

Territorial Trends of the  
Management of the  
Natural Heritage

ESPON 1.3.2.

First Interim Report

March 2003

## **Territorial trends of the Management of the Natural Heritage**

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Utrecht

**EuroNet EEIG** in co-operation with  
**European Centre for Nature Conservation (ECNC)**

This report has been produced by the projects core group consisting of:

- EuroNet – Royal Haskoning (leadpartner)
- European Centre for Nature Conservation (ECNC)
- EuroNet – Enviplan
- EuroNet – Land Use Consultants
- EuroNet – Territoires, Sites & Cités

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## Summary

### 1. General

The Transnational Project Group (TPG) on ESPON priority 1.3.2 led by EuroNet Haskoning combines the European Centre of Nature Conservation, EuroNet partners as well as specific project partners.

The TPG established its approach in a core group meeting in February, which was the kick-off of its activities.

The chosen approach is to analyse the question 'What are the territorial trends of the management of the Natural Heritage?' along four lines:

1. How to define natural heritage with regard to its management and the spatial impact thereof?
2. Which relevant territorial trends should be considered?
3. Which are essential variables of the management of natural heritage?
4. What is the interrelation between those three strands?

This last broad question is the core of this project that aims at policy recommendations for influencing the spatial developments with regard to the natural heritage.

The simplest approach would be to define the territorial trends of natural heritage as the development of the surface designated to protected natural areas. But, since this would not give due respect to the value of natural heritage in non-protected areas, geographical features or landscapes the definition used for natural heritage is wider. The applicability of the results for policy recommendations with regard to the objectives of ESDP requires also a more complex definition of the spatial developments to be considered: urbanisation, urban pattern, development of infrastructure and landscapes.

Analysis of the interrelation of territorial trends, management and natural heritage resulted in a set of key questions. The answers to those key questions present the most relevant territorial trends of the management of the natural heritage.

The monitoring system that results from this project will be based on the indicators required to answer those key questions. In this first interim report the key questions, the indicators and the required data are presented.

### 2. Key questions

Spatial developments as well as the management of natural heritage occur on a multitude of spatial scales. Therefore the study of interrelations requires a multi-level approach. The distinction in macro, meso, and micro level as has been proposed by ESPON project 3.1 seems adequate for the purpose of this project. According to those scales thirteen key questions have been formulated:

Macro: *What is the influence of the management of large bio-geographic features and ecological network on urbanisation and the development of large infrastructure?*

*How effective are EU and national level activities for the management of natural heritage.*

1. What is the influence of the management of large biogeographic features with regard to urbanisation?
2. What is the influence of the management of large biogeographic features with regard to the development of large infrastructures?
3. What is the influence of the management of the ecological network with regard to urbanisation?
4. What is the influence of the management of the ecological network with regard to the development of large infrastructures?

Meso: *What is the influence of the management of protected natural areas and specific land cover types on the patterns of urbanisation and networks of main infrastructure?*

5. What is the influence of the management of protected natural areas with regard to the pattern of urbanisation?
6. What is the influence of the management of protected natural areas with regard to the network of main infrastructures?
7. What is the influence of the management of protected natural areas with regard to specific landscape types?
8. What is the influence of the management of semi natural landcover types with regard to the pattern of urbanisation?
9. What is the influence of the management of semi natural landcover types with regard to the network of main infrastructures?
10. What is the influence of the management of semi natural landcover types with regard to specific landscape types?

Micro: *What is the influence of the management of the semi-natural habitat types and of the protected natural areas on urbanisation?*

11. What is the influence of the management of protected natural areas with regard to urbanisation (shift to artificial landcover types)?
12. What is the influence of the management of semi natural habitat types with regard to urbanisation (shift to artificial landcover types)?

All scales:

13. How effective is EU and national level management of the natural heritage?

### 3. Indicators

The selection of indicators needs to be based on the project's objective and key questions. Indicators are needed here to provide a way to describe and evaluate natural heritage. They also should be used for monitoring purposes in the future and should therefore be quantifiable.

The following set of indicators and supporting information will be required:

#### For biodiversity:

- Species richness of a relevant set of selected species per unit area: total number of (sub)species that have been identified as being of European importance (Bern Convention annex species for pan-Europe, EU Birds and Habitats Directive annex species for EU) per unit area - 50x50 km cell). For the micro scale this may be replaced by species of national or local conservation concern;
- Richness of semi-natural habitat types per unit area: total number of semi-natural CORINE land cover types per unit area (50x50-km cell). For the micro scale this may be replaced by habitat types at the national or local scale;
- Extent of semi-natural land cover types: area coverage of identified semi-natural CORINE land cover types (mapped as absolute boundaries or as percentage cover per unit area - 50x50 km grid cell);
- Extent of Pan-European Ecological Network: location of areas that have been identified to possibly become part of PEEN;
- Location and extent of designated areas: point location and absolute boundaries of all types of internationally and nationally protected areas (selected on the basis of size that varies between macro, meso and micro scale).

#### For geomorphology:

- Altitude;
- Steepness: altitude difference / slope length, expressed per unit area;
- River basins: including the boundary of river catchments at various hierarchical scales;
- Coastline: location and size of islands and their distance from the mainland;
- (Semi)permanent ice coverage: location and size of areas that are covered with ice or snow for more than 9 (?) months per year.

#### For spatial development:

- Urbanisation;
- The development of large infrastructure;
- Pattern of urbanisation;
- Networks of main infrastructure;
- Landscape types;
- Changes towards more artificial landcover types (urbanisation).

For management:

- Resource allocation for nature protection;
- Resource allocation for land habilitation;
- Resource allocation for land acquisition;
- Number of agencies involved.



## 1. Introduction

### 1.1. Background

Of central importance for the protection of natural heritage is efficient and effective management. This is increasingly important because of the undesirable effects of human activities on the biotic and a-biotic constituent parts of natural heritage. These constituent parts are strongly interrelated with the development of settlements, intensive human economic and social activities, and all the necessary networks that have been developed over centuries to serve man's socio-economic needs.

The complexity of development factors, enlargement of the European Union, climatic change and the high environmental costs from human activities, in recent years, dictate the need for highly sophisticated, efficient and effective management policies and methods for natural heritage.

Therefore it is no coincidence that four of the main aims of all European Spatial Planning Observation Network (ESPON) projects focus on better spatial decisions, where balanced polycentric development can take place in a sustainable manner.

The long tradition of the management of natural heritage in Europe, coupled with concern over the deterioration of the environment and the mitigation of existing problems, is reflected in the development of a large number of policies and methods which EU member states and other countries apply either unilaterally or in partnership with their neighbours or other countries, where the extent and importance of natural areas goes beyond national boundaries. International conventions and treaties, EU directives, national legislation etc. have been used extensively for the conservation of nature and biodiversity with varying degrees of success.

It is apparent that in the 21<sup>st</sup> century this effort should be accelerated and streamlined, adopting a comprehensive and systematic approach to the development and use of tools, methodology, policy, management and evaluation of its effectiveness.

Having accepted the notion of sustainability as the overarching theme for all future development, a great effort is required in order to positively exploit the diversity of cultural and natural characteristics which are inherent in Europe.

The enlargement of the EU will incorporate more territorial space, as well as a plethora of new natural features of high conservation value and approaches to territorial and natural heritage management. The diversity of EU natural heritage will increase with enlargement, which will provide an even greater impetus for setting up tools for effective management and maintenance of the natural heritage.

For the last thirty years, the European Union has believed that protection of the natural heritage is of paramount importance. The First Environmental Action Programme came into effect in 1973, followed by a series of policy instruments. An interesting summary<sup>1</sup> of the EU environmental policy is the one, which follows:

"The EU's interest in environmental protection dates back to 1972 and the Stockholm Conference. Although the Treaty of Rome did not foresee the need for environment-related action, the Member States at that time agreed that a number of environmental protection concerns required EU-level action. Since 1972, the EU has drawn up five Community action programmes to guide its work in the environment sector. These action programmes have in turn given rise to over 300 pieces of legislation covering pollution of the atmosphere, water and soil, waste management, controls over chemicals and biotechnology, nature protection and environmental impact assessment."

