

3. The delineation of European mountain areas

3.1 Development of delineation alternatives

The first strand of this project is the delineation of mountain areas in the study area. The purpose is to find a definition that can be applied throughout ‘Europe 27+2’, even if national definitions vary considerably from country to country, as discussed in section 3.4.

The point of departure for this work was the global analysis conducted by the UNEP-World Conservation Monitoring Centre (UNEP-WCMC) (Kapos et al., 2000) using the GTOPO30 Digital Elevation Model (DEM), derived from satellite images. This records the average elevation in a 30 arc-second (1km²) grid of the Earth’s land surface. The UNEP-WCMC approach uses altitude alone to define mountain areas above 2500m and combines altitudinal and slope criteria to define mountains above 1000m. For lower elevations (300-999m), an additional criterion based on local elevation range is used to identify mountainous areas. These linked criteria, which were developed iteratively by scientists, policy-makers and mountaineers, have proved broadly acceptable to a wide variety of international organisations and to the scientific community. They give a total of nearly 1.7 million km² of mountains for the area shown in Figure 3.1.

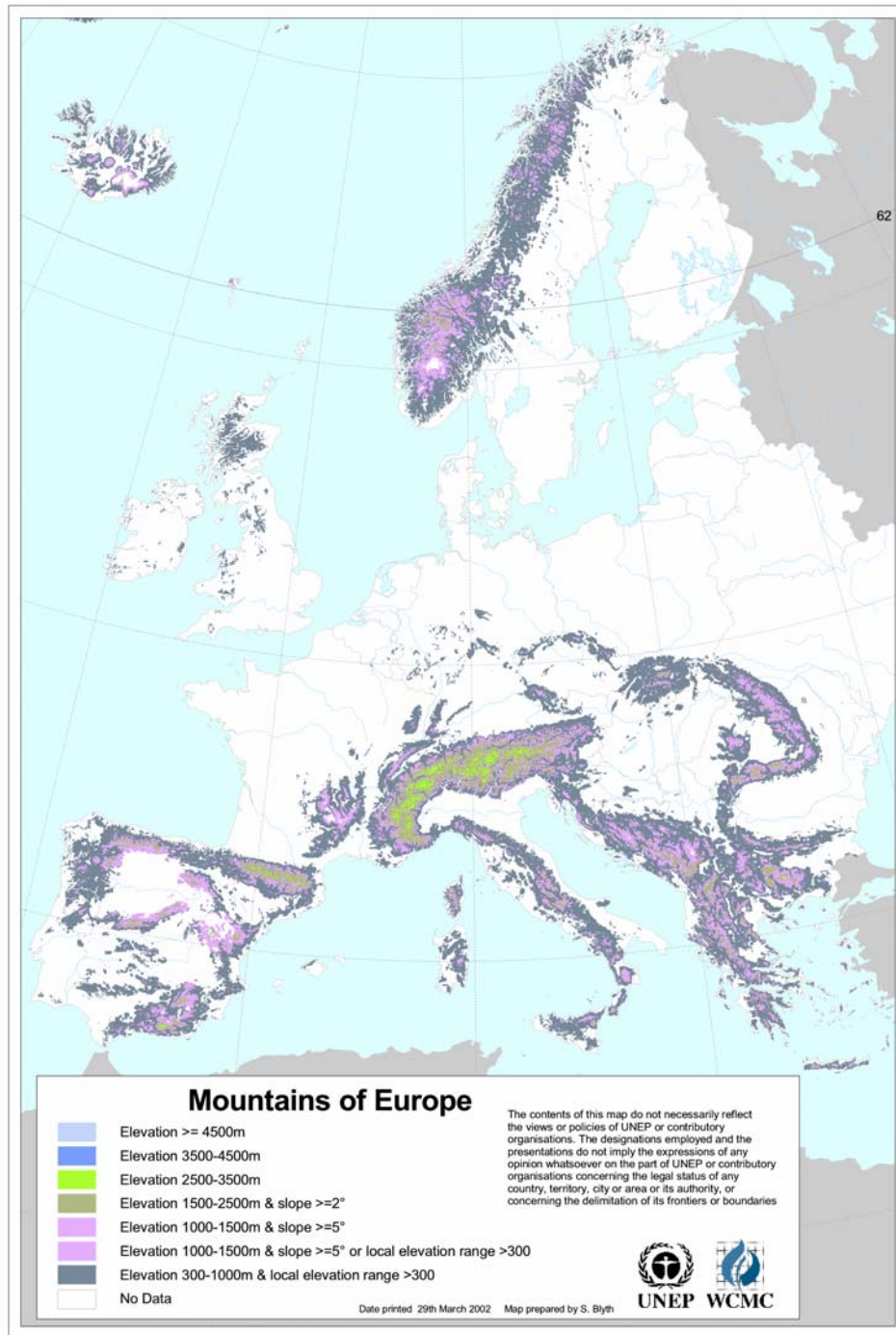
In socio-economic terms, the natural handicaps of mountain areas consist of two elements:

- altitude, because winter temperatures decrease and temperature contrasts become larger with increasing altitude – which limits the agricultural use of the land, makes road transport difficult during winter, increases heating costs, etc.;
- topography, because rough terrain constrains regional accessibility, makes communication and other infrastructure investments more expensive, and makes modern agricultural or industrial production more difficult.

The UNEP-WCMC 2000 global delineation is based on altitude and slope, but does not include areas with marked topography at altitudes below 300 m. However, in several parts of Europe, including the Iberian Peninsula, the British Isles, Greece, and Fennoscandia, there are mountains along the coasts, extending down to sea level. A European delineation should therefore be based on a combination of altitude and topography. We therefore tested a number of different combinations of altitude and topography and different ways of calculating the topographic element.

The significance of altitude is relative, as temperatures are lower not only at higher altitudes but also at higher latitudes (i.e., northwards). Consequently, climatic conditions closer to sea level in the north are comparable to those at high altitudes further south. A number of discussions on mountain areas have drawn attention to the fact that the harsh climates of these environments are a major determining factor in the lives of the communities living within them. For example, Article 18 of Council Regulation (EC) No 1257/1999 suggests that harsh climatic conditions might justify the categorization of all lands north of 62°N latitude as ‘mountain areas’. A more precise basis for identifying areas with these conditions was thus sought.

Figure 3.1. Mountains of Europe, using UNEP-WCMC 2000 global delineation



Mountain climates are characterised by low night-time temperatures, even during the warmer months, and thus by relatively short seasons when minimum temperatures climb above freezing. Although daytime temperatures may rise significantly above freezing during the summer, they tend to be lower than those in the surrounding lowlands. Maximum temperatures are therefore relatively low, particularly at high latitudes. During the winter months, temperatures in most temperate mountain areas not only remain below freezing but are also lower than lowland temperatures at the same latitude.

Given such characteristics, the interpolated climate data for Europe provided by GISCO are a useful basis for adding simple climate-based criteria to the definition of mountain areas. The 50km resolution of these data can be smoothed to make them more compatible with the topographic data and criteria used in the preceding alternatives. These data were examined with a view to identifying the parameters and combinations that can be used to help delimit mountain areas. The climate data for each month include measures of absolute minimum and maximum temperatures, average minimum temperature and average maximum temperature, total precipitation, total global radiation and total potential evaporation. After some experimentation, the average monthly minimum and maximum temperature data were judged to be most useful for identifying mountain-like climates such as those described above.

A simple index was developed, combining these parameters in a way that captures both the total accumulation of heat through the growing season and the contrast between summer and winter temperatures. This ‘temperature contrast index’, K is defined as:

$$K = \frac{\{\sum(T_{\max}^{\circ} > 0^{\circ}) - \sum(\text{ABS}[T_{\min}^{\circ} < 0^{\circ}])\}}{\{\sum(T_{\max}^{\circ} > 0^{\circ}) + \sum(\text{ABS}[T_{\min}^{\circ} < 0^{\circ}])\}}$$

where $\sum(T_{\max}^{\circ} > 0^{\circ})$ is the sum of average monthly maximum temperatures $>0^{\circ}\text{C}$, and $\sum(\text{ABS}[T_{\min}^{\circ} < 0^{\circ}])$ is the sum of absolute values of average monthly minimum temperatures $<0^{\circ}\text{C}$. This index varies from -1 (in areas where average minimum temperatures never climb above freezing) to $+1$ (in areas where the average minimum temperature never falls below 0°C), and in Europe it varies from -0.36 to $+1.0$.

