patterns	229864	40331	13416	202949	387981	62995	29973	354959	183792	31359	32660	185093	1147163	320195	57178	884146	515054	147522	27149	394681	632109	172673	30029	489465	152388	10158	6023	148253	52899	3599	1481	50781
243 Agriculture land with significant areas of natural vegetation	123591	11238	5312	117665	130723	15529	5440	120634	105266	6514	4504	103256	406427	30642	14418	390203	98977	5156	4205	98026	307450	25486	10213	292177	110638	19606	7527	98559	15690	1355	2288	16623
244 Agro-forestry areas	2184	1162	15	1041	1642	51	141	1732	596	63		533	15167	1507	163	13823	1666	1016		650	13501	491	163	13173	1362	597	314	1329	5945	338	120	5727
3 Forests and semi-natural areas	**529809**	**49599**	**39461**	**519671**	**503659**	**38808**	**28319**	**493170**	**267702**	**31913**	**15257**	**251046**	**745134**	**63754**	**65091**	**746471**	**183828**	**13177**	**9311**	**179962**	**561306**	**50577**	**55780**	**566509**	**1216907**	**132941**	**139909**	**1223875**	**341785**	**27531**	**23533**	**337787**
3.1 Forest	236710	16433	7985	228262	256757	11313	4965	250409	174192	7494	4643	171341	220760	14030	19904	226634	59893	2568	2843	60168	160867	11462	17061	166466	931545	71100	80722	941167	283615	16030	7680	275265
311 Broad-leaved forest	69683	1910	1110	68883	67123	2552	2195	66766	75410	3669	1952	73693	93758	5356	5205	93607	20253	757	806	20302	73505	4599	4399	73305	311950	24946	57033	344037	41873	6501	2959	38331
312 Coniferous forest	109495	10615	6367	105247	111520	6563	2126	107083	45701	2297	2408	45812	77229	4691	11111	83649	27483	1241	1045	27287	49746	3450	10066	56362	314727	11157	6729	310299	196729	4810	1991	193910
313 Mixed forest	57532	3908	508	54132	78114	2198	644	76560	53081	1528	283	51836	49773	3983	3588	49378	12157	570	992	12579	37616	3413	2596	36799	304868	34997	16960	286831	45013	4719	2730	43024
3.2 Shrub and/or herbaceous vegetation associations	256625	28309	24190	252506	205914	22878	16736	199772	70091	14556	8308	63843	460027	40802	38332	457557	94910	7499	4313	91724	365117	33303	34019	365833	241997	50873	54276	245400	40595	7536	14185	47244
321 Natural grassland	54337	5931	4963	53369	49332	6462	3603	46473	25817	9301	2350	18866	141926	8404	4109	137631	39382	3027	479	36834	102544	5377	3630	100797	26948	3149	7725	31524	1618	301	1483	2800
322 Moors and heathland	29940	2503	1012	28449	15704	993	564	15275	5530	88	124	5566	39409	2697	1018	37730	10663	749	338	10252	28746	1948	680	27478	54833	1503	2877	56207	8902	348	480	9034
323 Sclerophyllous vegetation	111099	11712	11040	110427	94656	9861	5518	90313	22847	1982	2890	23755	194852	14322	22013	202543	29885	2101	1460	29244	164967	12221	20553	173299	40509	11778	5509	34240	7227	2734	2577	7070
324 Transitional woodland shrub	61249	8163	7175	60261	46222	5562	7051	47711	15897	3185	2944	15656	83840	15379	11192	79653	14980	1622	2036	15394	68860	13757	9156	64259	119707	34443	38165	123429	22848	4153	9645	28340
3.3 Open spaces with little or no vegetation	36474	4857	7286	38903	40988	4617	6618	42989	23419	9863	2306	15862	64347	8922	6855	62280	29025	3110	2155	28070	35322	5812	4700	34210	43365	10968	4911	37308	17575	3965	1668	15278
331 Beaches, dunes and sand plains	14097	1640	957	13414	14684	1459	740	13965	9605	3369	609	6845	25601	7012	1023	19612	18772	2635	799	16936	6829	4377	224	2676	18346	6008	1303	13641	14271	3601	931	11601
332 Bare rock	3944	292	156	3808	5716	156	837	6397	340		672	1012	7975	200	3417	11192	2735	1	956	3690	5240	199	2461	7502	7307	736	618	7189	1120	99	48	1069
333 Sparsely vegetated areas	17128	1692	891	16327	19688	2200	1989	19477	12478	5498	975	7955	29980	1290	980	29670	7499	467	355	7387	22481	823	625	22283	15243	2530	2946	15659	2079	248	689	2520
334 Burnt areas	1305	1233	5282	5354	900	802	3052	3150	996	996	50	50	791	420	1435	1806	19	7	45	57	772	413	1390	1749	2469	1694	44	819	105	17		88
335 Glaciers and perpetual snow																																
4 Wetlands	**100112**	**20410**	**2935**	**82637**	**79387**	**8826**	**1130**	**71691**	**71455**	**8176**	**14019**	**77298**	**175730**	**11771**	**4572**	**168531**	**140537**	**9436**	**4106**	**135207**	**35193**	**2335**	**466**	**33324**	**13284**	**658**	**356**	**12982**	**12658**	**658**	**355**	**12355**
4.1 Inland wetlands	12017	331	402	12088	11247	323	143	11067	20466	658	239	20047	49879	2602	993	48270	21790	273	590	22107	28089	2329	403	26163	4449	234	77	4292	4449	234	76	4291
411 Inland marshes	10617	237	303	10683	8959	298	143	8804	13534	654	235	13115	11150	208	594	11536	9997	200	576	10373	1153	8	18	1163	4449	234	77	4292	4449	234	76	4291
412 Peatbogs	1400	94	99	1405	2288	25		2263	6932	4	4	6932	38729	2394	399	36734	11793	73	14	11734	26936	2321	385	25000								
4.2 Coastal wetlands	88095	20079	2533	70549	68140	8503	987	60624	50989	7518	13780	57251	125851	9169	3579	120261	118747	9163	3516	113100	7104	6	63	7161	8835	424	279	8690	8209	424	279	8064
421 Salt marshes	36036	19415	1022	17643	22676	7968	480	15188	27718	4020	13260	36958	23154	559	2663	25258	22524	559	2663	24628	630			630	4692	278	171	4585	4582	278	171	4475
422 Salines	7837	162	1384	9059	15014	183	507	15338	11559	103	510	11966	5587	273	7	5321	5542	273	7	5276	45			45	843		108	951	843		108	951
423 Intertidal flats	44222	502	127	43847	30450	352		30098	11712	3395	10	8327	97110	8337	909	89682	90681	8331	846	83196	6429	6	63	6486	3300	146		3154	2784	146		2638
5 Water bodies	**82868**	**2878**	**17763**	**97753**	**71898**	**1908**	**9215**	**79205**	**101342**	**2201**	**7520**	**106661**	**48386**	**1201**	**8438**	**55623**	**44932**	**1201**	**8015**	**51746**	**3454**		**423**	**3877**	**29975**	**770**	**1661**	**30866**	**28465**	**740**	**1395**	**29120**
5.1 Inland waters	20620	276	751	21095	15395	74	1231	16552	20826	616	1161	21371	19925	127	752	20550	17460	127	329	17662	2465		423	2888	19003	175	1157	19985	17904	145	913	18672
511 Water courses	9408	189	76	9295	4545	33	78	4590	6291	325	149	6115	5115		207	5322	4032		185	4217	1083		22	1105	3149	81	178	3246	2714	65	172	2821
512 Water bodies	11212	87	675	11800	10850	41	1153	11962	14535	291	1012	15256	14810	127	545	15228	13428	127	144	13445	1382		401	1783	15854	94	979	16739	15190	80	741	15851
5.2 Coastal waters	62248	2602	17012	76658	56503	1834	7984	62653	80516	1585	6359	85290	28461	1074	7686	35073	27472	1074	7686	34084	989			989	10972	595	504	10881	10561	595	482	10448
521 Coastal lagoons	18800	292	326	18834	46396	241	733	46888	78138	772	2117	79483	17180	191	227	17216	17050	191	227	17086	130			130	279			279	235			235
522 Estuaries	7603	148	16100	23555	4013		6531	10544	528	55	1	474	10348	332	105	10121	9489	332	105	9262	859			859	10199	101	449	10547	9832	101	449	10180
523 Sea and Ocean	35845	2162	586	34269	6094	1593	720	5221	1850	758	4241	5333	933	551	7354	7736	933	551	7354	7736					494	494	55	55	494	494	33	33
TOTAL	**1976950**	**175219**	**175219**	**1976950**	**2808556**	**219372**	**219372**	**2808556**	**2761698**	**173654**	**173654**	**2761698**	**5122033**	**580923**	**580923**	**5122033**	**2341844**	**253521**	**253521**	**2341844**	**2780189**	**327402**	**327402**	**2780189**	**1742189**	**180378**	**180378**	**1742189**	**547153**	**40651**	**40651**	**547153**