The 300+ EU environmental *Directives and Regulation (acquis)* form a major body of law. Most environmental *acquis* are in the form of directives, which are "binding as to the result to be achieved," but leave the choice of form and methods for achieving the results up to each country. Regulations are directly applicable, superseding any conflicting national laws, and will come into effect at the date of accession. Though regulations cannot be transposed as such, it may be necessary to enact temporary legislation valid until the date of accession, or subsidiary administrative rules as needed to ensure that systems and procedures needed for compliance are in place. However, it is arguable that these do not provide a complete framework for environmental protection. Under the principle of subsidiarity, Community action should be taken only in those areas where there is a Community concern, leaving the Member States free to deal with problems national or local in scope. For example, in Denmark it is estimated that EU requirements comprise only 50 % of the laws needed to form an adequate environmental regulatory framework.

Project 1.3.2 'Territorial Trends of the Management of the Natural Heritage' is launched under the ESPON programme, which follows an integrated approach and will be developed in connection with other ESPON projects that touch related issues.

One of the objectives of ESPON is to identify decisive factors for a more polycentric development of European territory. ESPON project 1.3.2 aims to draw conclusions as to how the ESDP-objectives of polycentricity and sustainable development can be met or be supported through the management (and planning) of natural heritage. This question concentrates on the interrelation between management, natural heritage and territorial trends. Therefore it is necessary to analyse the management of natural heritage and territorial trends and the relationship between these.

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<sup>1</sup> PHARE, Republic of Lithuania, Strategy for Approximation in the Environment Sector, prepared by the Ministry of Environment, 1998.

The following general objectives of the ESPON programme influence the objective and aims of this project.

1. To contribute to the European Spatial Development Perspective (ESDP) fundamental objectives: economic and social cohesion, the conservation of natural resources and cultural heritage and more balanced competitiveness of the European territory;
2. To contribute to the identification of the existing spatial structure of the EU territory in particular the degree and diversity of physical and functional polycentrism at different geographical scales, and to gain concrete and applicable information on the EU-wide effects of spatially relevant development trends and their underlying determinates;
3. To define concepts and to find appropriate territorial indicators, typologies and instruments as well as new methodologies to consider territorial information linked to polycentrism, to detect territories most negatively and positively affected by the identified trends with special reference to regions in terms of accessibility, polycentric development, environment, urban areas, territorial impact assessment, particular attention will be paid to areas exposed to extreme geographical positions and natural handicaps such as mountain areas, islands, ultra-peripheral regions.

#### 1.2. Objective and aims

The central question of the ESPON project 1.3.2 is:

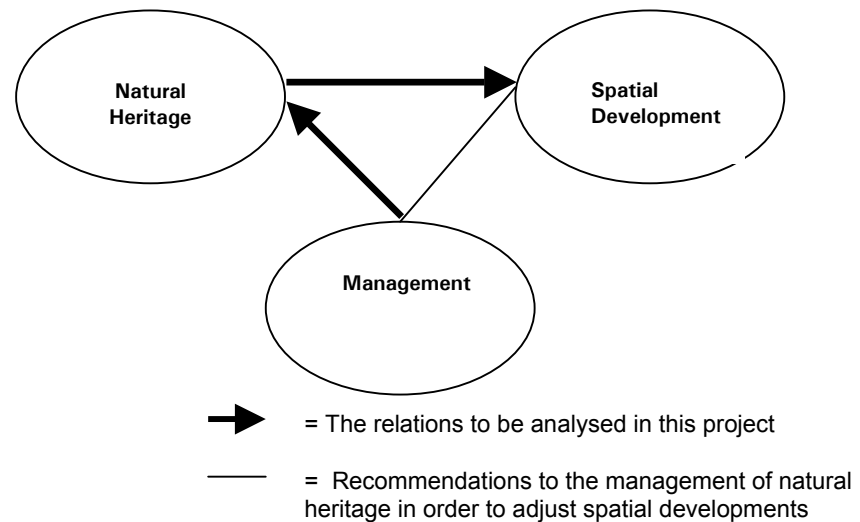
*What is the influence of the management of natural heritage on spatial development?*

This question covers a wide range of issues and is very broad in scope. Therefore the limits of the scope of this study must be clearly defined.

The central question must be addressed at the European scale and a system of monitoring data must be developed for the whole area. Moreover, this project is a first elaboration on this scale for this subject and is planned to be finished within 1.5 years. Taking into account the broad objective, the large number of countries and the lack of data together with the relatively short period that is available for this project, answering the central question requires a precise, careful and robust definition of the scope.

Figure 1.1 presents schematically the three strands of the study and the interrelations between the three strands.

Figure 1.1: Three strands and their relations



### 1.3. Strands and their relations

Natural heritage consists of many different elements and includes both the ordinary (or 'everyday') countryside and 'green' in cities and the outstanding or exceptional elements such as rare species, protected areas, and remarkable ecological processes.

A-biotic features (notably in terms of geomorphology) are also included in the term 'natural heritage'. For example, mountainous regions may have extra value as infiltration zones for large European rivers; wetlands may be especially vulnerable and therefore require protection.

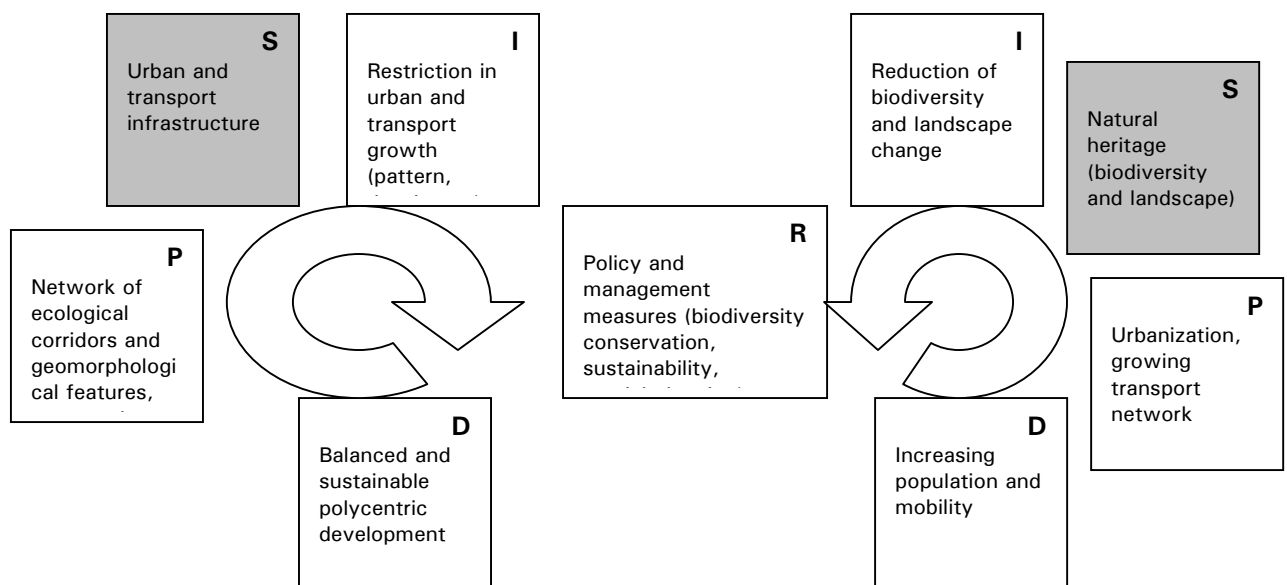
Management of these areas takes place at a range of levels; from day-to-day management up to higher level management where decisions are taken about the acquisition of new land in order to extend the areas designated for their natural heritage value. Here an important relationship exists with the possibilities of spatial planning systems of the European countries and their legal possibilities for protecting the natural heritage.