Departing from these parameters, different sets of changes were considered to produce a delineation alternative that would be optimal in a European context. Three main paths were explored in this respect:

- integrating an indicator of climatic constraints, in order to take into consideration the fact that mountain-like conditions are found at lower altitudes at higher latitudes;
- considering standard deviations in local elevation rather than local elevation ranges, in order to take into account not only altitudinal amplitude, but also the shape of the landscape;
- finding appropriate ways of including areas below 300 meters with mountainous characteristics, as found particularly in Mediterranean and northern Europe.

In total, 16 different alternatives were produced, testing different thresholds for altitude, climate, and topography. Their advantages and disadvantages were discussed

with representatives of the European Commission and European mountain organisations, as well as the national experts.

3.2 The chosen delineation of European mountain areas

The topographical delineation of mountain areas in Europe was carried out using the GTOPO30 DEM, which has a 1 km resolution. Locally steep slopes can be important elements in the perception of a ‘mountain landscape’. The relatively coarse resolution of the DEM implies that such micro relief cannot be taken into account. This may have led to some discrepancies between the final mountain delineation and the general perception of mountain areas. Overall, however, previous studies at UNEP-WCMC have demonstrated that satisfactory mountain delineations can be produced using data with a 1 km resolution, identifying the extent of topographic constraints which create obstacles to human activities.

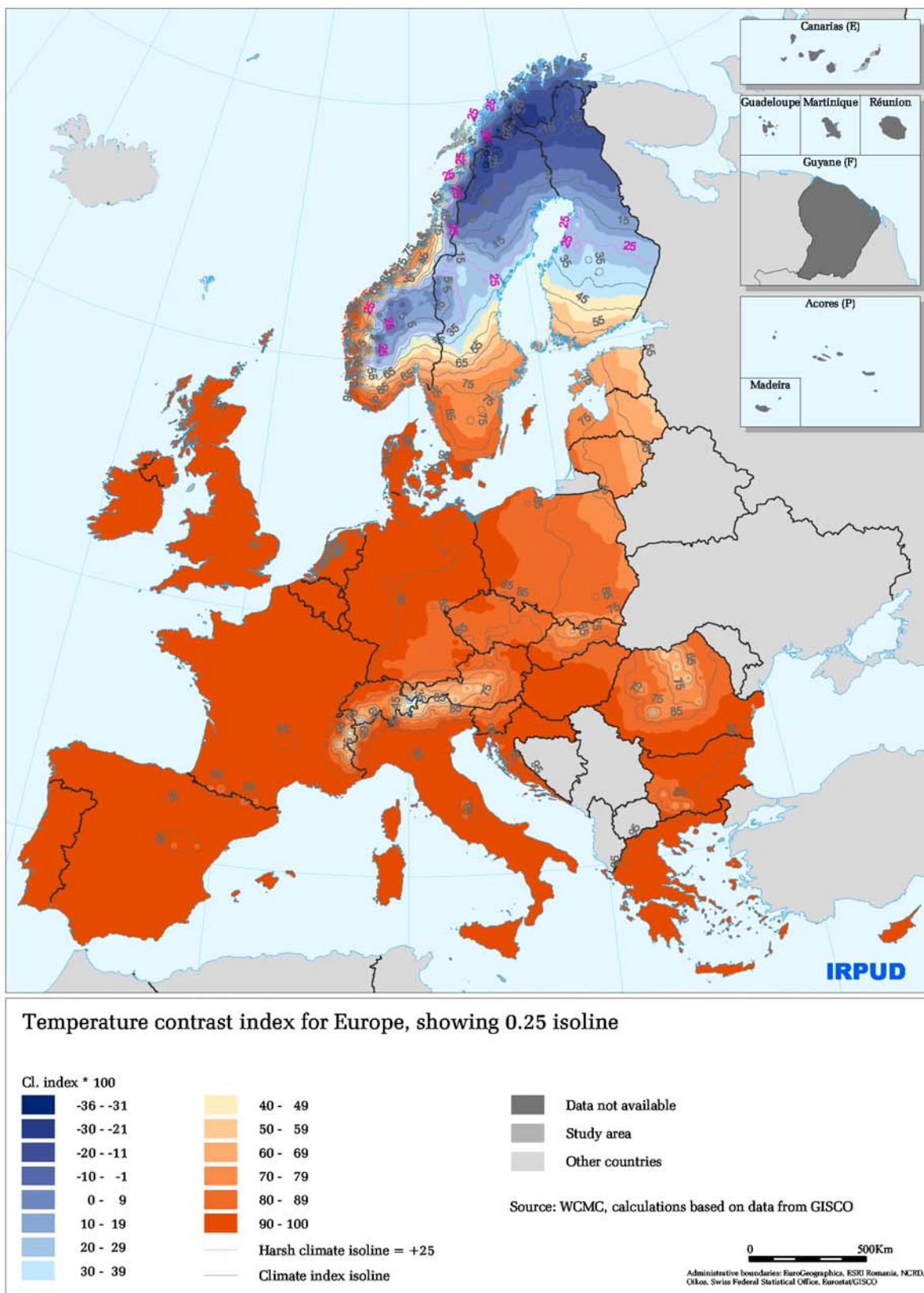
In order to achieve a satisfactory delineation, this study used slightly different topographical criteria from the UNEP-WCMC 2000 global study within five elevation belts, using the principle that the threshold for rough topography decreases as the altitude increases:

- Below 300m, the objective is to identify areas with strong local contrasts in the relief, such as Scottish and Norwegian fjords and Mediterranean coastal mountain areas. Selecting areas according to the standard deviation of elevations in the close neighbourhood of each is the best approach to include these types of landscapes. For each point of the DEM, the standard deviation with the 8 cardinal points surrounding it (North – North-East – East – South-East – South – South-West – West – North-West) was calculated. If this standard deviation 50 meters or greater, the landscape is sufficiently rough to be considered as mountainous despite the low altitude.
- Between 300m and 1000m, areas which either meet the previously mentioned criterion or where altitudes encountered within a radius of 7 km vary by 300 meters or more are considered mountainous.
- Between 1000m and 1500m, all areas which meet any of the previously mentioned criteria are considered mountainous. In addition to this, areas where the maximum slope between each point (to which value is assigned to) and the 8 cardinal points surrounding it is 5° or more are also considered mountainous.
- Between 1500m and 2500m, in addition to all previous criteria, areas where the maximum slope between each point (to which value is assigned to) and the 8 cardinal points surrounding it is 2° or more are also considered mountainous.
- Above 2500m, all areas are included into the mountain delineation;

For the climatic constraints, a temperature contrast index of 0.25 was chosen. Only areas in the north where the temperature contrast is similar or worse than the values in the highest parts of the Alps are included (see Figure 3.2).

In order to create more continuous areas, and considering that topographic constraints play a greater role when they extend over a certain area, isolated mountainous areas less than 5 km² in area were not considered. Similarly, non-mountainous areas within mountain massifs were included.