ANNEX 5 b: ACCOUNT OF LAND COVER CHANGES 1975-1990 BY LANDSCAPE TYPES - CLC Level 3 - European coast, 1975-90, ha

C12				C2				C21				C22				C3				C31				C32				TOTAL				
UPLAND FORESTED LANDSCAPE				OPEN SEMI-NATURAL OR NATURAL LANDSCAPE				*LOWLAND OPEN SEMI-NATURAL OR NATURAL LANDSCAPE*				*UPLAND OPEN SEMI-NATURAL OR NATURAL LANDSCAPE*				LANDSCAPE WITH NO DOMINANT LAND COVER CHARACTER				*LOWLAND WITH NO DOMINANT LAND COVER CHARACTER*				*UPLAND WITH NO DOMINANT LAND COVER CHARACTER*								
1975	(-)	(+)	1990	1975	(-)	(+)	1990	1975	(-)	(+)	1990	1975	(-)	(+)	1990	1975	(-)	(+)	1990	1975	(-)	(+)	1990	1975	(-)	(+)	1990	1975	(-)	(+)	Net Changes	1990
12015	**552**	**1933**	**13396**	**64612**	**1940**	**11977**	**74649**	**50800**	**1046**	**8244**	**57998**	**13812**	**894**	**3733**	**16651**	**164396**	**7143**	**29226**	**186479**	**117866**	**3899**	**18858**	**410913**	**46530**	**3244**	**10368**	**53654**	**1285227**	**43129**	**208012**	**164883**	**1120344**
9704	*359*	*1357*	*10702*	*45025*	*421*	*7018*	*51622*	*35304*	*180*	*4785*	*39909*	*9721*	*241*	*2233*	*11713*	*124570*	*1768*	*17086*	*139888*	*89395*	*1024*	*10829*	*298966*	*35175*	*744*	*6257*	*40688*	*963456*	*16370*	*131717*	*115347*	*848109*
2010	45	567	2532	10828	11	1278	12095	8484	6	728	9206	2344	5	550	2889	22529	144	4318	26703	17709	90	1714	56270	4820	54	2604	7370	201757	1499	26862	25363	176394
7694	314	790	8170	34197	410	5740	39527	26820	174	4057	30703	7377	236	1683	8824	102041	1624	12768	113185	71686	934	9115	242696	30355	690	3653	33318	761699	14871	104855	89984	671715
1289	*3*	*388*	*1674*	*9327*	*115*	*2263*	*11475*	*7813*	*14*	*1796*	*9595*	*1514*	*101*	*467*	*1880*	*22956*	*1743*	*5857*	*27070*	*17172*	*590*	*4525*	*73544*	*5784*	*1153*	*1332*	*5963*	*191750*	*7375*	*42208*	*34833*	*156917*
892		229	1121	3945	113	1479	5311	3172	12	1096	4256	773	101	383	1055	13560	398	3847	17009	10336	267	2796	49480	3224	131	1051	4144	112236	2930	30675	27745	84491
57		159	216	941	2	104	1043	847	2	104	949	94			94	678	2	1071	1747	529	2	934	4046	149		137	286	10458	60	4313	4253	6205
52	3		49	2717		565	3282	2275		544	2819	442		21	463	2952	27	369	3294	2647	27	349	11790	305		20	325	34396	1232	5292	4060	30336
288			288	1724		115	1839	1519		52	1571	205		63	268	5766	1316	570	5020	3660	294	446	8228	2106	1022	124	1208	34660	3153	1928	-1225	35885
967	*190*	*170*	*947*	*5483*	*1361*	*2178*	*6300*	*3248*	*809*	*1195*	*3634*	*2235*	*552*	*983*	*2666*	*11332*	*3614*	*4774*	*12492*	*6785*	*2268*	*2298*	*19008*	*4547*	*1346*	*2476*	*5677*	*62048*	*18572*	*25577*	*7005*	*55043*
788	120	145	813	1801	124	1046	2723	433	24	392	801	1368	100	654	1922	5600	1356	2576	6820	1722	353	348	11332	3878	1003	2228	5103	27926	4332	12004	7672	20254
		25	25	135		191	326	103		142	245	32		49	81	390	74	745	1061	246	18	688	2304	144	56	57	145	4275	205	3310	3105	1170
179	70		109	3547	1237	941	3251	2712	785	661	2588	835	452	280	663	5342	2184	1453	4611	4817	1897	1262	5372	525	287	191	429	29847	14035	10263	-3772	33619
55		*18*	*73*	*4777*	*43*	*518*	*5252*	*4435*	*43*	*468*	*4860*	*342*		*50*	*392*	*5538*	*18*	*1509*	*7029*	*4514*	*17*	*1206*	*19395*	*1024*	*1*	*303*	*1326*	*67973*	*812*	*8510*	*7698*	*60275*
4				323			323	323								818	1	39	856	705		23	5173	113	1	16	128	21962	302	801	499	21463
51		18	69	4454	43	518	4929	4112	43	468	4537	342		50	392	4720	17	1470	6173	3809	17	1183	14222	911		287	1198	46011	510	7709	7199	38812
305763	**33735**	**21151**	**293179**	**1307892**	**130475**	**113267**	**1290684**	**673862**	**42884**	**35226**	**666204**	**634030**	**87591**	**78041**	**624480**	**2824494**	**277045**	**261199**	**2808648**	**1564242**	**133928**	**125972**	**1753577**	**1260252**	**143117**	**135227**	**1252362**	**13449945**	**1327206**	**1181557**	**-145649**	**13595594**
43698	2141	4431	45988	373940	37386	37384	373938	311444	16497	15324	310271	62496	20889	22060	63667	1148027	81857	98989	1165159	762601	49188	58447	846912	385426	32669	40542	393299	5147173	331031	361352	30321	5116852
41663	2058	1219	40824	328100	23328	18340	323112	284771	7505	9219	286485	43329	15823	9121	36627	1039765	52037	82298	1070026	672210	21777	48021	786555	367555	30260	34277	371572	4623395	220984	280723	59739	4563656
762	83	3173	3852	43614	13890	19044	48768	24472	8849	6105	21728	19142	5041	12939	27040	98705	29409	16301	85597	80914	27008	10036	52907	17791	2401	6265	21655	463554	108111	74460	-33651	497205
1273		39	1312	2226	168		2058	2201	143		2058	25	25			9557	411	390	9536	9477	403	390	7450	80	8		72	60224	1936	6169	4233	55991
30481	3569	4315	31227	158872	21572	8744	146044	39390	4968	2157	36579	119482	16604	6587	109465	288136	36603	29601	281134	98654	13686	8927	262646	189482	22917	20674	187239	1656602	132063	149463	17400	1639202
4715	518	876	5073	27724	4046	1324	25002	12871	1164	105	11812	14853	2882	1219	13190	73348	8257	7309	72400	44630	4317	2110	71752	28718	3940	5199	29977	408411	24700	34278	9578	398833
5030	1037	676	4669	20078	1173	2497	21402	6161	527	858	6492	13917	646	1639	14910	55476	5828	5703	55351	24461	3493	3520	90068	31015	2335	2183	30863	384869	21203	43590	22387	362482
20736	2014	2763	21485	111070	16353	4923	99640	20358	3277	1194	18275	90712	13076	3729	81365	159312	22518	16589	153383	29563	5876	3297	100826	129749	16642	13292	126399	863322	86160	71595	-14565	877887
7274	1421	420	6273	261928	5322	8971	265577	154759	4133	3946	154572	107169	1189	5025	111005	342213	27567	30692	345338	217793	19496	14406	117609	124420	8071	16286	132635	1870902	104698	315870	211172	1659730
7274	1421	420	6273	261928	5322	8971	265577	154759	4133	3946	154572	107169	1189	5025	111005	342213	27567	30692	345338	217793	19496	14406	117609	124420	8071	16286	132635	1870902	104698	315870	211172	1659730
224310	26604	11985	209691	513152	66195	58168	505125	168269	17286	13799	164782	344883	48909	44369	340343	1046118	131018	101917	1017017	485194	51558	44192	526410	560924	79460	57725	539189	4775268	759414	354872	-404542	5179810
22206	1535	2010	22681	5800	847	124	5077	4177	499	93	3771	1623	348	31	1306	59827	1834	3508	61501	29081	1090	1531	49085	30746	744	1977	31979	270591	12935	21335	8400	262191
99489	6559	4542	97472	188270	30880	22420	179810	77215	9351	8338	76202	111055	21529	14082	103608	589839	87819	57134	559154	326027	42170	32569	354959	263812	45649	24565	242728	2879297	583737	218804	-364933	3244230
94948	18251	5239	81936	297368	26541	34260	305087	83648	6825	4910	81733	213720	19716	29350	223354	353283	32922	39646	360007	121272	6770	9974	120634	232011	26152	29672	235531	1527296	142992	111107	-31885	1559181
