2. Data sources, availability and compilation

The implementation of this study required the use of a wide range of data sources, some developed specifically for the study, others already available. The indicators were grouped into the following categories:

- indicators related to geography;
- demographic indicators;
- economic indicators;
- indicators related to agriculture;
- infrastructure indicators;
- indicators related to the environment;
- indicators related to Structural Funds and Community Initiatives.

The geographical indicators include data concerning land use, climatic and topographic conditions. Another set of indicators refers to demography, including population numbers, age structures and densities, births, deaths and migration. Indicators on the economy include information on employment and unemployment. Infrastructure indicators mainly concern facilities for tourists, health care, educational facilities, and accessibility, especially regarding the transport network. Indicators in the environmental category include information about land uses, habitats etc.

In addition to published documents, the indicators were principally based on three types of data:

1) quantitative data compiled by the national experts from national sources in each country of the study area;
2) national reports compiled by the national experts based on interviews and review of documents in each country of the study area;
3) data recorded within geographic information systems (GIS).

These three types of sources are described in the following sections.

2.1 National quantitative data

At the beginning of the study, the European Commission provided a list of 70 indicators for consideration during its implementation. However, a thorough review, involving all the national experts and consultation with the European Commission, revealed that many of these were not available for a reasonable proportion of the countries under consideration and/or at an appropriate spatial resolution.

The national experts determined the availability of quantitative data at an appropriate spatial scale for the study. A wide range of national statistical sources was utilised. The main categories of statistical indicators were as follows:

- demography (total population, number under 15 and over 60, fertility and mortality, migration);
- economics (total and sectoral employment, unemployment, qualifications, commuting);
- agriculture (number of farms and livestock, agricultural gross product, utilisable agricultural area);

- infrastructure (tourist overnight stays, doctors, hospitals, secondary schools, universities, airports).

More detail on these indicators is provided in Annex 1.

A key issue in the process of collecting data was to ensure consistency in the definition of the respective indicators, which is essential to harmonise the data from the different countries. For a small number of countries, lack of harmonisation regarding indicators, definitions and methodology between regions also had to be solved.

Wherever possible, data were collected at NUTS 5 (municipality) level. However, a number of indicators were only available at more aggregated NUTS levels. In part, this is due to the small size of the NUTS 5 areas in some countries. Another general problem, applying to a number of countries, is the change of NUTS 5 boundaries over time. This challenge was overcome by transforming all data to the 1997 boundaries. The problem of different sizes was solved by standardising all indicators *per capita* or per area, by calculating percent shares, or by calculating index values (with the average value set to 100).

Additionally, the results of the 2001 census have not yet been released in some countries, so in these cases many data for 2001 were not available for this study. In cases where data from 1999 or 2000 were available, these were used instead.

2.2 Interviews

To complement the collection of national-level statistical data, the national experts conducted interviews with key individuals involved in the elaboration and implementation of mountain policies at the national/regional level in their respective countries. National experts were asked to select interviewees to cover the main points of view on mountain issues in their country: both those occupying key positions and those with ideas on mountain policy development for the future. They could be selected from the following categories:

- members of civil society, e.g., representative of an association, a lobby organisation, a farmers organisation, a trade union;
- elected representatives from a mountain area;
- senior officials from a regional administration body in a mountain area or in charge of , for example, integrated mountain policy; territorial/rural policy; agriculture, forestry and/or environmental policies; Community Initiatives, such as Interreg Programmes; or infrastructure policy;
- experts in charge of evaluating policies related to mountain areas: either external consultants or senior officials, or other key persons with an external point of view (e.g., Common Agricultural Policy expert);
- persons responsible for a national centre for research and education on issues relevant to mountain areas.

The number of interviews depended on the extent and population of mountain areas in each country. The importance of mountain policies currently implemented, or in the process of being adopted, and of emerging mountain strategies on a local or national scale was also taken into account. Thus, the number of interviews per country varied from 1 to 20. In total, 111 people were interviewed (Annex 2).

The interviews considered the points of view of the relevant actors both on issues of current policy and on adjustments to be made in light of enlargement and the revision of EU Structural policies and of the CAP. Specific issues addressed included:

- 'mountain' as a policy concept;
- current policies (mountain-specific policies and the effects of other economic, regional and environmental strategies in mountain areas);
- future development potentials in mountain areas;
- the possible creation of a harmonised European mountain policy.

A semi-open process was used and extended, as necessary, depending on the position and role of the interviewee.