Figure 3.2 Temperature contrast index for Europe, showing 0.25 isoline

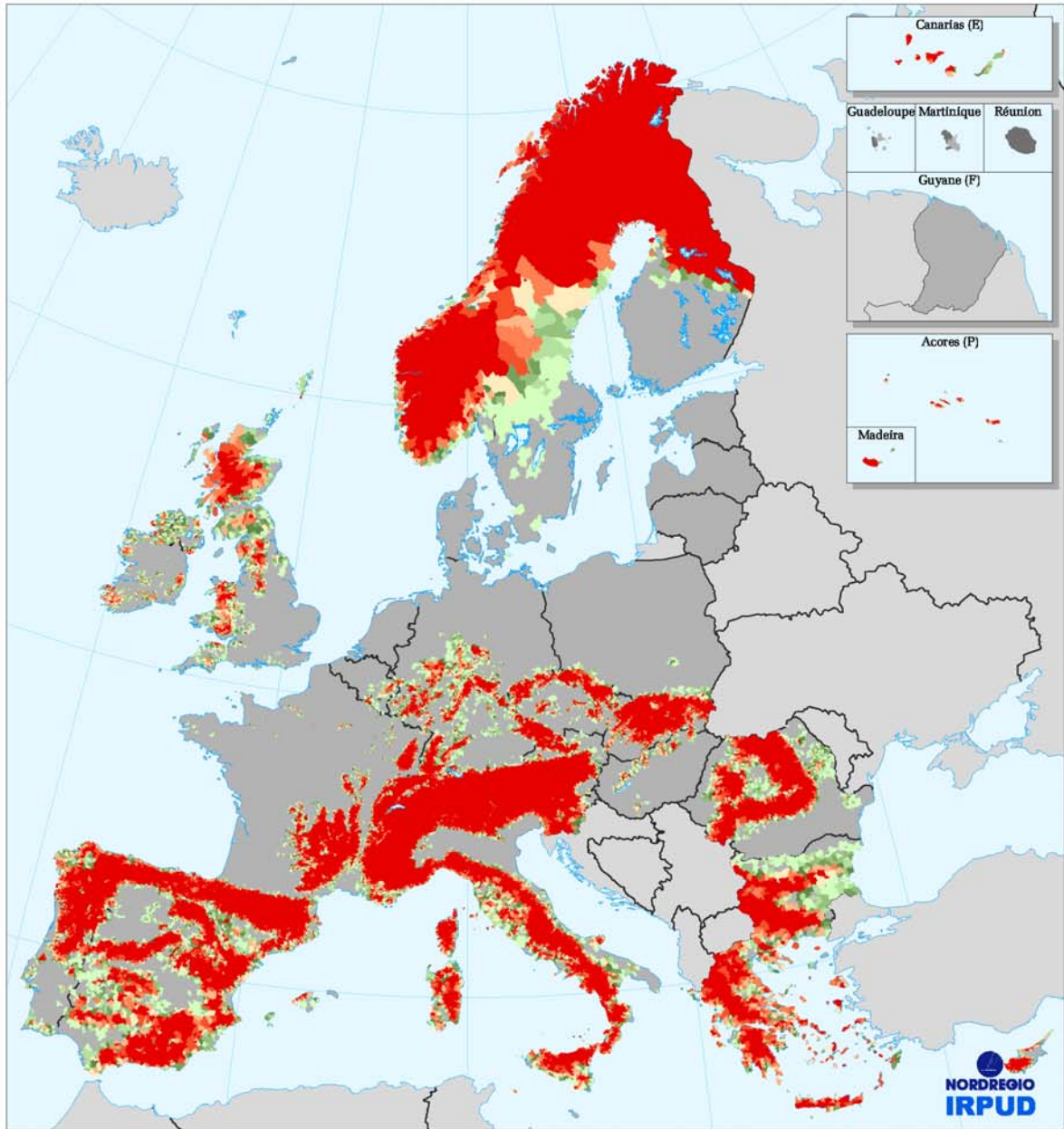


Finally, the mountain area was approximated to municipal boundaries. First, an assessment was made of the proportion of each municipality falling into the mountain delineation, derived from the analysis based on the above-mentioned criteria (Figure 3.3). To be considered as mountainous, a municipality had to have at least 50% of its area within the area delimited as mountain. The final result is shown in Figure 3.4; Figure 3.5 shows the mean altitude of these mountainous municipalities. A further analysis was made of the relative proportions of ‘mountain’ land within non-mountainous municipalities and ‘non-mountain’ land falling within the boundaries of mountainous municipalities. For the study area as a whole, the proportions were, respectively, 2.5 and 3.4%. The greatest differences were in Greece (especially in the islands: 4.8 and 12.0%, respectively), Bulgaria (6.0 and 6.5%), the UK (5.4 and 5.4%), Italy (4.3 and 5.6%), Spain (4.3 and 5.5%), and Slovenia (4.1 and 6.9%), and Norway (1.3 and 5.1%) (Table 3.1).

Table 3.1. Proportions of ‘mountain’ land within non-mountainous municipalities and ‘non-mountain’ land falling within the boundaries of mountainous municipalities

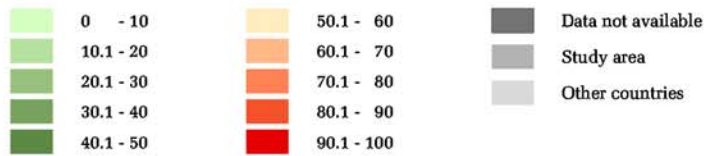
Country	Mountain municipalities, % of country total	Geographical non-mountain areas included into "mountain" municipalities, % of country total	Non-mountain municipalities, % of country total	Geographical mountain areas included into "non-mountain" municipalities, % of country total
Austria	73.34	1.52	26.66	1.52
Belgium	4.20	1.25	95.80	1.44
Denmark	0.00	0.00	100.00	0.00
Finland	49.37	0.42	50.63	0.97
France	25.25	1.55	74.75	1.35
Germany	14.72	2.04	85.28	2.74
Greece	77.88	11.99	22.12	4.76
Ireland	10.61	3.27	89.39	4.38
Italy	59.94	5.56	40.06	4.24
Luxembourg	4.43	1.27	95.57	6.54
Netherlands	0.00	0.00	100.00	0.00
Portugal	39.12	3.14	60.88	2.84
Spain	55.59	5.53	44.41	4.34
Sweden	50.85	4.80	49.15	2.25
United Kingdom	25.21	5.45	74.79	5.38
Bulgaria	48.76	6.49	51.24	5.97
Cyprus	47.44	4.44	52.56	3.61
Czech Republic	32.26	2.72	67.74	2.96
Estonia	0.00	0.00	100.00	0.00
Hungary	4.70	1.26	95.30	1.68
Latvia	0.00	0.00	100.00	0.00
Lithuania	0.00	0.00	100.00	0.00
Malta	0.00	0.00	100.00	0.00
Poland	5.20	0.54	94.80	0.45
Romania	37.84	2.99	62.16	3.07
Slovakia	61.98	4.20	38.02	2.28
Slovenia	77.98	6.86	22.02	4.12
Norway	91.84	5.14	8.16	1.27
Switzerland	93.30	1.96	6.70	1.01