7667	259	194	7602	21714	7927	1364	15151	3229	611	458	3076	18485	7316	906	12075	43169	8443	1629	36355	8814	1528	118	1732	34355	6915	1511	28951	98084	19750	3626	-16124	114208
875122	**105410**	**116376**	**886088**	**2364381**	**297556**	**306520**	**2373345**	**493762**	**57154**	**51062**	**487670**	**1870619**	**240402**	**255458**	**1885675**	**1561836**	**216921**	**206332**	**1551247**	**406496**	**44827**	**32670**	**493170**	**1155340**	**172094**	**173662**	**1156908**	**7189428**	**831492**	**800889**	**-30603**	**7220031**
647930	55070	73042	665902	282041	38980	82932	325993	69266	2234	12762	79794	212775	36746	70170	246199	613375	47593	73571	639353	204995	9772	8405	250409	408380	37821	65166	435725	2715380	206943	274722	67779	2647601
270077	18445	54074	305706	81326	8960	8557	80923	18187	752	2052	19487	63139	8208	6505	61436	261452	16577	21276	266151	65312	4882	1537	66766	196140	11695	19739	204184	960702	63970	97328	33358	927344
117998	6347	4738	116389	137145	20404	31184	147925	44382	1082	3825	47125	92763	19322	27359	100800	224927	10534	16805	231198	109947	2889	2037	107083	114980	7645	14768	122103	1020744	66261	76730	10469	1010275
259855	30278	14230	243807	63570	9616	43191	97145	6697	400	6885	13182	56873	9216	36306	83963	126996	20482	35490	142004	29736	2001	4831	76560	97260	18481	30659	109438	733934	76712	100664	23952	709982
201402	43337	40091	198156	1704715	213343	202510	1693882	316835	39279	30476	308032	1387880	174064	172034	1385850	827285	145470	117399	799214	158189	26977	20049	199772	669096	118493	97350	647953	3766654	516231	461751	-54480	3821134
25330	2848	6242	28724	484868	56895	47032	475005	115410	16022	7757	107145	369458	40873	39275	367860	140142	24829	18279	133592	38487	7511	5486	46473	101655	17318	12793	97130	923370	114971	88061	-26910	950280
45931	1155	2397	47173	222596	15689	7221	214128	59315	1734	826	58407	163281	13955	6395	155721	102029	8960	7181	100250	27404	1805	1018	15275	74625	7155	6163	73633	470041	32433	19997	-12436	482477
33282	9044	2932	27170	807999	112314	86636	782321	112148	15498	14782	111432	695851	96816	71854	670889	396201	79585	30813	347429	64542	13217	6452	90313	331659	66368	24361	289652	1668163	241554	164419	-77135	1745298
96859	30290	28520	95089	189252	28445	61621	222428	29962	6025	7111	31048	159290	22420	54510	191380	188913	32096	61126	217943	27756	4444	7093	47711	161157	27652	54033	187538	705080	127273	189274	62001	643079
25790	7003	3243	22030	377625	45233	21078	353470	107661	15641	7824	99844	269964	29592	13254	253626	121176	23858	15362	112680	43312	8078	4216	42989	77864	15780	11146	73230	707394	108318	64416	-43902	751296
4075	2407	372	2040	63076	9967	4542	57651	59688	9499	4332	54521	3388	468	210	3130	32889	8242	2046	26693	26536	3580	1639	13965	6353	4662	407	2098	178298	37697	11220	-26477	204775
6187	637	570	6120	30534	1599	1790	30725	4704	384	310	4630	25830	1215	1480	26095	15888	770	3357	18475	1644	76	279	6397	14244	694	3078	16628	71704	3753	10847	7094	64610
13164	2282	2257	13139	274808	29401	9794	255201	42249	4874	2268	39643	232559	24527	7526	215558	67825	11489	4561	60897	14631	4229	1317	19477	53194	7260	3244	49178	437150	54100	22136	-31964	469114
2364	1677	44	731	9207	4266	4952	9893	1020	884	914	1050	8187	3382	4038	8843	4574	3357	5398	6615	501	193	981	3150	4073	3164	4417	5326	20242	12768	20213	7445	12797
626		**1**	**627**	**870943**	**87390**	**53653**	**837206**	**527248**	**76538**	**50491**	**501201**	**343695**	**10852**	**3162**	**336005**	**194640**	**26458**	**12793**	**180975**	**163176**	**24824**	**12574**	**71691**	**31464**	**1634**	**219**	**30049**	**1505551**	**163689**	**89458**	**-74231**	**1579782**
		1	1	437635	13512	4490	428613	95116	2758	1710	94068	342519	10754	2780	334545	51028	2416	709	49321	23887	854	670	11067	27141	1562	39	25618	586721	20076	7053	-13023	599744
		1	1	16060	1557	3089	17592	14984	1338	1513	15159	1076	219	1576	2433	18404	661	644	18387	18062	624	644	8804	342	37		305	83173	3849	5085	1236	81937
				421575	11955	1401	411021	80132	1420	197	78909	341443	10535	1204	332112	32624	1755	65	30934	5825	230	26	2263	26799	1525	39	25313	503548	16227	1968	-14259	517807
626			626	433308	73878	49163	408593	432132	73780	48781	407133	1176	98	382	1460	143612	24042	12084	131654	139289	23970	11904	60624	4323	72	180	4431	918830	143613	82405	-61208	980038
110			110	71602	8211	7325	70716	71421	8113	6943	70251	181	98	382	465	55008	14800	9533	49741	54383	14775	9353	15188	625	25	180	780	240886	55251	34454	-20797	261683
				8847	23	9	8833	8755	23	9	8741	92			92	19157	305	948	19800	19157	305	948	15338					68844	1049	3473	2424	66420
516			516	352859	65644	41829	329044	351956	65644	41829	328141	903			903	69447	8937	1603	62113	65749	8890	1603	30098	3698	47		3651	609100	87313	44478	-42835	651935
1510	**30**	**266**	**1746**	**391503**	**43512**	**75456**	**423447**	**376896**	**42693**	**75292**	**409495**	**14607**	**819**	**164**	**13952**	**146385**	**6325**	**24342**	**164402**	**139335**	**6233**	**23637**	**79205**	**7050**	**92**	**705**	**7663**	**872357**	**58795**	**144395**	**85600**	**786757**
1099	30	244	1313	74187	1119	6039	79107	60008	375	5875	65508	14179	744	164	13599	35898	355	3717	39260	29535	305	3041	16552	6363	50	676	6989	205854	2742	14808	12066	193788
435	16	6	425	5978		258	6236	4328		258	4586	1650			1650	8407	220	400	8587	7541	192	391	4590	866	28	9	847	42893	848	1346	498	42395
664	14	238	888	68209	1119	5781	72871	55680	375	5617	60922	12529	744	164	11949	27491	135	3317	30673	21994	113	2650	11962	5497	22	667	6142	162961	1894	13462	11568	151393
411		22	433	317316	42393	69417	344340	316888	42318	69417	343987	428	75		353	110487	5970	20625	125142	109800	5928	20596	62653	687	42	29	674	666503	56053	129587	73534	592969
44			44	243505	467	4042	247080	243281	451	4042	246872	224	16		208	75348	1436	5320	79232	75094	1425	5317	46888	254	11	3	246	479646	3399	12765	9366	470280
367			367	29729	77	4848	34500	29717	77	4848	34488	12			12	24731	720	7218	31229	24329	720	7218	10544	402			402	87151	1433	35252	33819	53332
		22	22	44082	41849	60527	62760	43890	41790	60527	62627	192	59		133	10408	3814	8087	14681	10377	3783	8061	5221	31	31	26	26	99706	51221	81570	30349	69357
1195036	**139727**	**139727**	**1195036**	**4999331**	**560873**	**560873**	**4999331**	**2122568**	**220315**	**220315**	**2122568**	**2876763**	**340558**	**340558**	**2876763**	**4891751**	**533892**	**533892**	**4891751**	**2391115**	**213711**	**213711**	**2808556**	**2500636**	**320181**	**320181**	**2500636**	**24302508**	**2424311**	**2424311**		**24302508**