To complement the national interviews and reports, 16 regional and European organisations with a sole or major focus on mountain regions were contacted by e-mail. Each was requested to provide information on aims and objectives, membership, and geographical and thematic scope, and policies and positions: the latter questions were identical to those directed to national respondents. The organisations contacted were as follows:

- European organisations : Association Européenne des Elus de Montagne (AEM), Euromontana, European Mountain Forum (EMF), European Observatory of Mountain Forests (EOMF), Friends of Nature International (FNI), Mountain Wilderness International;
- Regional organisations (Alps): Alliance dans les Alpes, Diamant Alpin, Espace Mont Blanc, Initiative dans les Alpes, International Commission for the Protection of the Alps (CIPRA), Pro Mont-Blanc, Pro Vita Alpina, Réseau Alpin des Espaces Protégés;
- Regional organisations (Pyrenees): Working Community of the Pyrenees;
- Regional organisations (Carpathians): Carpathian Ecoregion Initiative.

2.3 National reports

The final task implemented by the national experts was the preparation of national reports, based on analysis of the interviews, statistical and qualitative data, and published documents. Each expert was provided with a standardised outline for the report, which was used for a number of purposes, particularly the overview and analysis of impacts of policies and the development of typologies of mountain areas. The outline was as follows:

- Short history of national mountain policy and measures relevant to mountainous areas: Main elements of national mountain policy; administrative definition of mountain areas; extent to which mountain policies take into account EU objectives;
- Policy coordination and governance in mountain areas: Legislation and regulations and level of implementation; European Commission support / training programmes; education and research;
- Primary activities in mountain areas;
- Mining and manufacturing activities in mountain areas;
- Leisure and tourism-related industries in mountain areas;
- Sustainable territorial development and protection of the environment in mountain areas: Trends in the extent of cultivated land and landscape

management; urban and land use planning; risk management; parks and other protected areas;
- Measures promoting improvements in quality of life in mountain areas: Infrastructure, public services, housing;
- Development strategies for mountain areas: Perception of strengths, weaknesses, opportunities and threats in mountain areas; scope and objectives of integrated and sectoral mountain policies; perspectives for future policy initiatives
- Evaluation of policy effects or impacts in mountain areas
- Examples of good practice in integrated projects/policies in mountain areas or other mountain programmes

2.4 GIS data

The majority of GIS data used in the study were obtained from Eurostat/GISCO, particularly to allow for unproblematic future updates of the GIS database deriving from the study (Annex 1). Nevertheless, other data providers were also asked to contribute to this study, and the GIS databases of the consortium partners were explored to this end.

The GIS approach: advantages and disadvantages

Indicators derived from GIS play an important role in this study as they complement the national-level quantitative data (section 2.1) stored in the database with seamless data that cannot be collected from statistics. The calculations of these indicators follow one common principle: a seamless pan-European GIS base layer is overlaid with the NUTS 5 municipality boundary layer, and the indicators are then derived by using statistical functions.

The importance and benefits of these GIS indicators can be summarised as follows:
- GIS techniques allow the introduction of indicators that are hardly and, in some cases, not at all, covered by statistical databases, such as the accessibility of regions, the location of certain facilities, and detailed land-use types;
- usually, the GIS layer covers the whole of Europe, thus GIS indicators can be calculated for all municipalities, avoiding gaps in the final database;
- a common indicator definition and a common method of indicator calculation can be applied to all countries – which addresses one of the largest problems concerning the statistical indicators.

On the other hand, two disadvantages of the GIS approach must be mentioned. First, only a limited number of GIS layers are available. Second, in some cases, the level of detail of these layers may not be appropriate for the study, with respect to the spatial resolution of the data on which the layers are based (e.g., the map scale is too coarse) and/or the number of attributes and value classes associated with them (e.g., only a limited number of land-cover types are available). Despite these comparatively small drawbacks, indicators derived from GIS layers play an essential role in the analysis of the situation of mountain areas in Europe, particularly because the range of statistical indicators available at the European scale was found to be limited in many domains.

The metadata review (Annex 3) revealed that, in some countries, statistical indicators are simply not available, though seamless GIS maps were available, basically providing the same kind of information (e.g., temperature and sunshine indicators for Hungary). In such cases, the statistical indicators were also calculated using GIS overlay techniques.

The GIS layers (grouped by theme) received from Eurostat/GISCO and other GIS data providers are listed below, with the source of layers indicated in brackets.