Figure 3.3. Municipalities: proportion falling within mountain delineation



Municipalities: Proportion falling within mountain delineation

in percent

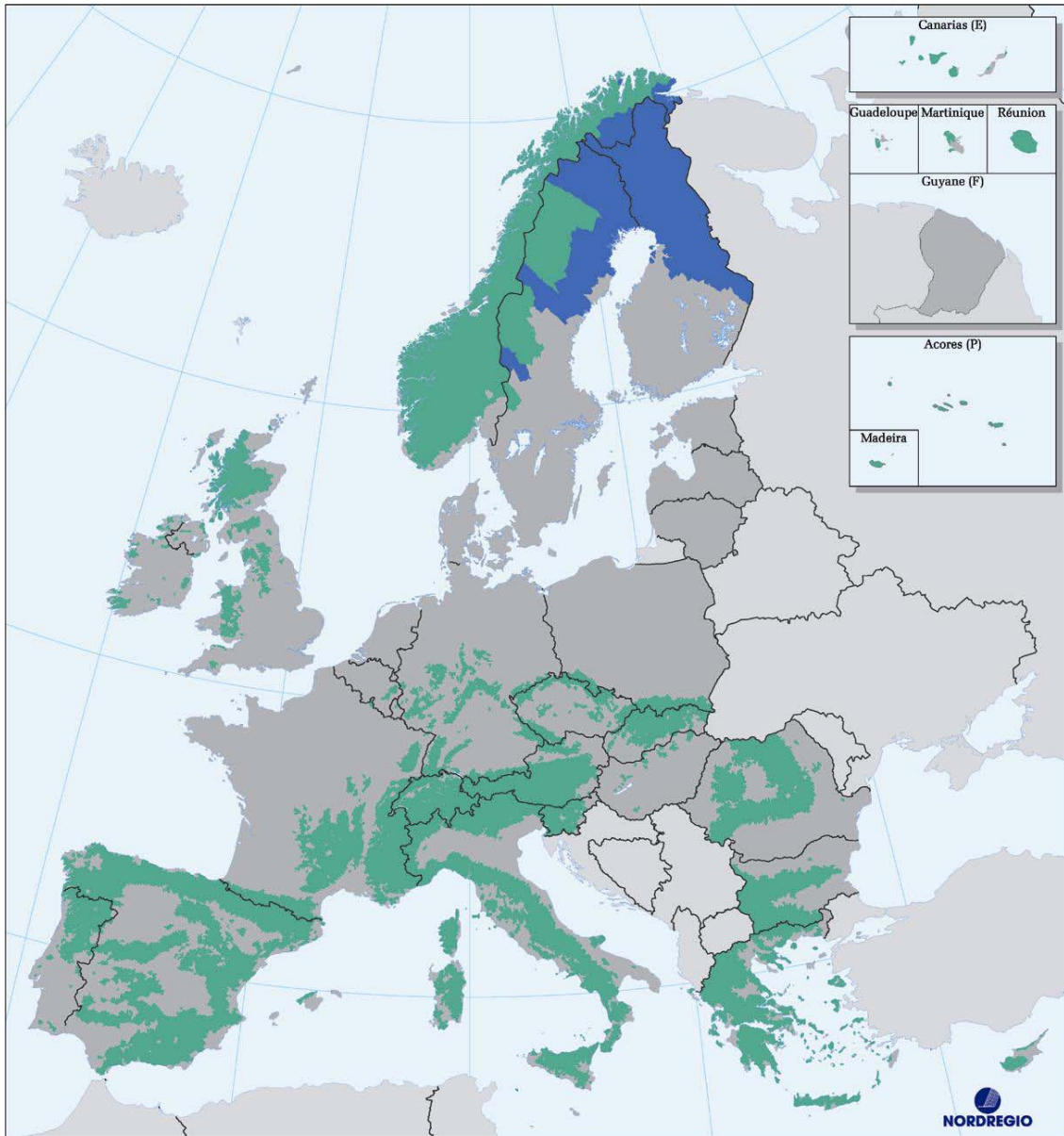


Source: DG Regio/GISCO





0 500Km

Administrative boundaries: EuroGeographics, ESRI Romania, NCRD, Otkor, Swiss Federal Statistical Office, Eurostat/GISCO

Figure 3.4: Delineation of mountain municipalities in Europe



Delimitation of mountain municipalities in Europe

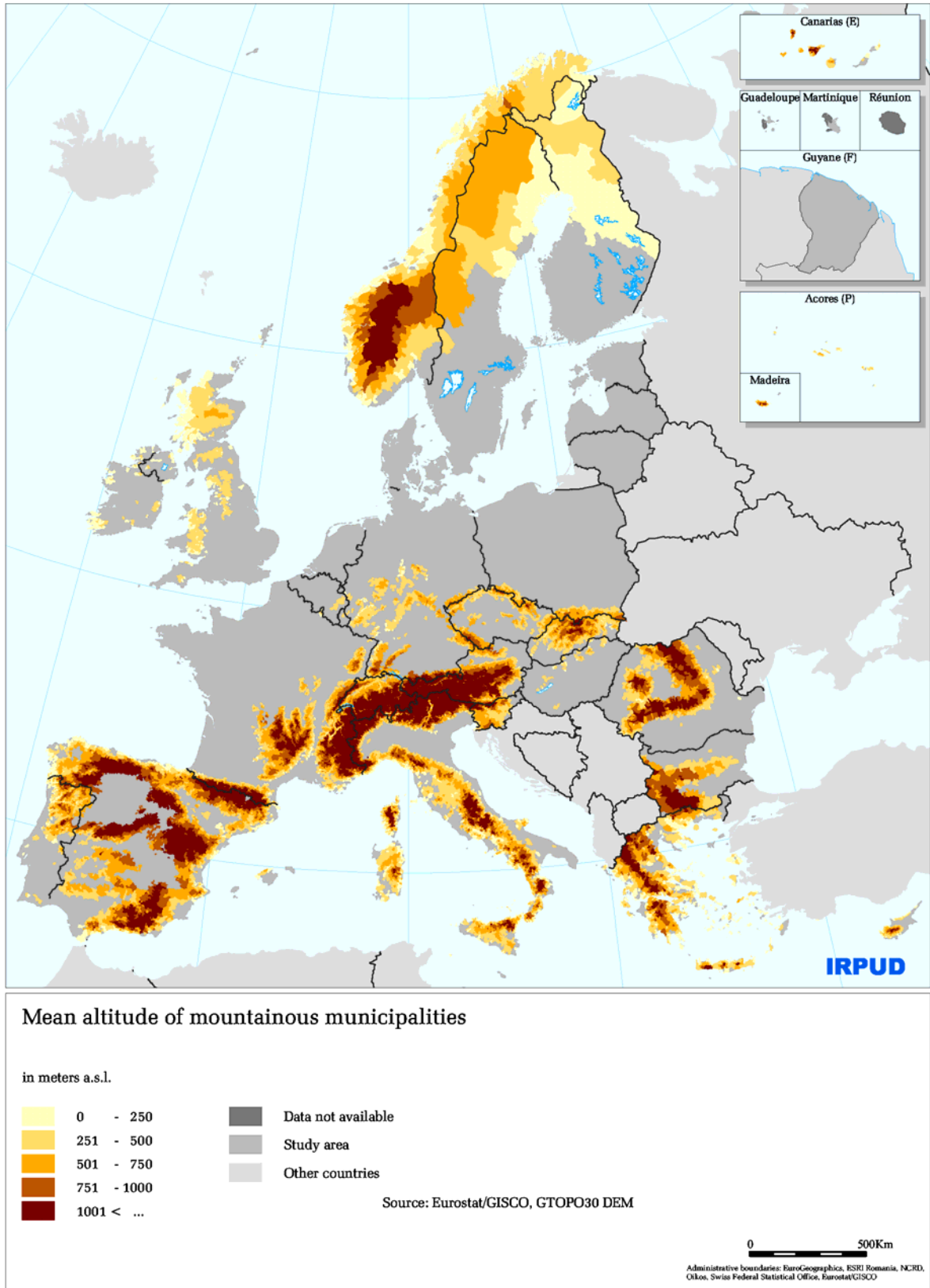
- | | |
|---|---|
|  Municipalities defined as mountainous according to topographic criteria |  Study area |
|  Municipalities defined as mountainous according to climatic criteria |  Other countries |

Source: Eurostat/GISCO

0 500Km

Administrative boundaries: EuroGeographics, ESRI Romania, NCRD, Oikos, Swiss Federal Statistical Office, Eurostat/GISCO

Figure 3.5 Mean altitude of mountainous municipalities



3.3 Delineation and characterisation at the national scale

General figures at national level

The total area and the proportion of the national territory of each the countries of the study area designated as ‘mountainous’ according to the above-mentioned criteria differ significantly (Table 3.2). For the EU15 as a whole, some 1,323 thousand km² (40% of the EU territory) are designated as mountainous areas. While two Member states (Denmark, The Netherlands) have no mountain area, at least half of the area of six Member states is defined as mountainous, with the greatest proportions in Austria (73%) and Greece (78%). Among the acceding and candidate countries, the three Baltic countries, Estonia, Lithuania, and Latvia, have no mountainous areas, while more than half of Bulgaria (53%), Slovakia (62%) and Slovenia (78%) is mountainous. More than 90% of the territory of both Norway and Switzerland is covered by mountains.

The percentage of area covered by mountains is, as expected, much higher than the percentage of the population living in mountain areas (Table 3.3). This simply reflects the fact that, even where mountains cover a large proportion of the national territory, population centres are usually located in lowland areas.

As regards the territory of the European Union as a whole, 75.9 million people (20.3 percent of the population) live in mountain municipalities. If Denmark and The Netherlands (the two Member states with no mountains) are excluded, the percentage shares of the Member states range from 0.8% for Belgium up to 49.6% for Greece and 49.8% for Austria. Comparing the shares of the area with those of the population yields rather balanced patterns for some countries (e.g., Germany: 14.7% mountain area vs. 10.1% population living there), while for others there are significant differences. For instance, more than half of the territory of Sweden and Finland is considered as mountainous, whereas only small percentages of their populations live there. Significant differences can also be found in the UK, Italy, and Greece.

In the acceding countries and the two candidate countries covered by the study, a slightly lower proportion (17.6%) lives in mountain municipalities. Slovenia has the highest share of its population (64.9%) living in mountainous areas. In Slovakia and Bulgaria, almost half of the population lives in mountainous areas. In contrast to the present Member States, the proportion of the area covered by mountains and the population living in mountainous areas is quite balanced for most of the acceding and candidate countries. The only major exception is Cyprus, where 47.6% of the territory is considered mountainous, while only 14.3% of the population lives there. Similarly, in Norway, 91.3% of the territory is considered mountainous, while only 63.4% of the population lives there. In contrast, the proportion is quite balanced in Switzerland.