ANNEX 6 - Account of Formation of Land Cover - summary - European coast, 1975-1990, ha

Consumption of land cover									*Formation of land cover*							
1	2.1+2.2	2.3+2.4	3.1	3.2+3.3	4	5			1	2.1+2.2	2.3+2.4	3.1	3.2+3.3	4	5	
Artificial surfaces	Arable Land & Permanent Crops	Pastures & Mixed agricultural areas	Forests	Shrub and other semi-natural land	Wetlands	Water bodies	Total	Land cover flows	Artificial surfaces	Arable Land & Permanent Crops	Pastures & Mixed agricultural areas	Forests	Shrub and other semi-natural land	Wetlands	Water bodies	Total
15403	259	302	48	99		41	16152	LCF1 Urban land management	16152							16152
	40584	51657	7502	16314	178	131	116366	LCF2 Urban sprawl	116366							116366
6530	22987	24089	3841	10532	3874	3641	75494	LCF3 Extension of economic sites and infrastructures	75494							75494
	288686	605684					894370	LCF4 Agricultural rotation and intensification		388641	505729					894370
13765		57770	32933	103005	6093	977	214543	LCF5 Conversion of land to agriculture		122174	92369					214543
1454	7108	586	155744	171041	10016	220	346169	LCF6 Forests creation and management			633	238646	106890			346169
600	1695	1115	532	990			4932	LCF7 Water body creation and management							4932	4932
4702	101417	122710	6299	322040	141747	48005	746920	LCF8 Changes of Land Cover due to natural and multiple causes			72011	36076	418982	87312	132539	746920
								Adjustment								
42454	**462736**	**863913**	**206899**	**624021**	**161908**	**53015**	**2414946**	**Sub/Total Flows**	**208012**	**510815**	**670742**	**274722**	**525872**	**87312**	**137471**	**2414946**
165558	***48079***	***-193171***	***67823***	***-98149***	***-74596***	***84456***		***Net Formation of Land Cover***								
208012	**510815**	**670742**	**274722**	**525872**	**87312**	**137471**	**2414946**	**TOTAL**	**208012**	**510815**	**670742**	**274722**	**525872**	**87312**	**137471**	**2414946**

Land cover stock 1975	**1285227**	**6803775**	**6646170**	**2715380**	**4474048**	**1505551**	**872357**	**24302508**
Net Formation of Land Cover	***165558***	***48079***	***-193171***	***67823***	***-98149***	***-74596***	***84456***	
Land cover stock 1990	**1450785**	**6851854**	**6452999**	**2783203**	**4375899**	**1430955**	**956813**	**24302508**

ANNEX 7 - Account of Formation of Land Cover - detailed - European coast, 1975-1990, ha