Municipality boundaries

- SABE 97 municipality boundaries, covering all study countries except Romania and Bulgaria (Eurostat/GISCO)
- generalised municipality boundaries for Switzerland (Swiss Federal Statistical Office)
- actual NUTS 5 boundaries for Slovenia (Oikos)
- map of Bulgarian municipalities (NCRD)
- map of Romanian municipalities (ESRI Romania)

These layers were used to compile the NUTS 5 boundary GIS layer, forming the basis for the establishment of the GIS database as well as the analysis of the situation of mountain areas in Europe.

Geography

- Digital terrain models (Eurostat/GISCO, USGS GTOPO30)
- Cities in Europe (IRPUD, 2003)
- Global Seismic Hazard Map (GSHAP)

The digital terrain models were used as the main source for the physical delineation of mountain areas in Europe, together with the municipality boundaries layer and the climate layers (Chapter 3). They were also used to derive some of the GIS indicators related to geography, which offer basic information on municipalities (e.g., on the location of municipality centres, altitude, slope). The 'Cities in Europe' layer was used to calculate some of the accessibility indicators.

Natural and land resources, climate

- CORINE land cover grid (Eurostat/GISCO) and PELCOM land cover grid (EC, 4th Framework Programme project)
- basic inventories of soil units and natural vegetation (Eurostat/GISCO)
- major landscape types and bio-geographical zones (Eurostat/GISCO)
- inventories of internationally designated areas and sites of major importance for nature conservation (Eurostat/GISCO)
- climate point data and interpolated layer (Eurostat/GISCO)
- mean annual radiation (IRPUD, based on Palz and Greif, 1995)
- rainfall (IRPUD, based on Westermann, 1997)

The climate datasets provided additional information for the delineation of mountain areas. Together with other layers, they also contributed to the analysis of the natural potentials and environmental handicaps of mountain areas. In particular, the two land cover grids were important for the characterisation of massifs. Originally, it was

planned to use the CORINE land cover grid to assess land-cover patterns (based on 44 different land-use types). However, as this lacks data for Cyprus, Norway, Sweden and Switzerland, the PELCOM land cover database was also introduced. This covers the whole of Europe according to 13 land use categories, which were aggregated for some of the analyses (Table 2.1). These categories focus on agriculture and forestry, and lack detailed information on settlement types, glacier, and bare rock areas, which were required in order to satisfy some of the indicators requested by the European Commission. As such, a combination of CORINE and PELCOM was adopted for the study.

Table 2.1. Aggregation of the PELCOM land cover categories

Aggregated land use category	**PELCOM land cover category**	**PELCOM code**
Forest area	Coniferous forest Deciduous forest Mixed forest	11 12 13
Arable area	Rainfed arable land Irrigated arable land Permanent crops	31 32 40
Permanent ice and snow area	Permanent ice and snow	70
Settlement area	Urban areas	100
Other areas	Grassland Scrubland Barren land Wetlands Inland waters	20 50 60 80 91

Infrastructure

- Airports, ports, ferry links, railways, road network (Eurostat/GISCO)
- Pan-European airports, railway network, road network (IRPUD, 2003)
- Nuclear power stations, energy production, energy transport (Eurostat/GISCO)

These layers contribute to the analysis of the geographical position, accessibility and transport network provision and network usage of mountain regions. The GISCO layers were used to calculate indicators describing the transport network provision within mountain regions. The attribute information of the IRPUD road layer allows the calculation of accessibility indicators for different years (i.e., 1981, 1991 and 2001, and all years until 2020), as the history and projected future development of the road networks is recorded. Moreover, information on traffic flows compiled from the United Nations (1995) is already associated with the IRPUD road network database, which was used for further analysis.

Other layers

- degree of urbanisation, settlements (Eurostat/GISCO)
- Less Favoured Areas, Structural Funds (Eurostat/GISCO)

These layers offer information that is complementary to that of the others, and was used for certain quantitative analyses.

Harmonisation of the layers

All GIS layers were harmonised with each other. Harmonisation in this context refers to:

- adjusting the projection (i.e. the IRPUD layers were adjusted to the Eurostat/GISCO standard reference system);
- quality checks on attributes and to the territory covered (e.g., see comparisons between CORINE and PELCOM land use grids);
- geometrical corrections (particularly in the context of the compilation of the NUTS 5 boundary layer);
- solving obvious errors in attribute values (some of the municipality codes or names were missing, misspelled or wrong);
- assessing their appropriateness to derive certain indicators (in particular with respect to the levels of detail and geometrical accuracy they offer).