Table 3.2. National area covered by mountain municipalities

Country	Country area (1,000 km ²)	Area of mountain municipalities (Mountain area) (1,000 km ²)	Mountain area as percentage of total country area
Study area	4,760.68	1,934.65	40.6
EU15	3,318.80	1,322.91	39.9
Austria	83.85	61.51	73.4
Belgium	30.62	1.29	4.2
Denmark	43.10	..	..
Finland	326.76	166.08	50.8
France*	637.90	142.12	22.3
Germany	356.77	52.59	14.7
Greece	132.22	102.98	77.9
Ireland	70.14	7.44	10.6
Italy	300.59	180.78	60.1
Luxembourg	2.59	0.11	4.4
The Netherlands	41.20	..	..
Portugal	92.36	36.14	39.1
Spain	505.21	281.61	55.7
Sweden	450.00	227.70	50.6
UK	245.49	62.56	25.5
Acceding /candidate countries	1,076.68	240.96	22.4
Bulgaria	101.74	54.18	53.3
Cyprus	9.23	4.40	47.6
Czech Republic	78.79	25.41	32.3
Estonia	45.23	0.00	0.0
Hungary	92.48	4.37	4.7
Lithuania	65.30	..	..
Latvia	64.59	..	..
Malta	0.22	..	..
Poland	311.44	16.18	5.2
Romania	238.40	90.24	37.9
Slovakia	48.99	30.37	62.0
Slovenia	20.27	15.81	78.0
Norway	323.90	295.86	91.3
Switzerland	41.30	37.46	90.7

* Including DOM. Values excluding DOM: Total area 549,035 km², Mountain area 138,465 km²; Proportion of mountain area: 25,2%.

All values obtained adding values provided at NUTS 5 level. Minor discrepancies with official national values may occur.

Table 3.3. Population living in mountain areas; total and percentage in mountain municipalities

Country	Total population	Mountain area population	% of total population living in mountain municipalities
Study Area	493 116 714	94 316 416	19.1
EU15	375 982 254	66 789 474	17.8
Austria	8 024 449	3 993 337	49.8
Belgium	10 263 414	83 256	0.8
Denmark*	5 330 000	..	..
Finland	5 194 902	624 184	12.0
France***	59 921 649	8 577 499	14.3
Germany	81 944 737	8 254 700	10.1
Greece	10 817 789	5 365 931	49.6
Ireland	3 917 203	101 903	2.6
Italy	56 095 135	18 267 183	32.6
Luxembourg	439 539	6 787	1.5
The Netherlands	15 987 076	..	..
Portugal	10 356 116	2 741 590	26.5
Spain	40 738 016	15 681 826	38.5
Sweden	8 901 038	615 343	6.9
UK	58 051 191	2 475 935	4.3
Acceding /candidate countries	105 343 879	18 540 683	17.6
Bulgaria	7 973 671	3 637 787	45.6
Cyprus	690 253	98 995	14.3
Czech Republic	10 215 299	2 385 905	23.4
Estonia*	1 439 200	..	..
Hungary	10 246 939	709 239	6.9
Lithuania*	3 698 500	..	..
Latvia*	2 424 200	..	..
Malta**	393 095	..	..
Poland	38 632 453	2 255 261	5.8
Romania	22 236 918	5 535 706	24.9
Slovakia	5 401 316	2 624 492	48.6
Slovenia	1 992 035	1 293 298	64.9
Norway	4 503 436	2 854 051	63.4
Switzerland	7 287 145	6 132 208	84.2

*Source: EUROSTAT NewCronos data 2000

**Source: NSO Malta

***Including DOM. Values excluding DOM: Total population 58 255 213, Mountain population 7 633 595; Proportion of population living in mountain areas: 13.1%.

All values obtained adding values provided at NUTS 5 level. Minor discrepancies with official national values may occur.

Tables 3.4 and 3.5 give a ranking of countries by mountain area and population, both in absolute numbers and according to proportion (in percent). Norway, Spain and Sweden are the countries with greatest extent of mountain areas in absolute terms; however, in relative terms, Switzerland, Norway, Greece and Slovenia have the highest proportion. As regards population, Italy, Spain, and France have the largest mountain populations while, in relative terms, Switzerland, Slovenia and Norway are most prominent. Thus, in general for both mountain area and population, in absolute terms, countries with large areas are more significant, whereas in relative terms smaller countries come into focus. The latter aspect is, however, of much greater importance, because countries with a high proportion of mountain area and/or mountain population can be characterised as predominantly mountain countries.

Table 3.4. Ranking of countries according to total mountain area and mountain population

	Mountain area (km ²)		Mountain population
Norway	298 409	Italy	18 267 183
Spain	284 348	Spain	15 681 826
Sweden	232 122	France*	8 577 499
Italy	181 615	Germany	8 254 700
Finland	169 750	Switzerland	6 132 208
France	138 469	Romania	5 535 706
Greece	103 630	Greece	5 365 931
Romania	89 845	Austria	3 993 337
UK	63 370	Bulgaria	3 637 787
Austria	61 550	Norway	2 854 051
Bulgaria	53 549	Portugal	2 741 590

*including DOM

EU Member States in bold

Table 3.5. Ranking of countries according to proportion of mountain area and mountain population

	Mountain area (%)		Mountain population (%)
Switzerland	94	Switzerland	84
Norway	93	Slovenia	65
Greece	78	Norway	63
Slovenia	78	Austria	50
Austria	73	Greece	50
Slovakia	62	Slovakia	49
Italy	60	Bulgaria	46
Spain	57	Spain	38
Sweden	52	Italy	33
Finland	50	Portugal	26
Bulgaria	48	Romania	25

EU Member States in bold

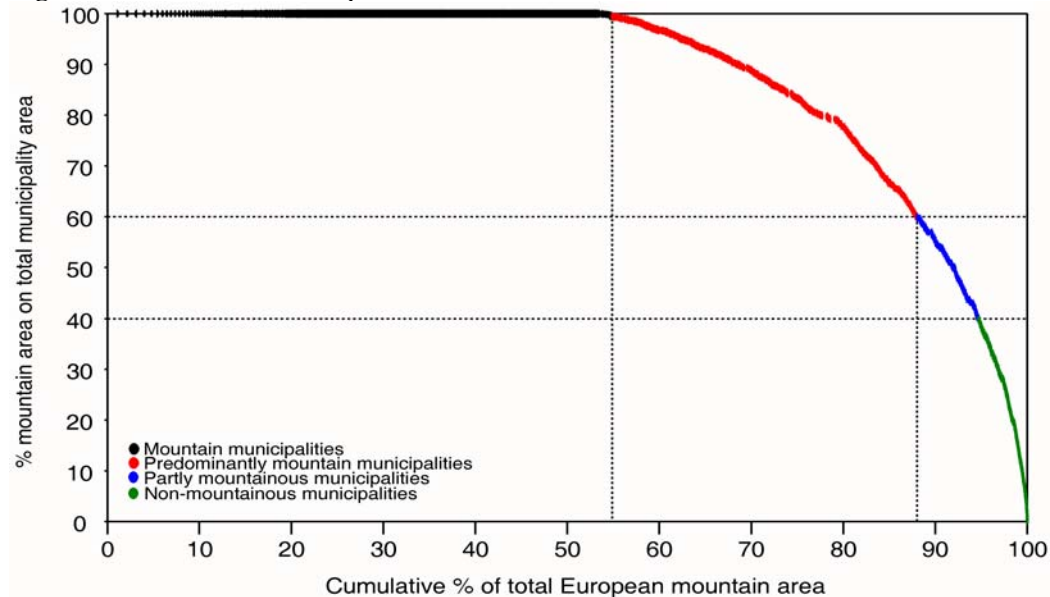
Analysis of mountainous municipalities

An assessment of all mountain municipalities in detail reveals a very distinct picture. Figures 3.6 and 3.7 follow the differentiation of mountain municipalities similar to that introduced by Copus and Price (2002: 17) in their pilot study on Europe's mountains. The criteria used in this study are:

- *Mountain municipalities* (100% of their area covered by mountains);
- *Predominantly mountainous municipalities* (more than 60% of their area covered by mountains);
- *Partly mountainous municipalities* (40 to 60% of their area covered by mountains);
- *Non-mountainous municipalities* (less than 40% of their area covered by mountains).