		111 Continuous urban fabric	112 Discontinuous urban fabric	121 Industrial or commercial units	122 Road and rail networks and associated land	123 Port areas	124 Airports	131 Mineral extraction sites	132 Dump sites	133 Construction sites	141 Green urban areas	142 Sport and leisure facilities	211 Non-irrigated arable land	212 Permanently irrigated land	213 Rice fields	221 Vineyards	222 Fruit trees and berry plantations	223 Olive groves	231 Pastures	241 Annual crops associated with permanent crops	242 Complex cultivation patterns	243 Land principally occupied by agriculture, with significant areas of natural vegetation	244 Agro-forestry areas	311 Broad-leaved forest	312 Coniferous forest	313 Mixed forest	321 Natural grassland	322 Moors and heathland	323 Sclerophyllous vegetation	324 Transitional woodland shrub	331 Beaches, dunes and sand plains	332 Bare rock	333 Sparsely vegetated areas	334 Burnt areas	335 Glaciers and perpetual snow	411 Inland marshes	412 Peatbogs	421 Salt marshes	422 Salines	423 Intertidal flats	511 Water courses	512 Water bodies	521 Coastal lagoons	522 Estuaries	523 Sea and ocean	TOTAL
Consumption of land cover																																													
LCF11	Urban development/ infilling		-8192								-178	-310																																	-8680
LCF12	Developped land recycling	-623		-359	-22	-872	-177	-44		-4574																																			-6671
LCF13	Development of green urban areas	-23	-29										-259						-89		-178	-35		-48				-42		-27	-10			-20							-4				-37	-801
LCF21	Urban continuous sprawl												-2614	-763		-246	-1334	-3392	-988	-919	-3735	-1222	-31	-188	-163	-85	-353	-27	-495	-656	-399	-34	-293												-26	-17963
LCF22	Urban diffuse sprawl												-22218	-1459		-2444	-3629	-2485	-6419	-695	-28817	-8828	-3	-758	-5178	-1130	-3543	-1525	-4632	-2758	-762	-287	-550			-58	-17	-79	-23	-1			-6		-99	-98403
LCF31	Extension of industrial & commercial sites	-97	-632		-9	-33	-8	-103	-21	-1402		-36	-6923	-1035	-63	-231	-864	-3048	-1812	-386	-7120	-1567	-34	-242	-668	-502	-1407	-369	-337	-322	-83	-1	-470			-137		-300	-94	-146	-1	-10	-8	-29	-125	-30675
LCF32	Extension of transport networks	-30	-19	-19		-175				-1207			-959	-21		-58	-283	-88	-259	-100	-330	-211		-3	-83	-192	-5	-32	-54	-4						-11			-31	-47			-3		-89	-4313
LCF33	Extension of habours	-5	-14	-36	-5			-2		-605		-79	-304	-21					-105		-316	-375			-8	-11	-43	-117	-55	-38	-281		-28			-25		-16	-4	-210	-31	-40	-23	-48	-2447	-5292
LCF34	Extension of airports		-5					-288					-522	-202		-22			-112	-122	-200	-201			-38	-5		-37	-37							-22							-14		-101	-1928
LCF35	Extension of mines and quarrying areas	-4	-8	-99					-38	-34			-1787	-85		-274	-247	-1490	-245	-166	-2032	-1145	-43	-305	-359	-155	-1065	-379	-935	-337	-200	-4	-434			-90				-13		-15	-16			-12004
LCF36	Extension of dumpsites			-35				-137		-94			-132			-8			-876		-35	-73			-13	-57	-43	-182	-100	-137	-18	-329		-78			-191		-501		-224					-47	-3310
LCF37	Construction	-62	-440	-177	-23	-20		-24					-1738	-686		-72		-131	-942	-164	-1110	-539	-41	-29	-370	-6	-153	-124	-895	-84	-104		-89			-8		-881	-64	-722		-8			-557	-10263
LCF38	Extension of sport and leisure facilities	-7	-124	-25				-44		-284	-21		-1435	-141		-117			-638		-1692	-1098		-13	-676	-63	-124	-309	-391	-130	-29		-182			-7		-130			-10	-18	-1			-7709
LCF41	Recent extension of pasture, fallow land, set aside												-96228	-39803	-333	-242	-20	-429		-2694	-268104	-7273																							-415126
LCF42	Planting of vineyards, fruit and olive trees over arable & pasture												-29948	-3319	-127				-1937	-4919	-59446		-3455																						-103151
LCF43	Rotation of annual crops												-330	-44892	-536																														-45758
LCF44	Rotation of permanent crops															-1495	-1587	-3684																											-6766
LCF45	Intensification of agriculture												-14234			-16126	-10053	-25300	-84023	-1840	-167972		-4021																						-323569
LCF51	Intensive conversion of forest to agriculture																							-10167	-5757	-3729																			-19653
LCF52	Intensive conversion of marginal land to agriculture																					-39639					-17920	-631	-11128	-11613	-6997	-76	-10559	-197											-98760
LCF53	Diffuse conversion of forest to agriculture																							-5635	-4006	-3639								-83											-13363
LCF54	Diffuse conversion of marginal land to agriculture																					-18131					-8301	-2114	-17682	-10597	-2447	-68	-2012	-580											-61932
LCF55	Conversion of wetlands to agriculture																																			-699	-1290	-3516	-252	-336	-227	-536	-141	-14	-59	-7070
LCF56	Conversion of developed areas to agriculture	-573	-4298	-1299			-2945	-2061	-74	-2444	-59	-12																																	-13765
LCF61	Forests creation	-21	-309	-50				-551		-523			-3529	-286		-549	-523	-2221		-483	-103			-10036	-5219	-77492	-67639	-2681	-679	-3695	-3600		-286	-9530	-54		-146	-73	-96	-19	-5	-27	-190425
LCF62	Forests rotation																							-7003	-10888	-30963																			-48854
LCF63	Recent felling and transition																							-37844	-33926	-35120																			-106890
LCF71	Water body creation							-296		-304			-1038	-189		-10	-22	-436	-321		-331	-407	-56	-258	-274		-124	-22	-52	-210	-107		-475												-4932
LCF72	Water body management																																													
LCF81	Semi-natural creation																		-118		-1268	-914												-8308											-10608
LCF82	Semi-natural rotation																										-70361	-20991	-118342	-30936	-13018	-2554	-34014			-2046	-5372	-13411		-1092	-206	-536	-2421	-470	-1349	-317119
LCF83 84	Farmland abandonment												-32291	-3937	-790	-2643	-2540	-43232	-5603	-353	-40573	-60121	-11769																						-203852
LCF85	Other land abandonment (other than farmland)	-43	-716	-404		-45	-4	-1065	-36	-2030	-44	-45																												-570					-5002
LCF86	Forests and shrubs fires												-121	-107				-197		-89	-260	-990	-280	-738	-3214	-1047	-1256	-260	-8822	-1730		-50	-1052												-20213
LCF87	Coastal erosion	-11	-4			-63				-166			-51	-1					-67		-33	-82			-6	-6	-29	-99	-4	-30	-9572		-38			-8	-18	-31683		-78453	-8		-357	-696		-121485
LCF88	Impacts of storms, floods…			-2		-19		-5					-128	-86	-87		-22			-5	-33	-2		-331	-23	-3		-2		-97	-103					-190		-104							-1242
LCF89	Other changes and unknown												-3944	-10992		-163	-79	-6	-11		-14	-108	-17	-395	-523	-13	-47		-14	-300		-11			-71		-3692		-5037	-288	-345	-276	-166	-40887	-67399
	Adjustment		-81	-425	-1	-5	-19		-36	-80		-28	-251	-86				-21	-133		-35	-31			-44		-22	-34	-50	-47	-275		-100				-884	-11	-886		-290	-114	-5	-5371	-9365
	Total consumption of cover	**-1499**	**-14871**	**-2930**	**-60**	**-1232**	**-3153**	**-4332**	**-205**	**-14035**	**-302**	**-510**	**-220984**	**-108111**	**-1936**	**-24700**	**-21203**	**-86160**	**-104698**	**-12935**	**-583737**	**-142992**	**-19750**	**-63970**	**-66261**	**-76712**	**-114971**	**-32433**	**-241554**	**-127273**	**-37697**	**-3753**	**-54100**	**-12768**		**-3849**	**-16227**	**-55251**	**-1049**	**-87313**	**-848**	**-1894**	**-3399**	**-1433**	**-51221**	**-2424311**
Formation of land cover																																												
LCF11	Urban development/ infilling	8281	399																																									8680
LCF12	Developped land recycling	618	6053																																									6671
LCF13	Development of green urban areas										801																																		801
LCF21	Urban continuous sprawl	17963																																										17963
LCF22	Urban diffuse sprawl		98403																																									98403
LCF31	Extension of industrial & commercial sites			30675																																								30675
LCF32	Extension of transport networks				4313																																							4313
LCF33	Extension of habours					5292																																						5292
LCF34	Extension of airports						1928																																					1928
LCF35	Extension of mines and quarrying areas							12004																																				12004
LCF36	Extension of dumpsites								3310																																			3310
LCF37	Construction									10263																																		10263
LCF38	Extension of sport and leisure facilities											7709																																7709
LCF41	Recent extension of pasture, fallow land, set aside																		308220		106906																							415126
LCF42	Planting of vineyards, fruit and olive trees over arable & pasture															25565	33778	35342		8466																							103151
LCF43	Rotation of annual crops												41641	107	4010																													45758
LCF44	Rotation of permanent crops															1940	2733	2093																									6766
LCF45	Intensification of agriculture												202809	38249	374					8173	73964																							323569
LCF51	Intensive conversion of forest to agriculture												5394	7107	45	778	441	5206		682																							19653
LCF52	Intensive conversion of marginal land to agriculture												27475	28403	193	4933	6211	27856		3689																							98760
LCF53	Diffuse conversion of forest to agriculture																		1196		4461	7096	610																					13363
LCF54	Diffuse conversion of marginal land to agriculture																		3536		28810	27233	2353																					61932
LCF55	Conversion of wetlands to agriculture												1210	501	1545	35	9	19	2072	118	610	943	8																					7070
LCF56	Conversion of developed areas to agriculture												2194	93	2	1027	418	1079	846	207	4053	3824	22																					13765
LCF61	Forests creation																						633	47628	61082	81082																		190425
LCF62	Forests rotation																							25532	10279	13043																		48854
LCF63	Recent felling and transition																										5463	2618	25473	68510	1285	822	2719												106890
LCF71	Water body creation																																										4932			4932
LCF72	Water body management																																												
LCF81	Semi-natural creation																										1126	775	3701	2039		331	336			82	324	1894							10608
LCF82	Semi-natural rotation																										63778	13554	85495	96693	1595	8490	14089			1663	1150	17340				1335	11099	838		317119
LCF83	Farmland abandonment																					72011		24168	5369	6539	16392	1895	48491	20752	2302	1035	4461			437										203852
LCF85	Other land abandonment (other than farmland)																										793	1009	1132	1199	211	26	62					514					56			5002
LCF86	Forests and shrubs fires																																	20213											20213
LCF87	Coastal erosion																																							5313			188	34414	81570	121485
LCF88	Impacts of storms, floods…																																								1242					
LCF89	Other changes and unknown																										311	67	120	81	5827	132	469			1283	494	14261	3392	39165		1797				67399
	Adjustment																										198	79	7			11				1620		445	81		104	5398	1422			9365
	Total Formation of Cover	**26862**	**104855**	**30675**	**4313**	**5292**	**1928**	**12004**	**3310**	**10263**	**801**	**7709**	**280723**	**74460**	**6169**	**34278**	**43590**	**71595**	**315870**	**21335**	**218804**	**111107**	**3626**	**97328**	**76730**	**100664**	**88061**	**19997**	**164419**	**189274**	**11220**	**10847**	**22136**	**20213**		**5085**	**1968**	**34454**	**3473**	**44478**	**1346**	**13462**	**12765**	**35252**	**81570**	**2424311**
	Net Formation of cover	***25363***	***89984***	***27745***	***4253***	***4060***	***-1225***	***7672***	***3105***	***-3772***	***499***	***7199***	***59739***	***-33651***	***4233***	***9578***	***22387***	***-14565***	***211172***	***8400***	***-364933***	***-31885***	***-16124***	***33358***	***10469***	***23952***	***-26910***	***-12436***	***-77135***	***62001***	***-26477***	***7094***	***-31964***	***7445***		***1236***	***-14259***	***-20797***	***2424***	***-42835***	***498***	***11568***	***9366***	***33819***	***30349***	***0***