Territorial trends and spatial developments also occur in many different ways. Urbanisation is a very obvious phenomenon of spatial development, but also slower incremental processes of sub-urbanisation are of great importance within the scope of this project. Many recreational and other economically induced new land uses also gradually increase their territories. Agricultural intensification is another form of spatial development. Alongside these incremental developments, which are leading to higher densities and increases in the paved area, are developments of new roads and railways.

Regarding causal relations, these processes can be expressed in terms of the DPSIR model (Driving Forces, Pressures, States, Impacts and Responses).

Starting from the project's key question 'What is the influence of the management of natural heritage on territorial trends?' one can identify the components of the DPSIR framework from two different angles that are linked through the responses from policy makers and society. In the first perspective the urban and transport infrastructure is the central component on which driving forces and pressures (for example from nature conservation measures) have an impact. In the second perspective the natural heritage has a central position and drivers and pressures impact upon it (for example through increase of urban density). Figure 1.2 provides a schematic presentation of the relationship between these two perspectives, which are linked via the responses from society and policy. These management responses are pro-active in terms of spatial development objectives (as included in the ESDP, left side of figure) and re-active in terms of defensive management actions protecting the natural heritage (righthand side of the figure).

Figure 1.2: Management: pro-active and re-active



The interrelationships between the strands are central. The key questions for the interrelationships of the strands are:

1. Key question 1: What is the influence of the management of large biogeographic features and ecological network on urbanisation and the development of large infrastructure?
2. Key question 2: What is the influence of the management of protected natural areas and specific land cover types on the patterns of urbanisation and networks of main infrastructure?
3. Key question 3: What is the influence of the management of the semi-natural habitat types and the protected natural areas on urbanisation?
4. Key question 4: How effective are EU and national level activities management of natural heritage?

#### 1.4. Work packages

The project has been organised according to the four strands in four distinguished work packages:

Work package 1:

Natural heritage: The aspects of biodiversity, ecology and biogeography

Work package 2:

Spatial development: The aspects of urbanisation, infrastructural development and landscapes.

Work package 3:

Management: The aspects of policies / spatial planning.

Work package 4:

Case studies and scenarios.

The interrelation between the strands is organised by intensive exchange of information, proposals and draft text between the various work packages. This information will be completed with conclusions of the consideration of two possible scenarios and extra information about local practice as has been envisaged from the case studies.

## 1.5. Connection to other ESPON projects

As a basis for further analysis the typology of the European Urban System including three spatial levels has been adopted.<sup>2</sup> This typology distinguishes between the following three spatial levels:

- Macro level: core – periphery – accession countries  
The core – periphery distinction was introduced in the ESDP. ESPON 3.1 added this third dimension: the accession countries. The macro level will be composed of NUTS 1 and 2;
- Meso level: metropolitan areas – urbanised areas – non-urban (rural) areas  
The dimensions at macro level are not homogeneous; there are huge differences in the level of urbanisation. For the meso level, functional criteria are used. The meso level will be composed of aggregated NUTS 5 and NUTS 3 level information;
- Micro level: metropolises – cities – towns – villages  
The micro level will be composed of NUTS 5 information.

Networking with the following TPG's will be undertaken:

- A.1.1.2 Urban-rural relations
- A.1.1.3 Enlargement and beyond for the spatial tissue
- A.1.1.4 Demographic trends and migration
- A.1.2.1. Transport networks, basic supply
- A.1.3.1. Management of natural and technological hazards
- A.1.3.3. Spatial effects of cultural heritage and identity
- A.2.1.1. The EU infrastructure policy
- A.2.1.3. EU agricultural policy
- A.2.2.1. Structural funds
- A.2.3.1. The ESDP in the member states
- A.2.3.2. Co-ordination of territorial and urban oriented policy
- M.3.2. Spatial scenarios and orientations
- M.4.1. Data Navigator

According to the table of 'Core indicators by TPG responsible' (ESPON project 3.1), the project reported on here is responsible for the indicators on:

- Natural heritage;
- Coastal regions.

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<sup>2</sup> This typology, proposed as ESPON-typology in draft guidance paper "From project results to ESPON results" (23 February 2003) as prepared by ESPON-project 3.1, seems useful for the required analysis and should be endorsed for the sake of uniformity of the various ESPON projects.

## 2. Scope

The ambition to produce, in a relatively short period, useful policy recommendations for influencing spatial developments in the direction of ESDP-objectives requires an efficient goal oriented approach. Therefore the scope should be determined carefully but at the same time in a practical way. This necessitates definitions of the key concepts so that the central questions are covered sufficiently, resulting in useful recommendations.

This section aims to define the scope of the project by defining the key concepts of natural heritage, spatial development and management. It also provides information about the geographical level, time period and other basic conditions for data collection.

### 2.1. Natural heritage

The UNESCO World Heritage Convention, art. 2) defines natural heritage as:

*'Natural features consisting of physical and biological formations or groups of such formations, which are of outstanding universal value from the aesthetic or scientific point of view'.*

Such a definition would limit the project's scope to the 'outstanding' only, whereas it is desirable to consider the whole range of biodiversity. The objectives of this project require including 'biodiversity' and large geomorphological features.

'Biodiversity' is defined according to the Convention on Biological Diversity as:

*'The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems'.*

Marine ecosystems and genetic diversity will not be considered in this project.

Semi-natural areas can be defined as those parts of the land on which natural and ecological processes fulfil a dominant role. Areas that are characterised by dominant human influences are therefore excluded. In more practical terms, the CORINE land cover data set provides a good basis for making this distinction on a European scale:

- Class 1 of the CORINE nomenclature (artificial surfaces), falls entirely under 'non-natural areas';



- Class 2 (agricultural areas) can be divided into non-natural (2.1 Arable land and 2.2 Permanent crops) and semi-natural areas (2.3 Pastures and 2.4 Heterogeneous agricultural areas);
- Class 3 (Forests and semi-natural areas), class 4 (Wetlands) and class 5 (Water bodies) are all regarded as 'semi-natural areas'.

## 2.2. Spatial Development

Spatial development is:

- urbanisation,
- the increase of infrastructure.

Of major concern is the pace at which land is being consumed by urban development in Europe. Rural settlements further down the urban hierarchy and more remote from major cities are also subject to urbanisation pressures. Also within urban settlements, the loss of green space is a major issue.

The outward spread of cities, with dwellings and commercial and business developments on the outskirts threaten rural areas and landscapes. For 'landscape' the definition of the European Landscape Convention could be adopted:

*'An area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors'.*

The trend towards a more land-extensive structure of cities and the increasing separation between activities has exacerbated the growth in car traffic and has resulted in an increase in infrastructure e.g. roads and railways. The expansion of infrastructure is not an end in itself, but a consequence of a society that depends on mobility. This project focuses on linear transport infrastructure, including motorways, railways, canals and rivers, at the international and national level. The question here is: to what extent are they causing the fragmentation of natural entities?

Spatial developments include a variety of changes in land use. A change from natural/semi-natural land cover to agricultural land use can result in intensification of land use and might also include construction of buildings such as greenhouses and large stables. Whilst urbanisation of agricultural land results in residential and commercial land uses. Also recreational activities increasingly require built facilities. All these spatial developments go along with building activities in different densities. On top of that, access to these facilities require new roads and parking spaces. All those changes in land use have in common that roofs and pavements seal the surface. This causes increased run-off of water and decreased infiltration.

### 2.3. Management

This project is concerned with management of natural heritage and the management of territorial trends (spatial developments) which are likely to affect natural heritage. Management of natural heritage includes acquisition of land, fiscal incentives to owners, spatial zoning (planning), recreational exploitation of natural areas, site management and citizen awareness. Management of territorial trends includes planning and policy for changes in land use, shifts between built-up areas and open spaces, land cultivation for agricultural uses and the expansion of infrastructure networks. The management of these aspects is partly related to the possibilities of the national planning systems to influence developments.

### 3. Key questions

In order to focus the scope of this project it is important to specify key questions relating to the different phenomenon of natural heritage and spatial developments. Addressing four key questions results in narrowing down the broad concept of management of natural heritage in relation to spatial development. The table below sets out questions at the three spatial scales. The last column contains the central questions for both management strands (management of natural heritage and management of spatial development).