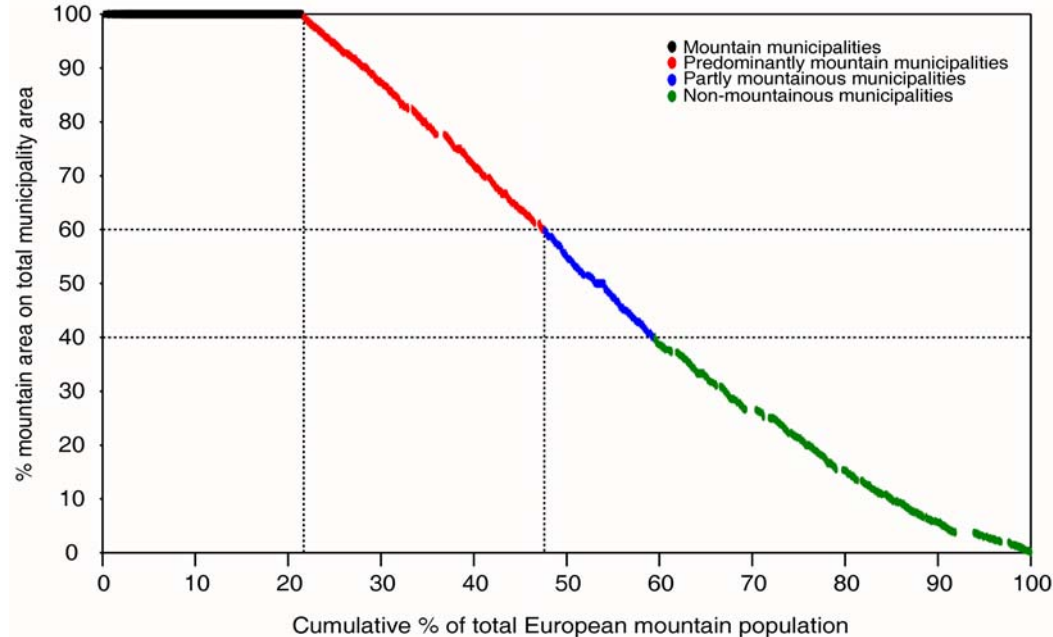
Using this categorisation, the following conclusions can be drawn, taking into account all municipalities that are fully or partly located in mountains. Mountain municipalities account for some 55% of the overall European mountain area (Figure 3.6). Together with the predominantly mountainous municipalities, they account for more than 88% of the total European mountain area. The remaining partly and non-mountainous municipalities only account for some 12% of the total European mountain area. The conclusion is that the majority of the municipalities are completely mountainous, and thus that relatively few are only partly covered by mountains. The completely mountainous ones are concentrated in Austria, Switzerland, and the Nordic countries (mostly due to the climate criterion), where the spatial extent of municipalities is comparatively great. This finding contrasts to some extent with the results of other empirical studies at spatially higher aggregated levels, where completely mountainous and predominantly mountain areas account for a smaller proportion of the total mountainous area (e.g., Copus and Price, 2002: 17).

Figure 3.6 Mountain municipalities and mountain area



While the mountain municipalities account for some 55% of the overall mountainous area, they account for only 22% of the total European mountain population (Figure 3.7). Together with the predominantly mountainous municipalities, some 48% of the mountain population is covered. The remaining European mountain population lives in partly mountainous municipalities, or even in municipalities that can be considered as non-mountainous (i.e. less than 40% of their area is considered as mountainous).

Figure 3.7 Mountain municipalities and mountain population



3.4 Massif delineation and characterisation

Delineation principles

When considering spatial policies at the European scale, ‘mountain areas’ can be used as a generic category. However, at national and regional scales, this concept is necessarily linked with specific ranges or ‘massifs’. These areas are designated by a name, and are generally perceived as cultural and economically specific. As such, they are one of the cornerstones of people’s perception of how their territory is structured, together with major rivers, islands, etc. The objective of the massif delineation is to identify these areas, and to suggest a possible demarcation of them.

Massif demarcations naturally consist of continuous or nearly continuous groups of municipalities. We have not sought to differentiate pre-massif areas from the core of each massif. Based on this demarcation, the statistical analysis (Chapters 4 to 7) assesses whether the degree of homogeneity in the internal structure of each massif.

For each country, a limited number of massifs were defined. If possible, massif areas should form a contiguous space, sometimes also surrounding small enclaves, which are not considered as ‘mountain’ according to the criteria used. A number of small and isolated groups of upland municipalities, which are not considered to be culturally

or functionally connected to any mountain range, were designated as *isolated mountain areas*.

A hierarchy of massifs was then developed. First, national massifs and isolated mountain areas were identified individually (*Massif Level 3*) (Table 3.6, Figure 3.8). In a second step, the isolated mountain areas were considered as one group, different from the national massifs (*Massif Level 2*). Finally, mountain ranges were designated; many of these are trans-national, crossing national boundaries (*Massif Level 1*) (Table 3.7, Figure 3.9). A name and a unique 8-digit code were assigned to each massif (see Annex 7).

It should be noted that some national entities (*Level 3*) only make sense as part of a mountain range (*Level 1*). An example of this is the German ‘Upper Rhine Valley’, which is the continuation of the larger Swiss ‘Mittelland’.

Table 3.6. National massifs (Level 3), excluding isolated mountain areas and enclaves

Country	National massif	Massif area (km ²)	Total population	Number of municipalities	Average municipality area (km ²)	Average municipality population
Austria	Austrian Alps	56,348.319	3,644,570	1,247	45,187	2,923
	Austrian Bohemian mountains	5,201.811	348,767	183	28,425	1,906
Belgium	Belgian Ardennes	1,286.972	83,256	14	91,927	5,947
Bulgaria	Rodopi Planina	20,463.437	983,625	52	393,528	18,916
	Sredna Gora	6,997.972	332,227	20	349,899	16,611
	Stara Planina	19,500.807	866,264	39	500,021	22,212
	Western mountains	6,586.372	1,455,671	15	439,091	97,045
Cyprus	Pentadaktylos	689.374	n.a.	46	14,986	n.a.
	Troodos	3,706.478	119,527	292	12,693	460
Czech Republic	Brdy	1,349.390	86,564	122	11,061	715
	Czech Carpathian Mountains	3,728.909	476,956	226	16,500	2,120
	Czech Ore mountains	4,132.397	551,541	184	22,459	3,014
	Czech Sudetes	8,882.675	857,192	543	16,359	1,579
	Moravian hills	2,689.530	197,726	296	9,086	670
	Sumava - Cesky Les	5,037.406	215,926	224	22,488	973
Finland	Forest Lapland	51,289.727	96,622	10	5,128,973	9,662
	Kainuu and Koillisma - Hill region	57,838.630	181,196	22	2,629,029	8,236
	Mountain Lapland	30,947.944	10,769	3	10,315,981	3,590
	Ostrobothnia and coastal hinterland	33,341.161	334,853	36	926,143	9,567
France	Corsica	7,808.768	212,731	338	17,726	629
	Cotes bourguignonnes	1,016.317	41,078	105	23,103	391
	French Ardennes	336.966	39,078	18	9,679	2,171
	French Jura	9,423.055	629,284	901	18,720	698
	French Pyrenees	16,516.586	373,498	1,064	10,458	351
	Massif Central	52,102.917	2,438,560	2,662	15,523	916
	Mediterranean Alps	15,157.442	1,386,430	582	19,573	2,386
	Morvan	1,596.811	39,013	55	26,044	709
	Northern Alps	29,268.502	2,009,187	1,327	29,033	1,514
	Northern Vosges	141.809	9,419	8	22,056	1,177
	Vosges	5,340.854	455,317	402	13,286	1,133
Germany	Bavarian Alps	6,694.135	707,586	144	46,487	5,091
	Black forest - Schwabian and Frankonian Alb	10,658.890	2,277,092	340	31,350	6,697
	German Bohemian mountains	4,554.430	399,761	138	33,003	3,304
	German low mountains. northern part	5,511.853	580,805	158	34,885	3,771