TOTAL OPENING YEAR ~1975		201757	761699	112236	10458	34396	34660	27926	4275	29847	21962	46011	4623395	463554	60224	408411	384869	863322	1870902	270591	2879297	1527296	98084	960702	1020744	733934	923370	470041	1668163	705080	178298	71704	437150	20242		83173	503548	240886	68844	609100	42893	162961	479646	87151	99706	24302508
TOTAL FINAL YEAR ~ 1990		227120	851683	139981	14711	38456	33435	35598	7380	26075	22461	53210	4683134	429903	64457	417989	407256	848757	2082074	278991	2514364	1495411	81960	994060	1031213	757886	896460	457605	1591028	767081	151821	78798	405186	27687		84409	489289	220089	71268	566265	43391	174529	489012	120970	130055	24302508

ANNEX 8 - Land Cover Resource & Use Account, European Coast, 1975-1990, ha
(by Landscape Types &/or by Land Reporting Units)

Detailed account		Landscape Types															
		A1	A2	B1	B2	*B21*	*B22*	C1	*C11*	*C12*	C2	*C21*	*C22*	C3	*C31*	*C32*	TOTAL
		URBAN DENSE AREAS	DISPERSED URBAN AREAS	BROAD PATTERN INTENSIVE AGRICULTURE	COMPOSITE RURAL LANDSCAPE	*LOWLAND COMPOSITE RURAL LANDSCAPE*	*UPLAND COMPOSITE RURAL LANDSCAPE*	FORESTED LANDSCAPE	*LOWLAND FORESTED LANDSCAPE*	*UPLAND FORESTED LANDSCAPE*	OPEN SEMI-NATURAL OR NATURAL LANDSCAPE	*LOWLAND OPEN SEMI-NATURAL OR NATURAL LANDSCAPE*	*UPLAND OPEN SEMI-NATURAL OR NATURAL LANDSCAPE*	LANDSCAPE WITH NO DOMINANT LAND COVER CHARACTER	*LOWLAND WITH NO DOMINANT LAND COVER CHARACTER*	*UPLAND WITH NO DOMINANT LAND COVER CHARACTER*	
A - Opening surface ~ 1975		**1976950**	**2808556**	**2761698**		*2341844*	*2780189*		*547153*	*1195036*		*2122568*	*2876763*		*2391115*	*2500636*	**24302508**
Consumption (loss) of Land Cover Resource																	
1 Artificial surfaces		**12312**	**12798**	**1805**	**5289**	*2995*	*2294*	**1842**	*1290*	*552*	**1940**	*1046*	*894*	**7143**	*3899*	*3244*	**43129**
1.1	*Urban fabric*	3648	6126	1089	2431	*1096*	*1335*	887	*528*	*359*	421	*180*	*241*	1768	*1024*	*744*	16370
1.2	*Industrial, commercial and transport units*	2736	1296	134	786	*438*	*348*	565	*562*	*3*	115	*14*	*101*	1743	*590*	*1153*	7375
1.3	*Mines, dump and construction sites*	5585	5059	521	2044	*1442*	*602*	388	*198*	*190*	1361	*809*	*552*	3614	*2268*	*1346*	18572
1.4	*Artificial non-agricultural vegetated areas*	343	317	61	28	*19*	*9*	2	*2*		43	*43*		18	*17*	*1*	812
2 Agricultural areas		**90020**	**157032**	**129559**	**498908**	*226712*	*272196*	**44167**	*10432*	*33735*	**130475**	*42884*	*87591*	**277045**	*133928*	*143117*	**1327206**
2.1	*Arable Land*	18931	47808	80260	59061	*34329*	*24732*	5728	*3587*	*2141*	37386	*16497*	*20889*	81857	*49188*	*32669*	331031
2.2	*Permanent Crops*	7361	19946	3991	38108	*8830*	*29278*	4482	*913*	*3569*	21572	*4968*	*16604*	36603	*13686*	*22917*	132063
2.3	*Pastures*	10723	6860	6495	45913	*28192*	*17721*	1818	*397*	*1421*	5322	*4133*	*1189*	27567	*19496*	*8071*	104698
2.4	*Heterogeneous agricultural areas*	53005	82418	38813	355826	*155361*	*200465*	32139	*5535*	*26604*	66195	*17286*	*48909*	131018	*51558*	*79460*	759414
3 Forests and semi-natural areas		**49599**	**38808**	**31913**	**63754**	*13177*	*50577*	**132941**	*27531*	*105410*	**297556**	*57154*	*240402*	**216921**	*44827*	*172094*	**831492**
3.1	*Forests*	16433	11313	7494	14030	*2568*	*11462*	71100	*16030*	*55070*	38980	*2234*	*36746*	47593	*9772*	*37821*	206943
3.2	*Shrub and/or herbaceous vegetation associations*	28309	22878	14556	40802	*7499*	*33303*	50873	*7536*	*43337*	213343	*39279*	*174064*	145470	*26977*	*118493*	516231
3.3	*Open spaces with little or no vegetation*	4857	4617	9863	8922	*3110*	*5812*	10968	*3965*	*7003*	45233	*15641*	*29592*	23858	*8078*	*15780*	108318
4 Wetlands		**20410**	**8826**	**8176**	**11771**	*9436*	*2335*	**658**	*658*		**87390**	*76538*	*10852*	**26458**	*24824*	*1634*	**163689**
4.1	*Inland wetlands*	331	323	658	2602	*273*	*2329*	234	*234*		13512	*2758*	*10754*	2416	*854*	*1562*	20076
4.2	*Coastal wetlands*	20079	8503	7518	9169	*9163*	*6*	424	*424*		73878	*73780*	*98*	24042	*23970*	*72*	143613
5 Water bodies		**2878**	**1908**	**2201**	**1201**	*1201*		**770**	*740*	*30*	**43512**	*42693*	*819*	**6325**	*6233*	*92*	**58795**
5.1	*Inland waters*	276	74	616	127	*127*		175	*145*	*30*	1119	*375*	*744*	355	*305*	*50*	2742
5.2	*Coastal waters*	2602	1834	1585	1074	*1074*		595	*595*		42393	*42318*	*75*	5970	*5928*	*42*	56053
B - TOTAL CONSUMPTION (LOSS) OF LAND COVER RESOURCE		**175219**	219372	**173654**	**580923**	*253521*	*327402*	**180378**	*40651*	*139727*	**560873**	*220315*	*340558*	**533892**	*213711*	*320181*	**2424311**
Formation of Land Cover																	
LCF1	**Urban land management**	**3993**	**6454**	**706**	**2280**	*1032*	*1248*	**757**	*497*	*260*	**446**	*308*	*138*	**1516**	*997*	*519*	**16152**
LCF11	*Urban development/ infilling*	1174	3587	503	1926	*815*	*1111*	553	*327*	*226*	92	*34*	*58*	845	*411*	*434*	8680
LCF12	*Developped land recycling*	2559	2479	130	313	*176*	*137*	204	*170*	*34*	354	*274*	*80*	632	*563*	*69*	6671
LCF13	*Development of green urban areas*	260	388	73	41	*41*								39	*23*	*16*	801
LCF2	**Urban sprawl**	**30962**	**36367**	**6408**	**17422**	*10893*	*6529*	**3026**	*1929*	*1097*	**6572**	*4477*	*2095*	**15609**	*9855*	*5754*	**116366**
LCF21	*Urban continuous sprawl*	3798	4052	557	4318	*2256*	*2062*	642	*301*	*341*	1186	*694*	*492*	3410	*1259*	*2151*	17963
LCF22	*Urban diffuse sprawl*	27164	32315	5851	13104	*8637*	*4467*	2384	*1628*	*756*	5386	*3783*	*1603*	12199	*8596*	*3603*	98403
LCF3	**Extension of economic sites and infrastructures**	**19369**	**24872**	**3316**	**8565**	*4878*	*3687*	**2312**	*1736*	*576*	**4959**	*3459*	*1500*	**12101**	*8006*	*4095*	**75494**