#### *Key management questions*

Scale	Natural heritage (aspects)	Spatial development (processes)	Management questions of <ul style="list-style-type: none"> <li>Natural heritage</li> <li>Spatial development</li> </ul>	
<b>Macro</b> <ul style="list-style-type: none"> <li>- Core</li> <li>- Periphery</li> <li>- Accession countries</li> </ul>	<ul style="list-style-type: none"> <li>• Large biogeographic features</li> <li>• Ecological network</li> </ul>	<ul style="list-style-type: none"> <li>• Urbanisation</li> <li>• The development of large infrastructure</li> </ul>	What is the influence of the management of large biogeographic features and ecological network on urbanisation and the development of large infrastructure? <b>(question 1)</b>	How effective are EU and national level activities for the management of natural heritage? <b>(question 4)</b>
<b>Meso</b> <ul style="list-style-type: none"> <li>- Metropolitan areas</li> <li>- Urbanised areas</li> <li>- Rural/peripheral areas</li> </ul>	<ul style="list-style-type: none"> <li>• Semi-natural land cover types (CORINE)</li> <li>• Protected natural areas</li> </ul>	<ul style="list-style-type: none"> <li>• Change in pattern of urbanisation</li> <li>• Change in networks of main infrastructure</li> <li>• Change in landscape types</li> </ul>	What is the influence of the management of protected natural areas and specific land cover types on the patterns of urbanisation and networks of main infrastructure? <b>(question 2)</b>	
<b>Micro</b> <ul style="list-style-type: none"> <li>- Metropolises</li> <li>- Cities</li> <li>- Towns</li> <li>- Villages</li> </ul>	<ul style="list-style-type: none"> <li>• Semi-natural habitat types</li> <li>• Protected natural areas</li> </ul>	<ul style="list-style-type: none"> <li>• Changes towards more artificial land cover types (urbanisation)</li> </ul>	What is the influence of the management of the semi-natural habitat types and of the protected natural areas on urbanisation? <b>(question 3)</b>	

The key questions and sub-questions for each scale level are as follows:

1. Macro level:

*What is the influence of the management of large bio-geographic features and ecological network on urbanisation and the development of large infrastructure?*

- What is the influence of the management of large biogeographic features with regard to urbanisation?
- What is the influence of the management of large biogeographic features with regard to the development of large infrastructures?
- What is the influence of the management of the ecological network with regard to urbanisation?
- What is the influence of the management of the ecological network with regard to the development of large infrastructures?

2. Meso level:

*What is the influence of the management of protected natural areas and specific land cover types on the patterns of urbanisation and networks of main infrastructure?*

- What is the influence of the management of protected natural areas with regard to the pattern of urbanisation?
- What is the influence of the management of protected natural areas with regard to the network of main infrastructures?
- What is the influence of the management of protected natural areas with regard to specific landscape types?
- What is the influence of the management of semi natural landcover types with regard to the pattern of urbanisation?
- What is the influence of the management of semi natural landcover types with regard to the network of main infrastructures?
- What is the influence of the management of semi natural landcover types with regard to specific landscape types?

3. Micro level:

*What is the influence of the management of the semi-natural habitat types and of the protected natural areas on urbanisation?*

- What is the influence of the management of semi natural habitat types with regard to urbanisation (shift to artificial landcover types)?

- What is the influence of the management of protected natural areas with regard to urbanisation (shift to artificial landcover types)?

Key question 3 at the micro level should, preferably, focus on the effectiveness and efficiency of EU, national and local policies for natural heritage and spatial development. The implementation and control of policy are essential for the trends of natural heritage and spatial development. It will be impossible to do an inventory and exploration of all entities at the micro level. It is therefore proposed to address these efficiency and effectiveness aspects mainly in the case studies.

4. All levels:

*How effective are EU and national level activities for the management of natural heritage?*

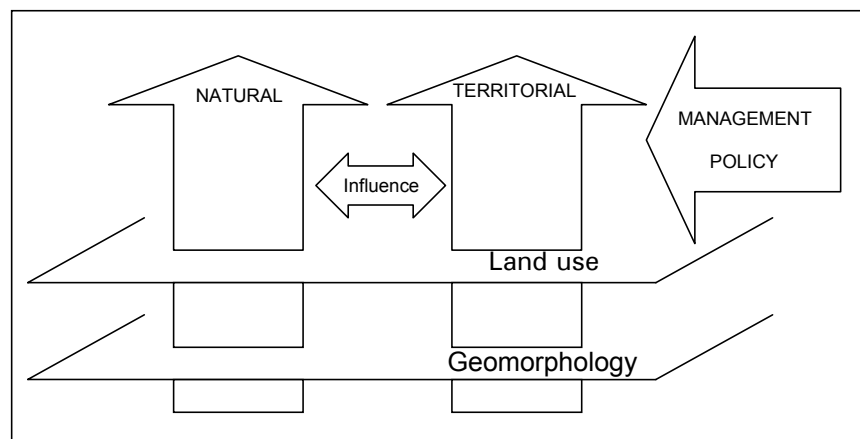
- How effective is EU and national level management of the natural heritage?

## 4. Method and Analysis

### 4.1. GIS and Database

The data-collection and storage will be structured according to the three strands; natural heritage, spatial development and management. For these strands indicators will be developed that are based on the analytical requirements of the different work-packages and the available data. The input to these indicators will consist of data related to geomorphology and land use. Figure 4.1 illustrates the different information layers and strands.

Figure 4.1: Information layers and strands



#### *Information layers (GIS-layer)*

- **Geomorphology:**  
This layer includes the geomorphologic features and soil types resulting from long-term physical processes (mountain ranges, coastal areas, wetlands, river basins, archipelagos). It also includes the hydrological system and the main ecological structure. These natural factors create conditions, which may influence or restrict the possibilities for spatial developments.
- **Land use:**  
This information layer will consist of the status quo of land use, human settlements and infrastructure networks.

#### *Case studies and scenarios:*

These will provide information relevant to the different case studies and scenarios. It is anticipated that the results of the case studies will be at a different scale and level than the pan-European data (scenarios and case studies are detailed further in chapter 10).

#### 4.2. Database design

An important requirement for the project is the facility to present the information in a consistent format for visualisation and dissemination. GIS links two kinds of map information:

- First of all the spatial information that describes the location, shape of geographic features and the spatial relationships between features;
- Secondly the descriptive or attribute information for the geographic features.

Displaying data in a spatial manner can reveal geographic relationships that might otherwise not be identified, thereby providing new insights into the data. The information in the tabular database can either be accessed through the map, or maps can be created based on information in the tabular database.

The database and mapping tools will be set up according to the specifications defined by ESPON project 3.1. The data will be generated and supplied to project 3.1 in Access format for the database input and the ArcView format for the GIS input:

- Geographic layers: boundaries of data specified shown on maps. Maps can be raster-oriented (landcover data, grid values combined with a raster cell) or vector oriented (point, line and polygon data);
- Descriptive data in tables: Average of summarised data per NUTS region. The majority of statistical data will be at level 2 , with some at level 3.

After screening, the intermediate results and end results will be described in a meta information system. A meta information system can be considered as a database of databases. It provides an index on the available information, its origin, quality, restriction in re-use etc. Without a good meta database the accessibility of the data archive will be minimal. The expected meta-information includes:

- Content: contents of the dataset;
- Scale: scale of layers, NUTS region level for statistical data;
- Projection: geographical projection;
- Extent: countries of EU data is collected for;
- Date(s): Date of collection, conform the metadata standards specified in the GISCO database;
- Source: origin of data;
- Type: Fact, Management policy, Prediction, Analysis Result.

#### 4.3. About the data

### *Europe*

The geographical area covered by this project includes the EU, the Candidate Countries and 2 extra countries, which are:

- The member states Belgium, Denmark, Germany, Greece, Spain, France, Ireland, Italy, Luxembourg, Netherlands, Austria, Portugal, Finland, Sweden, United Kingdom;
- The accession countries Hungary, Poland, Romania, Slovakia, Latvia, Estonia, Lithuania, Bulgaria, Czech Republic, Slovenia;
- Norway and Switzerland.