Mountain Areas in Europe – Final Report

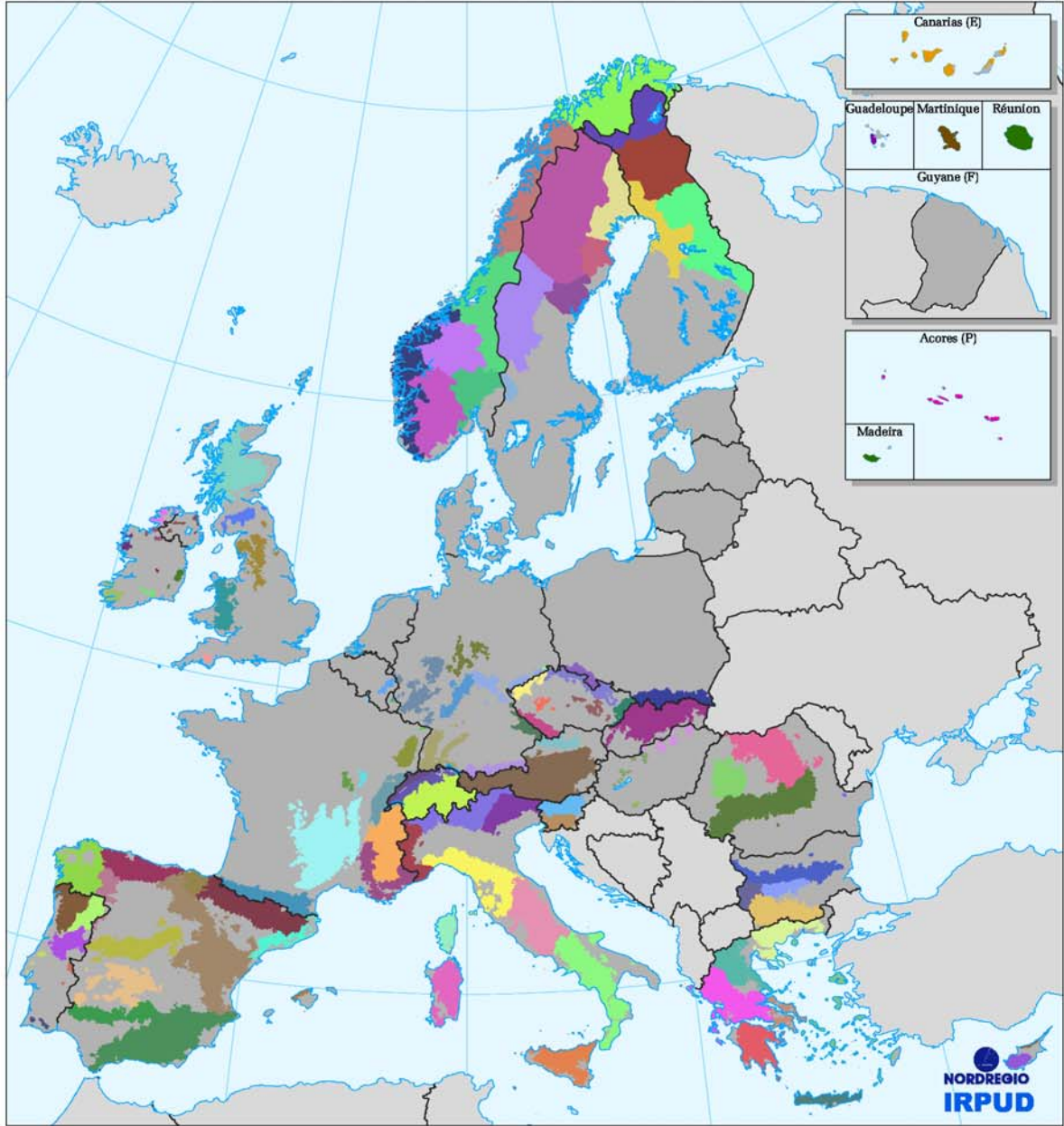
	German low mountains. southern part	6,216.778	938,558	229	27,148	4,966
	German Ore mountains	7,790.643	1,071,680	412	18,909	3,349
	German Sudetes	208.801	32,141	10	20,880	3,571
	Rhenish Slate Mountains (German part)	12,407.771	2,129,807	854	14,529	2,497
	Upper Rhine Valley	205.944	117,270	7	29,421	16,750
Greece	Aegian island mountains	7,633.705	318,770	70	109,053	4,550
	Crete	7,698.819	500,950	62	124,175	8,080
	Evia - Viotia - Attiki	6,403.014	1,225,145	85	75,330	14,413
	Olympos and Central Greece	18,403.396	789,454	111	165,796	7,112
	Peloponnesean mountains	18,585.803	840,576	121	153,602	6,947
	Pindos	30,029.006	930,257	210	142,995	4,430
	Rodopi	14,876.003	760,779	71	209,521	10,715
Hungary	Koszeg	42.820	755	2	21,410	378
	Mecsek	287.944	166,273	8	35,993	20,784
	North Hungarian mountain areas	2,669.110	193,191	107	24,945	1,806
	Transdanubian Mountains	1,475.043	349,02	51	28,922	684
Ireland	Connacht mountains	1,119.522	6,698	19	27,551	353
	Cumbria	696.295	6,356	30	58,922	212
	Donegal mountains	1,091.285	15,496	25	23,210	620
	Kerry mountains	2,954.567	35,593	73	43,651	488
	Mourne mountains (IE)	129.995	9,068	6	40,474	1511
	Slieve Bloom Mountains	82.653	861	3	21,666	287
	Waterford Mountains	459.853	5,606	16	28,741	350
	Wicklow	929.078	22,233	23	40,395	967
Italy	Central Alps	24,112.651	2,564,873	1,008	23,921	2,552
	Central Apennines	29,640.008	2,306,791	651	45,530	3,543
	Eastern Alps	15,710.669	1,189,553	388	40,491	3,066
	Italian Dinaric mountains	167.814	231,796	5	33,563	46,359
	Mountains of Sardinia	16,777.072	645,882	229	73,262	2,820
	Mountains of Sicily	18,818.604	3,202,790	323	58,262	9,916
	Northern Apennines	28,439.851	2,953,336	559	50,876	5,293
	Southern Apennines	36,315.731	4,209,464	1,002	36,243	4,201
	Western Alps	12,051.135	963,563	443	27,203	2,175
Luxembourg	Luxembourg Ardennes	114.795	6,787	5	22,959	1,357
Norway	Border area - Troendelag	57,156.764	237,732	49	1,166,465	4,852
	Finnmark and northern Troms	51,267.179	153,237	90	569,635	5,675
	Nordland - Troms	82,559.488	304,925	27	3,057,759	5,350
	Coastal mountain areas	42,793.418	772,954	39	1,097,267	8,588
	Hardangervidda - Southern mountain areas	34,892.786	154,808	25	1,395,711	3,969
	Jotunheimen - Rondane - Dovre	76,278.789	124,243	57	1,338,224	4,970
	Oestland mountain areas	22,036.180	1,106,152	41	537,468	26,979
Poland	Polish Carpathian mountains	11,997.020	1,573,691	121	99,149	13,006
	Polish Sudetes	4,184.119	681,57	47	89,024	1,450
Portugal	Acores - Grupo central	1,283.346	88,449	66	19,445	1,340
	Acores - grupo ocidental	138.042	3,22	7	19,720	46
	Acores - grupo oriental	790.420	77,572	49	16,131	1,583
	Complexo estremenho	598.729	103,965	27	22,175	3,851
	Cordilheira central	8,816.585	435,692	375	23,511	1,162
	ilha da Madeira	734.634	240,537	52	14,128	4,626
	Macico Noroeste	13,436.809	1,483,068	1,254	10,715	1,183
	non-massif mountain areas	656.733	30,65	16	41,046	192
	planalto transmontano - Beirao	8,986.050	258,704	472	19,038	548
	Serra Algarvia	723.164	19,733	5	144,633	3,947