LCF31	*Extension of industrial & commercial sites*	7087	12447	1606	3157	*1699*	*1458*	1052	*823*	*229*	1479	*1096*	*383*	3847	*2796*	*1051*	30675
LCF32	*Extension of transport networks*	1114	809	138	771	*418*	*353*	306	*147*	*159*	104	*104*		1071	*934*	*137*	4313
LCF33	*Extension of habours*	2174	1557	300	307	*307*		20	*20*		565	*544*	*21*	369	*349*	*20*	5292
LCF34	*Extension of airports*	682	294	83	155	*85*	*70*	29	*29*		115	*52*	*63*	570	*446*	*124*	1928
LCF35	*Extension of mines and quarrying areas*	1799	4065	502	1773	*536*	*1237*	243	*98*	*145*	1046	*392*	*654*	2576	*348*	*2228*	12004
LCF36	*Extension of dumpsites*	775	730	44	777	*731*	*46*	48	*23*	*25*	191	*142*	*49*	745	*688*	*57*	3310
LCF37	*Construction*	3827	2697	294	867	*614*	*253*	184	*184*		941	*661*	*280*	1453	*1262*	*191*	10263
LCF38	*Extension of sport and leisure facilities*	1911	2273	349	758	*488*	*270*	430	*412*	*18*	518	*468*	*50*	1470	*1183*	*287*	7709
LCF4	**Agricultural rotation and intensification**	**44641**	**90815**	**100941**	**416326**	*202098*	*214228*	**9997**	*3892*	*6105*	**53907**	*22723*	*31184*	**177743**	*99162*	*78581*	**894370**
LCF41	*Recent extension of pasture, fallow land, set aside*	17371	27752	32922	258756	*120887*	*137869*	1130	*357*	*773*	19346	*8308*	*11038*	57849	*31961*	*25888*	415126
LCF42	*Planting of vineyards, fruit and olive trees over arable & pasture*	6366	14242	7431	47633	*24545*	*23088*	2910	*792*	*2118*	4792	*1411*	*3381*	19777	*7025*	*12752*	103151
LCF43	*Rotation of annual crops*	483	9387	20382	1370	*949*	*421*	85	*50*	*35*	5623	*3039*	*2584*	8428	*7650*	*778*	45758
LCF44	*Rotation of permanent crops*	237	1422	403	1262	*613*	*649*	238	*44*	*194*	1411	*368*	*1043*	1793	*833*	*960*	6766
LCF45	*Intensification of agriculture*	20184	38012	39803	107305	*55104*	*52201*	5634	*2649*	*2985*	22735	*9597*	*13138*	89896	*51693*	*38203*	323569
LCF5	**Conversion of land to agriculture**	**14406**	**19681**	**22157**	**49734**	*9646*	*40088*	**18282**	*6165*	*12117*	**33213**	*8769*	*24444*	**57070**	*19945*	*37125*	**214543**
LCF51	*Intensive conversion of forest to agriculture*	1218	1049	3554	2465	*408*	*2057*	4740	*2284*	*2456*	146	*40*	*106*	6481	*3280*	*3201*	19653
LCF52	*Intensive conversion of marginal land to agriculture*	3946	4669	13855	28860	*5649*	*23211*	4615	*996*	*3619*	17184	*5311*	*11873*	25631	*9112*	*16519*	98760
LCF53	*Diffuse conversion of forest to agriculture*	878	1400	423	2405	*203*	*2202*	3900	*901*	*2999*	937	*74*	*863*	3420	*809*	*2611*	13363
LCF54	*Diffuse conversion of marginal land to agriculture*	4525	8303	1422	13457	*2019*	*11438*	4050	*1101*	*2949*	13200	*2633*	*10567*	16975	*4105*	*12870*	61932
LCF55	*Conversion of wetlands to agriculture*	234	368	2315	565	*271*	*294*	244	*244*		1405	*587*	*818*	1939	*1639*	*300*	7070
LCF56	*Conversion of developed areas to agriculture*	3605	3892	588	1982	*1096*	*886*	733	*639*	*94*	341	*124*	*217*	2624	*1000*	*1624*	13765
LCF6	**Forests creation and management**	**15929**	**7524**	**6083**	**21826**	*3219*	*18607*	**96909**	*15593*	*81316*	**106252**	*14275*	*91977*	**91646**	*11398*	*80248*	**346169**
LCF61	*Forests creation*	6557	3113	2898	13597	*1687*	*11910*	37330	*4837*	*32493*	70469	*12386*	*58083*	56461	*7302*	*49159*	190425
LCF62	*Forests rotation*	574	355	1021	2397	*404*	*1993*	24946	*1700*	*23246*	11033	*72*	*10961*	8528	*480*	*8048*	48854
LCF63	*Recent felling and transition*	8798	4056	2164	5832	*1128*	*4704*	34633	*9056*	*25577*	24750	*1817*	*22933*	26657	*3616*	*23041*	106890
LCF7	**Water body creation and management**	**452**	**967**	**579**	**498**	*97*	*401*	**926**	*688*	*238*	**290**	*172*	*118*	**1220**	*563*	*657*	**4932**
LCF71	*Water body creation*	452	967	579	498	*97*	*401*	926	*688*	*238*	290	*172*	*118*	1220	*563*	*657*	4932
LCF72	*Water body management*																
LCF8	**Changes of Land Cover due to natural and multiple causes**	**45241**	**32588**	**32627**	**63191**	*20577*	*42614*	**48157**	*10139*	*38018*	**350963**	*161929*	*189034*	**174153**	*60964*	*113189*	**746920**
LCF81	*Semi-natural creation*	1008	559	1107	913	*297*	*616*	685	*25*	*660*	4117	*1110*	*3007*	2219	*993*	*1226*	10608
LCF82	*Semi-natural rotation*	10523	11186	11059	15361	*4673*	*10688*	20055	*6140*	*13915*	165776	*32279*	*133497*	83159	*21217*	*61942*	317119
LCF83+LCF84	*Farmland abandonment without significant woodland creation+Farmland abandonment with woodland creation*	7691	8672	7573	35977	*6270*	*29707*	26814	*3531*	*23283*	58317	*11348*	*46969*	58808	*13821*	*44987*	203852
LCF85	*Other land abandonment (other than farmland)*	1693	819	273	453	*441*	*12*	143	*68*	*75*	553	*101*	*452*	1068	*676*	*392*	5002
LCF86	*Forests and shrubs fires*	5282	3052	50	1435	*45*	*1390*	44		*44*	4952	*914*	*4038*	5398	*981*	*4417*	20213
LCF87	*Coastal erosion*	16502	7110	4254	7908	*7845*	*63*	55	*33*	*22*	69786	*69786*		15870	*15844*	*26*	121485
LCF88	*Impacts of storms, floods…*	76	78	136	207	*185*	*22*	178	*172*	*6*	172	*172*		395	*386*	*9*	1242
LCF89	*Other changes and unknown*	2466	1112	8175	937	*821*	*116*	183	*170*	*13*	47290	*46219*	*1071*	7236	*7046*	*190*	67399
NA		**226**	**104**	**837**	**1081**	*1081*		**12**	*12*		**4271**	*4203*	*68*	**2834**	*2821*	*13*	**9365**
C - TOTAL FORMATION OF LAND COVER 1975-1990		**175219**	**219372**	**173654**	**580923**	*253521*	*327402*	**180378**	*40651*	*139727*	**560873**	*220315*	*340558*	**533892**	*213711*	*320181*	**2424311**
D - Final Surface ~ 1990 (D = A-B+C)		**1976950**	**2808556**	**2761698**		*2341844*	*2780189*		*547153*	*1195036*		*2122568*	*2876763*		*2391115*	*2500636*	**24302508**