### *Time period*

Monitoring spatial trends on large areas requires long term observations. Preferably, statistical data related to the years 1970, 1990-2000 would be collected. It is however impossible to gather information over such a period for all European and accession countries and for all indicators. Gaps in the interpretation of the information can be filled with information from the case studies, if available and understandable. The availability of data will therefore have an effect on the scope of the project.

### *Quantitative and qualitative data*

The indicators can be of a quantitative or qualitative nature. The project is about building databases to monitor developments. The emphasis will be on quantitative indicators, however qualitative indicators should not be neglected. Qualitative information will be gathered in a later stage of the project when case studies are carried out.

### *Scale*

Some of the indicators are useful and available at all scales, some only at one scale, e.g. the local scale. The 1998 revision of the NUTS regional system will form the basic geography of the analysis. The default level of analysis will be NUTS3. Data will be provided at different geographical scales (EU/candidate countries, country, NUTS1, NUTS2, NUTS3 and NUTS5) and resolutions.

### *Existing data*

The study will use existing data sources. Collection of new data will not be possible within the confines of the project time scale and budget.



## 5. Natural Heritage

The purpose of this chapter of the report is to consider in detail the definition of natural heritage.

### 5.1. Data sources

The principal data sources are listed below.

Data sources	Description	Availability
Worldmap	Species distribution in Europe (terrestrial vertebrates and 20% of vascular plants)	London NHM
Pan-European Ecological Network for Central and Eastern Europe	Areas that have been indicated to become part of PEEN as core areas, corridors, buffer zones or restoration areas (CEE only)	ECNC, Alterra
Digital Map of European Ecological Regions	Ecological distinct areas in Europe, on the basis of updated knowledge of climatic, topographic and geobotanical European data, together with the judgement of a large team of experts from several European nature related Institutions and the WWF. This may be an alternative for biogeographic regions.	EEA, <a href="http://dataservice.eea.eu.int/dataservice">http://dataservice.eea.eu.int/dataservice</a>
Land cover (CORINE)	Land cover in 44 classes	EEA, <a href="http://dataservice.eea.eu.int">http://dataservice.eea.eu.int</a>
Biotopes (CORINE)	The CORINE Biotopes, inventory of major nature sites. This could be used as an extra layer for the micro level.	EEA, <a href="http://dataservice.eea.eu.int/dataservice">http://dataservice.eea.eu.int/dataservice</a> European Topic Centre on Nature Protection and Biodiversity
Forest Statistics	Forest by Species groups, Categories of naturalness, Change over time in area of forest (Units: 1000 ha )	UNECE/FAO
Common Database of Designated Areas (CDDA)	Nationally and internationally protected areas in Europe	UNEP-WCMC, EEA
100m DEM of Europe	Elevation data set over most of Europe	Worldsat ( <a href="http://www.worldsat.ca/image_gallery/new_data/shade_b ig.html">http://www.worldsat.ca/image_gallery/new_data/shade_b ig.html</a> )
Wetlands database	Distribution of wetland areas created for the Wetlands in Danger book in 1993	UNEP-WCMC
Important Bird Areas (IBAs)	Point locations of Important Bird Areas in Europe	BirdLife International
WWF forest hotspots	Point locations of European forest hotspots	WWF
Biogeographic regions of Europe	The biogeographic regions dataset (Version 1998) contains the official delineations used in the Habitats Directive (92/43/EEC) and for the EMERALD Network set up under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention).	EEA, <a href="http://dataservice.eea.eu.int/dataservice/available.asp">http://dataservice.eea.eu.int/dataservice/available.asp</a>
PELCOM	Pan-European Land Use and Land Cover Monitoring project, 1km resolution	<a href="http://cgi.girs.wageningen-ur.nl/cgi/projects/eu/pelcom/index.htm">http://cgi.girs.wageningen-ur.nl/cgi/projects/eu/pelcom/index.htm</a>

## 5.2. Indicators

In the previous paragraph an overview is presented of the data sources and statistics that may be used to underpin the indicators that need to be selected for the project. The final selection of indicators will define which data sources will actually be needed.

The selection of indicators needs to be based on the project's objective or key question. This question contains the concept of 'natural heritage' that has been defined as a composition of both biotic and a-biotic parts. Indicators are needed here to provide a way to describe and evaluate natural heritage. They also should be used for monitoring purposes in the future and should therefore be quantifiable.

The following set of indicators and supporting information will be required:

### For biodiversity:

- Species richness of a relevant set of selected species per unit area: total number of (sub)species that have been identified as being of European importance (Bern Convention annex species for pan-Europe, EU Birds and Habitats Directive annex species for EU) per unit area - 50x50 km cell). For the microscale this may be replaced by species of national or local conservation concern;
- Richness of semi-natural habitat types per unit area: total number of semi-natural CORINE land cover types per unit area (50x50-km cell). For the microscale this may be replaced by habitat types at the national or local scale;
- Extent of semi-natural land cover types: area coverage of identified semi-natural CORINE land cover types (mapped as absolute boundaries or as percentage cover per unit area - 50x50 km grid cell);
- Extent of Pan-European Ecological Network: location of areas that have been identified to possibly become part of PEEN;
- Location and extent of designated areas: point location and absolute boundaries of all types of internationally and nationally protected areas (selected on the basis of size, which varies between macro, meso and micro scale).

### For geomorphology:

- Altitude;
- Steepness: altitude difference / slope length, expressed per unit area;
- River basins: including the boundary of river catchments at various hierarchical scales;
- Coastline: location and size of islands and their distance from the mainland;
- (Semi)permanent ice coverage: location and size of areas that are covered with ice or snow for more than 9 (?) months per year.

### 5.3. Output

Having identified the data sources and indicators, it is important to establish to describe the state of natural heritage and the changes therein in relation to spatial developments.

The following steps are proposed for each of the geographical levels considered in the ESPON projects.

#### *Basic maps*

- the large biogeographic features (macro scale);
- ecological network (macro scale);
- semi-natural land cover types (meso scale);
- protected natural areas (meso scale);
- semi natural habitat types (micro scale);
- protected natural areas (micro scale).

#### *Thematic maps*

##### Macro level:

1. map of mountain regions based on a combination of altitude (> 1000 m) and steepness (> 10%);
2. map of small (< 2500 km<sup>2</sup>) and remote (> 10 km from mainland) islands based on coastline data;
3. map of pan-European ecological network for CEE. For other countries map out combination of large protected areas (> 10,000 ha), major river basins with low urban densities, large forests (> 10,000 ha), large wetlands and water bodies (> 10,000 ha) and grid cells with more than average richness in protected species;
4. a map of major natural structure of Europe (combined maps produced in step 1-3).

##### Meso level:

1. map of semi-natural land cover types from CORINE (or alternatively map of % coverage of semi-natural land cover types per grid cell of 50x50 km or per NUTS3 region);
2. map of number of selected species. Present per grid cell to identifying grid cells with more than average richness in protected species of European importance;
3. map of large protected areas, including national parks and protected landscapes (> 5,000 ha) (Alternatively map out % coverage of protected areas per grid cell or per NUTS3 region);
4. map of natural heritage of Europe; combined maps produced in step 1-3 .

##### Micro level:

1. map of semi-natural habitat types from local sources (>25 ha or point location of very vulnerable habitats);
2. map of number of selected species present per micro-scale grid cell (1x1 km, depending of data quality at case study level) identifying grid

- cells with more than average richness in protected species of national or local importance;
3. map of protected areas, including national parks and protected landscapes (> 250 ha);
  4. map of natural heritage of micro scale; combined maps produced in step 1-3.

## 6. Spatial Development

The purpose of this section of the report is to consider in detail the definition of spatial development.

### 6.1. Indicators

The territorial trends of the management of natural areas appear eventually as spatial development in areas of different scale levels. This project aims to establish and monitor different spatial developments in relation to different forms of management of the natural heritage and different types of natural heritage.