ANNEXE 9

5/06/2002 NEWCRONOS - CLASSIFICATION PLAN DOMAIN : REGIO
Regional statistics
COLLECTION : REG_YBK Regions: Statistical yearbook 2001

TABLE : TU_T1 Hotels and similar establishments, 1999 - EU
LIST OF DIMENSIONS :
TOURINFO Tourism information
GEO Geopolitical entities (declaring)
EDITION Regions: Statistical yearbook
DIMENSIONS' DETAIL :
TOURINFO Tourism information
ESTABLISHMENTS Number of establishments
BED_ROOMS Number of bedrooms
BED_PLACES Number of bed-places
ARRIVAL_RESID Arrivals of residents
ARRIVAL_NON_RESID Arrivals of non-residents
NIGHTS_RESIDNights spent by residents
NIGHTS_NON_RESID Nights spent by non-residents
GEO Geopolitical entities (declaring)
See dimension 'geo' in annexe
EDITION Regions: Statistical yearbook
YB2001 Regions: Statistical yearbook 2001 (data as at June 2001)

TABLE : TU_T2 Tourist campsites, 1999 - EU
LIST OF DIMENSIONS :
TOURINFO Tourism information
GEO Geopolitical entities (declaring)
EDITION Regions: Statistical yearbook
DIMENSIONS' DETAIL :
TOURINFO Tourism information
ESTABLISHMENTS Number of establishments
BED_PLACES Number of bed-places
ARRIVAL_RESID Arrivals of residents
ARRIVAL_NON_RESID Arrivals of non-residents
NIGHTS_RESIDNights spent by residents
NIGHTS_NON_RESID Nights spent by non-residents
GEO Geopolitical entities (declaring)
See dimension 'geo' in annexe
EDITION Regions: Statistical yearbook
YB2001 Regions: Statistical yearbook 2001 (data as at June 2001)

TABLE : TU_T3 Holiday dwellings, 1999 - EU
LIST OF DIMENSIONS :
TOURINFO Tourism information
GEO Geopolitical entities (declaring)
EDITION Regions: Statistical yearbook
DIMENSIONS' DETAIL :
TOURINFO Tourism information
ESTABLISHMENTS Number of establishments
BED_PLACES Number of bed-places
GEO Geopolitical entities (declaring)
See dimension 'geo' in annexe
EDITION Regions: Statistical yearbook
YB2001 Regions: Statistical yearbook 2001 (data as at June 2001)

TABLE : TU_T4 Other collective accommodation, 1999 - EU
LIST OF DIMENSIONS :
TOURINFO Tourism information
GEO Geopolitical entities (declaring)
EDITION Regions: Statistical yearbook
DIMENSIONS' DETAIL :
TOURINFO Tourism information
ESTABLISHMENTS Number of establishments
BED_PLACES Number of bed-places
ARRIVAL_RESID Arrivals of residents
ARRIVAL_NON_RESID Arrivals of non-residents
NIGHTS_RESIDNights spent by residents
NIGHTS_NON_RESID Nights spent by non-residents
GEO Geopolitical entities (declaring)
See dimension 'geo' in annexe
EDITION Regions: Statistical yearbook
YB2001 Regions: Statistical yearbook 2001 (data as at June 2001)

5/06/2002 NEWCRONOS - CLASSIFICATION PLAN DOMAIN : REGIO
Regional statistics
COLLECTION : TOUR-R Tourism statistics

TABLE : T04_2R Arrivals of residents - NUTS 2 - annual data (derived table)
LIST OF DIMENSIONS :
UNIT Units
ACTIVITY Activity
GEO Geopolitical entities (declaring)
TIME Period of time (a=annual, q=quarterly, m=monthly, d=daily, c=cumulated from January)

DIMENSIONS' DETAIL :
UNIT Units
NBR Number/Absolute value/Unit
ACTIVITY Activity
A100 Hotels and similar establishments
B010 Tourist campsites
B020 Holiday dwellings
B040 Other collective accommodation n.i.e
B100 Other collective accommodation establishments, total
GEO Geopolitical entities (declaring) See dimension 'geo' in annexe

TABLE : T05_2R Nights spent by residents - NUTS 2 - annual data (derived table)
LIST OF DIMENSIONS :
UNIT Units
ACTIVITY Activity
GEO Geopolitical entities (declaring)
TIME Period of time (a=annual, q=quarterly, m=monthly, d=daily, c=cumulated from January)
DIMENSIONS' DETAIL :
UNIT Units
NBR Number/Absolute value/Unit
ACTIVITY Activity
A100 Hotels and similar establishments
B010 Tourist campsites
B020 Holiday dwellings
B040 Other collective accommodation n.i.e
B100 Other collective accommodation establishments, total
GEO Geopolitical entities (declaring) See dimension 'geo' in annexe

TABLE : T06_2R Arrivals of non-residents - NUTS 2 - annual data (derived table)
LIST OF DIMENSIONS :
UNIT Units
ACTIVITY Activity
GEO Geopolitical entities (declaring)
TIME Period of time (a=annual, q=quarterly, m=monthly, d=daily, c=cumulated from January)
DIMENSIONS' DETAIL :
UNIT Units
NBR Number/Absolute value/Unit
ACTIVITY Activity
A100 Hotels and similar establishments
B010 Tourist campsites
B020 Holiday dwellings
B040 Other collective accommodation n.i.e
B100 Other collective accommodation establishments, total
GEO Geopolitical entities (declaring) See dimension 'geo' in annexe

TABLE : T07_2R Nights spent by non-residents - NUTS 2 - annual data (derived table)
LIST OF DIMENSIONS :
UNIT Units
ACTIVITY Activity
GEO Geopolitical entities (declaring)
TIME Period of time (a=annual, q=quarterly, m=monthly, d=daily, c=cumulated from January)
DIMENSIONS' DETAIL :
UNIT Units
NBR Number/Absolute value/Unit
ACTIVITY Activity
A100 Hotels and similar establishments
B010 Tourist campsites
B020 Holiday dwellings
B040 Other collective accommodation n.i.e
B100 Other collective accommodation establishments, total
GEO Geopolitical entities (declaring) See dimension 'geo' in annexe

TABLE : T_3R Number of establishments, bedrooms and beds - NUTS 3 - annual data (derived table)
LIST OF DIMENSIONS :
UNIT Units
INDICAT Indicator
ACTIVITY Activity
GEO Geopolitical entities (declaring)
TIME Period of time (a=annual, q=quarterly, m=monthly, d=daily, c=cumulated from January)
DIMENSIONS' DETAIL :
UNIT Units
NBR Number/Absolute value/Unit
INDICAT Indicator
A001 Establishments
A002 Bedrooms
A003 Bed-Places
ACTIVITY Activity
A100 Hotels and similar establishments
B010 Tourist campsites
B020 Holiday dwellings
B040 Other collective accommodation n.i.e
B100 Other collective accommodation establishments, total
GEO Geopolitical entities (declaring) See dimension 'geo' in annex