Therefore, relevant spatial developments should be considered in general first. These will then be related to the variables of management and natural heritage in order to consider their interrelationships. The latter exercise concentrates on answering the key-questions (see chapter 4).

### 6.2. Data sources

Relevant information will be gathered by analysing selected key developments. Four specific types of spatial developments have been chosen which would enable monitoring throughout Europe:

1. Impermeable surface: the (increase of the) area that is covered by buildings and pavements
2. Spatial patterns: the (changing) spatial distribution of urban areas
3. Infrastructure: the (increase of the) length of main infrastructure
4. Land uses: changes in land use

#### *Type 1 Impermeable surface*

The impermeable surface - the built and paved surfaces – has less potential for the development of natural heritage. Therefore the amount of impermeable surfaces in hectares in relation to the total area will be measured and mapped. In this way a shifting impermeable surface index can be established. Impermeable areas contain various land-use types like residential areas, industrial parks, greenhouses, recreational resorts as well as roads, parking space, etc.

The appropriate geographical level will be NUTS 3.

The following data-source will be used:

Data sources	Description	Availability
Land cover	The 44 land cover classes from the databases will be addressed to impermeable or permeable surfaces	Derived from CORINE land cover

It should be noted that each land cover class will consist of:

- impermeable surfaces, and therefore less potential for the development of natural heritage and,
- permeable surfaces, and therefore high potential for the development of natural heritage.

For instance, the class 'continuous urban fabric' consists of houses, flats etc (the impermeable surfaces) but also of gardens and parks (the permeable surfaces). The same applies to the more or less permeable land cover uses such as 'pastures', which include farms and roads.

Nevertheless the CORINE land cover data seems the appropriate data source for this indicator.

We suggest the following land cover classes to be part of the impermeable surface:

- 1.1.1. continuous urban fabric
- 1.1.2. discontinuous urban fabric
- 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
- 1.3.1. mineral extraction sites
- 1.3.2. dump sites
- 1.3.3. construction sites
- 1.4.1. green urban areas
- 1.4.2. sport and leisure facilities

The other classes are suggested to be part of the permeable surface, which has potential for the development of natural heritage.

### *Type 2 Spatial patterns*

The spatial patterns of the urbanisation processes are relevant for natural heritage: the envisaged equal distribution of urban areas will affect natural heritage. The way in which this occurs depends on whether development is concentrated or linear.

Three indicators are distinguished:

- A. The distribution of population: growth in the number of persons in given spatial unit.
- B. The age-composition of the population in a given spatial unit: this indicator offers useful background information for future developments.
- C. Spatial pattern: the spatial distribution of urban areas will be expressed in terms of an urbanisation concentration index, which is the opposite of the fragmentation index as defined by the European Environment Agency (EEA).

The appropriate geographical level will be NUTS 3.

The following data-sources will be used:

Data sources	Description	Availability
Social economic statistics	Regional statistics Statistical Yearbook 2002 Data: Population	EUROSTAT Regional statistics
Concentration index spatial settlement <sup>*)</sup>	To develop. This indicator has the same composition as the fragmentation index for natural areas – [THIS NEEDS FURTHER EXPLAINING]	EEA (which is based on CORINE)

<sup>\*)</sup> Concentration index of spatial settlement: The European Environment Agency (EEA) developed a fragmentation index for sensitive areas by pressure from surrounding artificial territories such as urbanisation and transport infrastructure. EEA used a 10 x 10-km grid size because this gives the best coarse representation on the EU scale. They developed a formula with the connectivity of natural grid cells, the average size of the clusters in a square kilometre and the total area of all nature pixels in a square kilometre. This index can be used for natural areas as well as spatial settlement, and gives information on the concentration and fragmentation of the areas: the spatial pattern. The formula is relatively simple and transparent.

### *Type 3 Infrastructure*

The fragmentation of areas containing protected natural values or large biogeographical entities by the construction of infrastructure is a phenomenon that can be addressed by targeted management, policies and planning.

Fragmentation occurs mainly by the most intensively used roads and railways. Therefore, national highways with separated lanes are considered. This includes the Trans European Network, international and national highways. The increase in length in kilometres will be measured and mapped.

Canals are thought to be a minor cause when it comes to fragmentation of natural areas and will therefore not be part of the analysis. The same applies to the railway-network. Here the frequency of passing trains seems to be the problem instead of the amount of railway kilometres.

The analysis will be done at the meso and macro level.

The following data-sources will be used:

Data sources	Description	Availability
Infrastructure Main roads	The international and national road Network (including table with extra set of TEN network data available)	GISCO-database (RDEU)

### *Type 4 Land uses*

Spatial developments lead to changes in land uses that can occur in areas with high development pressures and areas under less pressure.. The management of natural heritage may, in areas under high development pressure, be directed on the defence of natural values. Territorial trends will show the resulting spatial developments.

In peripheral areas where the population is moving out, the natural heritage is under less pressure and the land prices are lower, so the possibilities to acquire land to be used for natural heritage increase.

Shifts in land uses go along with incremental processes at the local level, which results in slow changes in biodiversity and landscape types.

The appropriate geographical level will be NUTS 3.

The following data-source will be used:

Data sources	Description	Availability
Landcover	The 44 landcover classes from the databases will be addressed to sealed or non-sealed surfaces	Derived form CORINE landcover

The shift in the following land uses will be preferably measured and mapped:

extensive agricultural land cover: CORINE land cover classes:

- 2.4.3. land principally occupied by agriculture, with significant areas of natural vegetation
- 2.4.4. natural grassland
- 2.4.5. moors and heathland

intensive agricultural areas: CORINE land cover classes:

- 2.1.1. non-irrigated arable land
- 2.1.2. permanently irrigated arable land
- 2.1.3. rice fields
- 2.2.1. vineyards
- 2.2.2. fruit trees and berry plantations
- 2.2.3. olive groves
- 2.3.1. pastures
- 2.4.1. annual crops associated with permanent crops
- 2.4.2. complex cultivation patterns
- 2.4.4. agro-forestries

recreational areas:

- 1.4.2. sport and leisure facilities

residential areas:

- 1.1.1. continuous urban fabric
- 1.1.2. discontinuous urban fabric
- 1.3.3. construction sites
- 1.4.1. green urban areas

industrial areas

- 1.2.1. industrial of commercial units
- 1.2.3. port areas
- 1.2.4. airports
- 1.3.1. mineral extraction sites
- 1.3.2. dump sites
- 1.2.2. road and rail networks and associated land

natural areas

the other classes



### 6.3. Output

#### *Basic maps*

- urban areas and large infrastructure (macro scale);
- pattern of urbanisation (meso scale);
- network of large infrastructure (meso scale);
- landscape types (meso scale);
- more artificial land cover types (micro scale);

#### *Thematic maps*

- artificial landcover types surfaces;
- non or semi artificial landcover types;
- the amount of permeable surfaces;
- the distribution of population: growth in the number of persons in given spatial unit;
- the age composition of the population in a given spatial unit;
- the spatial distribution of urban functions;
- infrastructure network;
- the change in land uses;
- shift towards artificial landuse (urbanisation).

## 7. Management

### 7.1. Introduction

Built-up areas and centres of economic activity are often established around areas of natural beauty and areas of enhanced environmental quality. These qualities are highly valued in terms of economic activity and growth. However, integration of these values into spatial planning is not always adequate. Protection and management of the natural heritage has largely been developed with a lack of attention paid to long-term spatial planning. This results in the protection of certain threatened areas and species and a lack of protection for European natural heritage in its wider sense.

Deterioration in the quality and extent of the European natural heritage could be the outcome of either a lack of management, or of the unsuccessful implementation of management regimes. The study will consider a "do nothing" option for management as one of the scenarios in order to determine the outcome of a lack of successful management.

In relation to management of the natural heritage, questions include what is being managed? and what should be managed? Other questions such as: why is it managed? how is it managed? and how effective is the management? must also be answered, and this may require qualitative comment rather than quantitative data.

Research into management will consider how the type, quality and extent of management vary across Europe.

Information on management is essential for understanding the degree of aggregation or disaggregation between planning, policy and management in Europe. The integration of environmental protection into spatial planning will be explored thoroughly, as it is a key solution for achieving protection of the natural heritage and sustainable development. The issue is of even greater importance now, as Eastern and Central European countries along with Cyprus and Malta prepare to join the European Union. The enlarged EU will embrace additional natural areas and new cultural dimensions. This situation calls for a more comprehensive and systematic approach to the protection of the natural heritage. The effectiveness of any protection of the European natural heritage relies greatly on the uniformity of relevant management measures within the continent, since political borders are of no importance in relation to natural heritage.

The EU, through the ESDP and other policy measures, is seeking to promote polycentric patterns of economic growth. This approach to spatial planning emphasises the importance of good accessibility, both in terms of transport and accessibility to a wide range of services. It also highlights the importance of integration of spaces (including transnational integration), promotion of dynamic urban growth centres and the linking of peripheral and

disadvantaged areas to those centres. It is important that this project considers the effects of the management of the natural heritage on the EU approach to spatial planning and identifies any conflicting issues and goals. Recommendations will be made as to how these conflicts could be resolved.

## 7.2. Indicators

- Percentage of natural areas covered by management plans;
- Subject matter under management;
- Resource allocation for nature conservation;
- Resource allocation for land rehabilitation;
- Resource allocation for land acquisition;
- Resource allocation for grants and incentives;
- Number and Type of agencies involved.

A. The following four indicators: resource allocation for nature conservation, land rehabilitation, land acquisition and grants and incentives will facilitate the evaluation of the weight given to policies, by country and Europe as a whole.

Indicators in section A are relevant to key questions 1 and 2, and therefore concern with both the MACRO and MESO level (see table 3.3).

- B. Percentage of natural areas covered by management plans, will assist the evaluation of areas of special concern and possible problem causes.
- C. Subject matter under management, indicates the degree of integration or fragmentation, as the case may be, of the management of Natural Heritage and can be correlated to evaluate effectiveness and range of subject matter.

Indicators in sections B & C are relevant to all key questions and therefore to all levels (see table 3.3).

- D. Finally, Number and type of agencies involved in the management of Natural Heritage will be used to evaluate efficiency and effectiveness.

The indicator in section D is relevant to key question 4 and thus relates to MACRO, MESO and MICRO levels.

### 7.3. Focus

Our research will focus on the three spatial levels outlined earlier in this report (macro, meso and micro) and will address questions relevant to each level.

Research at the macro and meso levels will include:

- a) The recording and analysis of information on policy, planning and management at the EU + level(macro). Information sources will include data from EU Environmental Action Programmes, Europe 2000, the ESDP, and the EU legislative framework (directives, resolutions etc). Similar information for non-EU member countries will be gathered, including specialised management plans funded by foreign aid programmes and UN planning documents.
- b) The recording and analysis of information on policy, planning and management at the National level (meso). Information sources will include data from national environmental reports, regional development plans, protected area management plans, and legislative frameworks of each country.
- c) An evaluation of the characteristics and effectiveness of management over a period of thirty years, which will include the identification of turning points in the evolution of management, using sample years and issues.

#### *Qualitative data*

Analysis of information gathered should provide a qualitative understanding of the interrelationships between natural heritage, spatial development, and management. Information on management at the micro level will be provided through selected case studies.

Besides the use of quantitative data, other available data consists primarily in the form of legislation, directives, regulations etc. in EU member states, prospective member countries and Norway and Switzerland. Moreover, environmental plans and spatial development plans are of great importance and will be explored thoroughly at the national level. International and transborder agreements will also be taken into account. Relevant institutions will be contacted at the national level, including ministries for the environment and spatial planning, environmental agencies, the Natura 2000 network, protected areas networks etc. Key EU agencies will also constitute sources of information, along with international organisations. Major agencies and organisations that will be utilised include the European Council, the European Environment Agency, Eurostat, DG Environment, the Natura 2000 Network, DG Regio, UNEP, UNESCO, IUCN, OECD, World Bank, NATO, etc. Necessary information will mainly be available in document and digital form. Additionally, personal contacts will be established and utilised, especially for the former eastern European territory.

Comparability of available data concerning this work package is not expected to be easy. Nevertheless, because the work package involves researching and analysing the qualitative part of the information, comparability will therefore be made possible through the analysis of information gathered.

The following table outlines the main EU instruments for nature conservation:

Council Directive 79/409/EEC on the conservation of wild birds Birds Directive
Council Regulation (EEC) No 3528/86 on the protection of the Community's forests against atmospheric pollution
Council Regulation EEC/1973/92 establishing a financial instrument for the environment ("LIFE")
Council Directive 92/43/EEC on the conservation of natural habitats and wild fauna and flora Habitats Directive
Council Regulation (EEC) No 2158/92 on protecting forests against fire
Council Regulation (EC) No 338/97 on trade in wild fauna and flora
Directive 2000/60/EC establishing a framework for Community action in the field of water policy
Commission Regulation (EC) No 191/2001 of 30 January 2001 suspending the introduction into the Community of specimens of certain species of wild fauna and flora

The European Union is also party to a number of conventions and other legislative tools, including the Helsinki Convention on the Baltic Sea, the Barcelona Convention for the Protection of the Mediterranean Sea, the Ramsar Convention on the Conservation of Wetlands, the Bern Convention on the Conservation of European Wildlife and Natural Habitats, the Bonn Convention on the Conservation of Migratory Species, the Rio de Janeiro Convention on Biological Diversity, the UNESCO Convention concerning the protection of the World Cultural and Natural Heritage, the European Landscape Convention (Council of Europe), the Mediterranean Landscape Charter etc.

#### 7.4. Output

##### *Basic maps*

- EU policies on natural heritage;
- EU policies on spatial development;
- National policies on natural heritage;
- National policies on spatial development.

##### *Thematic maps*

- to be elaborated.

## 8. Scenarios and case studies

### 8.1. Introduction

Scenarios and case studies are scheduled in the second stage of the project. This chapter describes the provisional thinking at this stage of the function of the scenarios and case studies in the research. How they will best assist in setting guidelines and formulating recommendations for future territorial and sectoral policies?

### 8.2. The scenarios

At this moment it is envisaged to develop two scenarios at the EU level. Since the central question is about the influence of the management of natural heritage it is relevant to compare the impacts of the management 'the effective protection' and 'valorisation of natural heritage' with 'do nothing'.

#### Scenario 1

One scenario would show the evolution on the basis of the current trends. Resting on the outcomes of the database and the analysis and taking into account the conclusions of the other ESPON projects in relation to this survey (for example: urban- rural), this scenario would highlight the driving forces and the pressures as well as the effective impacts and responses of the implemented policies.

The main objective of such a scenario is to evaluate as much as possible the risks for natural heritage if today's "consumption" of it continues, taking into account the management actions that are implemented.

#### Scenario 2

The second scenario would seek to answer the question of what the impact would be of a true and effective protection and valorisation of natural heritage, as the priority objective for sustainable spatial development in the EU. It would present the consequences on urban and infrastructure development and land use shifts. This scenario will be evaluated according to the SWOT model related to main criteria such as economic, social, natural and cultural heritage.

The scenarios building process rests on an integrated approach addressing simultaneously natural heritage issues and spatial development ambitions, related to demography and economy.

In order to ensure this integrated approach, the scenario building process will involve two roundtable sessions with members of the Core Group. The sessions will allow cross fertilisation of ideas and issues in all fields, at the European scale, highlighting the different geographical areas, landscapes and natural resources, which would require special attention.

The aim is to produce two GIS-based maps at a European scale. There will be one map for each scenario showing schematically the main issues.

### 8.3. The case studies

The main objective of the case studies is to help provide an understanding of the effectiveness of natural heritage management, which indeed needs to be appreciated at the local level, the level of policy and action programmes implementation.

The case studies would allow testing of the database on actual examples. This will be used to help select the most relevant and accurate indicators that might help to explain unexpected outcomes of the data analysis.

Finally, the case studies will provide information needed for the development of the scenarios.

Case studies are essential. They offer the opportunity to study thoroughly natural heritage management and evaluate its effectiveness. Case studies would review the history of the management plan (when it started, why, how, expected results, difficulties encountered), examine how the initial plan evolved to the current one, describe the management plan and interpret this information.

Case studies will draw on written documentation and interviews.

Thus research will focus on 4 or 5 areas/landscapes. The selection will be based on a list of relevant areas/landscapes.

The criteria for selection would include:

- The existence of management over a sufficient period allowing for evaluation.
- The availability of contacts. The areas selected should fit with the geographic origin of the different members of our team and their contacts (also in the accession countries), in order to take advantage of the diversity of nationalities and cultures which constitute this group, and their knowledge on specific areas linked with their professional experiences.
- The availability of data at the local level showing evidence of the management processes.
- The exemplarity for regions elsewhere in Europe.

The case studies will be valuable because they will link the theory of the research with actual examples in member states. It is therefore important that selection and methodology are decided early in the process.

## 9. Towards a second interim report

### 9.1. Analysis

In the previous chapters the conceptual framework of the ESPON-project 1.3.2. has been developed and elaborated on. The key questions, sub-questions and indicators serve to narrow down and define the scope of the project. This final chapter provides an outline of the types of analyses that will be employed to answer the key questions and sub-questions, using the data/indicators discussed in the previous chapters.

The four key questions and 13 sub-questions combined with the seven management indicators provide a conceptual framework, which forms the starting point for the second stage of the project. Figure 9.1 shows an extract of this framework.

Figure 9.1 Extract of the conceptual framework

	Management indicators						
	1	2	3	4	5	6	7
Key question 1							
Sub question 1.1							
Sub question 1.2							
Etc.							

The seven management indicators:

- Percentage of natural areas covered by management plans;
- Subject matter under management;
- Resource allocation for nature conservation;
- Resource allocation for land rehabilitation;
- Resource allocation for land acquisition;
- Resource allocation for grants and incentives;
- Number and Type of agencies involved.

The full framework would list all the key questions and sub-questions and therefore contain 119 cells. Not all of these combinations of questions and indicators are relevant for the objectives and aims of the project and not all are measurable. The selection of relevant indicators in relation to each question/sub-question will be based on the following principles:

- which combinations of questions and indicators are relevant for the objective and aims of the project?
- which combinations lead to analyses that can be made operational?
- for which of these analyses is data available?



This selection will result in a list of research questions that can be operationalised. The following examples of analyses give an indication of possibilities:

- A number of European management policies and measures focus on large biogeographic features and try to protect these features e.g. the EU Strategy for Integrated Coastal Zone Management (ICZM). The assumption is that these measures 'guide' urbanisation and the development of infrastructure in such a way that most vulnerable and sensitive areas can be kept free from urban development. The following question seems relevant: Which EU management measures aim to reduce the pressures of urbanisation on vulnerable and sensitive areas?
- Within Europe there are several management measures and policies for the development and maintenance of specific landscape types. The aim is to protect the qualities of the specific landscape types. The following question could be elaborated: Is there a relationship between the management of specific landscape types and urban settlement?

A vital question to investigate is does the presence of protected natural areas stimulate a faster growth of nearby towns and cities (as opposed to towns and cities further away)? The presence of a natural area adds to the attractiveness of the city (in terms of recreation, healthy image etc.) and because of the attractiveness of the city the population will increase. (The data that will be used to answer the question is: change in the average number of houses in cities x change in the number of houses within 25 kilometres of a natural area.) The following questions are also interesting: does the existence of a protected natural area prohibit the development of TEN and other linear transport infrastructure? Or conversely, do natural areas in proximity to TEN decrease in size if they are not legally protected?

- Infrastructure and especially the junctions/exits and slip roads of motorways/TEN and railway stations are magnets for urban development. In particular, offices, industrial plants and distribution companies prefer these sites. The assumption is that the linear zone along main infrastructure routes gets urbanised and the junctions/exits and slip roads and railway stations form the nodes where urbanisation concentrates. (The data that will be used to answer this question is: the change in the total size of natural areas x a linear zone of 5 kilometres along TEN and especially around junctions and exits.)
- In relation to effectiveness of management, the following questions will be addressed: does the protection of natural areas by EU and national policy prevent the possibility of urban development? And, related to this

question, what is the influence of certain spatial developments on biodiversity?

This question focuses on the issue of the status of legally protected natural areas and the influence of this status on spatial development. An assumption in policy is that in legally protected areas urbanisation will not take place. We will find out whether this assumption is valid. The second part of the question relates to the influence of changes in the size of natural areas and biodiversity. The assumption is that a decrease in the size of the natural area will result in a decrease in biodiversity since insufficient areas/habitats or ranges for certain species remain. (The data that will be used to answer the question is: the change in the proportion of paved / non-paved areas within protected areas; 'biodiversity' x proportion paved / non-paved areas; the change in the 'biodiversity' x the change in the proportion paved / non-paved areas.) And, does the development of biodiversity reflect the investments made in natural areas and in the total and average size of natural areas?

Land purchase of natural areas will enlarge the total protected natural area and ecological networks. The extent of protected areas in the EU has grown in the past ten years although most areas remain protected 'islands'. Land purchase by the public sector and non-governmental organisations, for example for the protection of rare biotopes, is a common policy option. Stimulation of private owners of natural and agricultural areas to protect environmentally sensitive areas and stimulate areas of high biodiversity and assisting private owners in establishing environmentally friendly land uses, are also policy options. (The following data will be used to answer the question: 'biodiversity' x investment; average size of the natural area x investment.)

## 9.2. Maps

Maps in the second interim report present the trends for each strand and the relevant relationships between the strands determined by the objective, aims, key questions and sub-questions. In the coming period the selection within the conceptual framework presented in 9.1 will be 'translated' into analyses. Each analysis will result in a GIS-map. Maps that show important results will be presented in the second interim report.

The following list of maps provides a starting point for further mapping and analysis.

Basic maps:

- the large biogeographic features;
- ecological network;

- semi-natural land cover types;
- protected natural areas;
- semi natural habitat types;
- protected natural areas;
- urban areas and large infrastructure;
- pattern of urbanisation;
- network of large infrastructure;
- landscape types;
- artificial land cover types.

#### Natural heritage:

- mountain regions based on a combination of altitude (> 1000 m) and steepness (> 10%);
- small (< 2500 km<sup>2</sup>) and remote (> 10 km from mainland) islands based on coastline data;
- pan-European ecological network for CEE. For other countries map out combination of large protected areas (> 10,000 ha), major river basins with low urban densities, large forests (> 10,000 ha), large wetlands and water bodies (> 10,000 ha) and grid cells with more than average richness in protected species;
- major natural structure of Europe (combined maps produced in step 1-3).
- semi-natural land cover types from CORINE (or alternatively map of % coverage of semi-natural land cover types per grid cell of 50x50 km or per NUTS3 region);
- number of selected species. Present per grid cell to identifying grid cells with more than average richness in protected species of European importance;
- large protected areas, including national parks and protected landscapes (> 5,000 ha) (Alternatively map out % coverage of protected areas per grid cell or per NUTS3 region);
- natural heritage of Europe; combined maps produced in step 1-3;
- semi-natural habitat types from local sources (>25 ha or point location of very vulnerable habitats);
- number of selected species present per micro-scale grid cell (1x1 km, depending of data quality at case study level) identifying grid cells with more than average richness in protected species of national or local importance;
- protected areas, including national parks and protected landscapes (> 250 ha);
- natural heritage of micro scale; combined maps produced in step 1-3;

#### Spatial development:

- the amount of permeable surfaces;
- the distribution of population: growth in the number of persons in given spatial unit;
- the age composition of the population in a given spatial unit;
- the spatial distribution of urban functions;
- the change in land uses;

- shift towards artificial landuse (urbanisation).

Management:

- EU policies on natural heritage;
- EU policies on spatial development;
- National policies on natural heritage;
- National policies on spatial development.