Mountain Areas in Europe – Final Report

Romania	Eastern Romanian Carpathian mountains	35,660.669	<i>2,160,815</i>	325	109,725	<i>6,690</i>
	Muntii Apuseni	14,653.319	<i>905,253</i>	157	93,333	<i>5,803</i>
	Muntii Macinului	131.004	<i>5,719</i>	1	131,004	<i>5,719</i>
	Southern Romanian Carpathian mountains	39,951.709	<i>2,463,919</i>	416	96,038	<i>5,951</i>
Slovakia	Slovak Carpathian mountains	30,375.816	<i>2,624,492</i>	1,945	15,617	<i>1,350</i>
Slovenia	Dinaric Mountains	6,290.308	<i>403,936</i>	37	170,008	<i>10,917</i>
	North Slovenia Alps	9,514.805	<i>889,362</i>	91	104,558	<i>9,773</i>
Spain	Balearic Islands	932.584	<i>96,226</i>	16	58,287	<i>6,014</i>
	Basque Mountains	7,201.539	<i>1,483,572</i>	230	31,311	<i>6,713</i>
	Betic Systems	58,191.564	<i>4,104,559</i>	598	97,310	<i>6,910</i>
	Canary Islands	5,554.095	<i>1,154,721</i>	75	74,055	<i>15,396</i>
	Cantabrian Range	20,506.312	<i>815,078</i>	200	102,532	<i>4,159</i>
	Catalan Range	7,673.759	<i>2,617,933</i>	255	30,093	<i>10,307</i>
	Central System	22,832.548	<i>715,066</i>	594	38,439	<i>1,210</i>
	Galician Massif	23,029.557	<i>1,749,400</i>	250	92,118	<i>6,998</i>
	Iberic System	63,478.872	<i>982,952</i>	1,217	52,160	<i>832</i>
	Leon Mountains	7,504.771	<i>161,811</i>	92	81,574	<i>1,778</i>
	Sierra Morena	15,773.373	<i>277,738</i>	84	187,778	<i>3,306</i>
	Spanish Pyrenees	32,762.118	<i>1,228,674</i>	650	50,403	<i>1,938</i>
	Toledo Mountains	20,493.179	<i>294,096</i>	141	145,342	<i>2,086</i>
Sweden	Aangermanland	18,485.612	<i>100,578</i>	4	4,621,403	<i>25,145</i>
	Jamtland - Harjedalen - Dalarna	54,606.997	<i>122,69</i>	7	7,801,000	<i>1,753</i>
	Lapland	117,625.382	<i>100,98</i>	12	9,802,115	<i>842</i>
	Norrbottn	34,850.263	<i>194,827</i>	9	3,872,251	<i>21,647</i>
	Vaermland	4,366.773	<i>13,552</i>	1	4,366,773	<i>13,552</i>
	Vaesterbotten	14,758.238	<i>82,716</i>	3	4,919,413	<i>27,572</i>
Switzerland	Mittelland plateau	6,884.374	<i>3,676,204</i>	1,069	6,440	<i>3,439</i>
	Schwabian Alb (Swiss)	96.477	<i>6,092</i>	12	8,040	<i>508</i>
	Swiss Alps	26,795.937	<i>2,038,549</i>	1,076	24,903	<i>1,903</i>
	Swiss Jura	3,666.783	<i>411,363</i>	368	9,964	<i>1,118</i>
United Kingdom	Dartmoor and Exmoor	953.751	<i>83,132</i>	22	43,352	<i>3,779</i>
	Highlands and Islands	37,539.881	<i>414,408</i>	125	300,319	<i>3,315</i>
	Mourne Mountains (UK)	236.245	<i>20,547</i>	7	33,749	<i>2,935</i>
	Northern English Mountains	9,164.930	<i>968,286</i>	145	63,206	<i>6,678</i>
	Northern Ireland Mountains	1,032.169	<i>89,109</i>	26	39,699	<i>3,427</i>
	Southern Uplands	4,317.893	<i>68,286</i>	31	139,287	<i>2,203</i>
	Welsh Mountains	10,393.478	<i>902,852</i>	289	35,964	<i>3,124</i>

data in italics = data are not available for all municipalities

Figure 3.8. Massif delineation (level 3).



Massif delineation (level 3)

Source: UNEP-WCMC, NORDREGIO

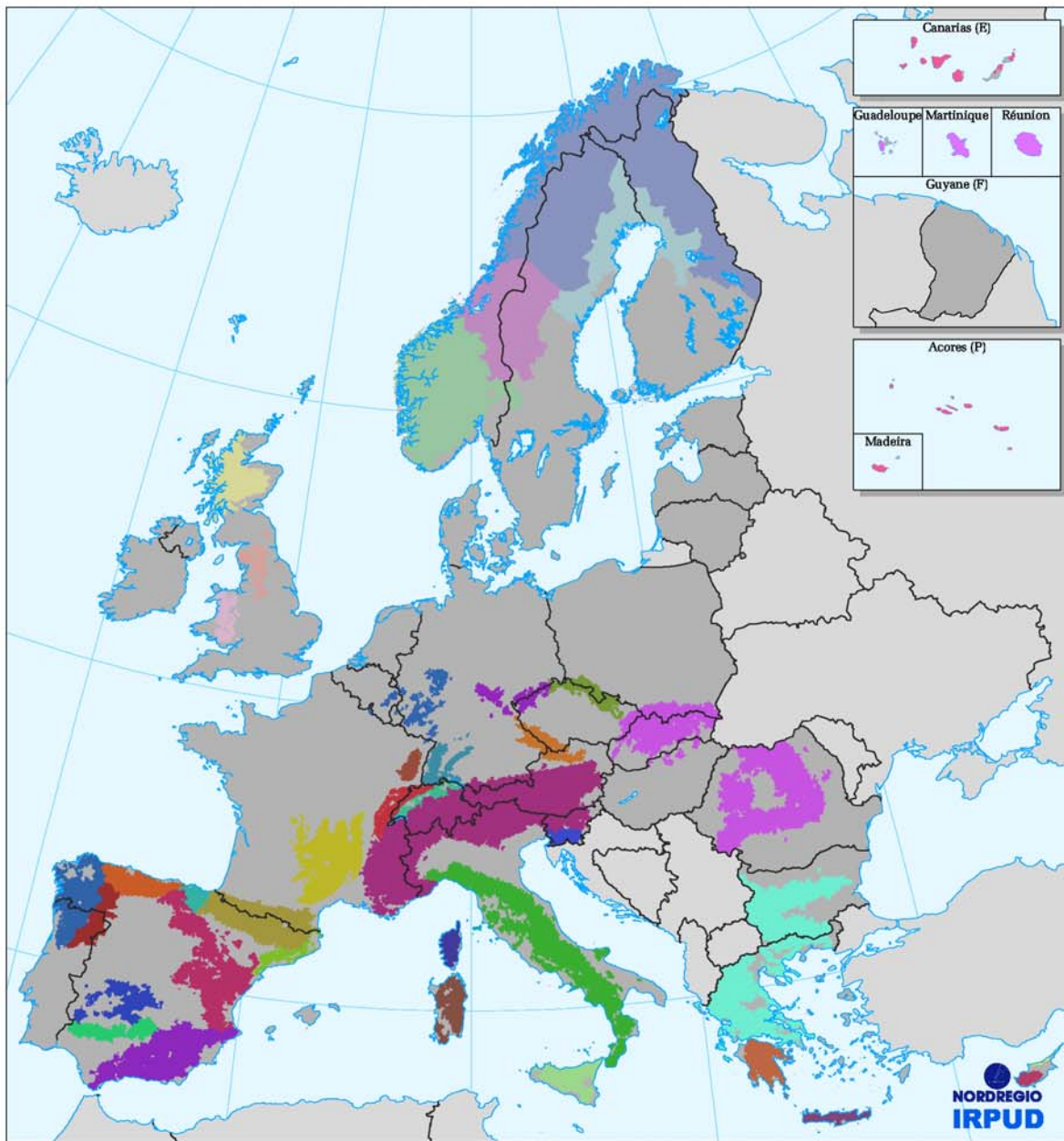
0 500Km
Administrative boundaries: EuroGeographics, ESRI Romania, NCRD, Oikos, Swiss Federal Statistical Office, Eurostat/GISCO

Table 3.7. Mountain ranges (Level 1)

Mountain range	Total area (km ²)	Total population	Number of Municipalities	Average municipality area (km ²)	Average municipality population
Alpine Range	195,696	15,394,428	6,308	31	2,446
Apennines	94,396	9,469,591	2,212	43	4,283
Balkans	123,260	7,343,422	603	204	12,178
Basque Mountains	7,202	1,483,572	230	31	6,713
Betic Systems	58,192	4,104,559	598	97	6,945
Black Forest - Schwabian and Frankonian Alp	10,755	2,283,184	352	31	6,486
Bohemian Range	14,794	964,454	545	27	1,827
Bothnian Arc	101,435	712,974	52	1,951	13,980
Cantabrian Range	20,506,312	815,078	200	102,532	4,159
Carpathian Range	139,037	10,398,317	3,297	42	3,158
Catalan Range	7,673,759	2,617,933	255	30,093	10,307
Corsica	7,808,768	212,731	338	23,103	629
Crete	7,698,819	500,950	62	124,175	8,080
Central Scandinavian Mountain Areas	111,764	237,732	56	1,996	4,245
Central System	31,649	1,150,758	969	33	1,188
Dinaric Mountains	6,458	635,732	42	154	15,136
Galician-Portuguese Massif	36,466	3,232,468	1,504	24	2,149
Highlands and Islands	37,540	414,408	125	300	3,315
Iberic System	63,479	982,952	1,217	52	1,116
Jura	13,090	1,040,647	1,269	10	820
Massif Central	52,103	2,438,560	2,662	20	916
Mittelland - Upper Rhine Valley	7,090	3,793,474	1,076	7	3,526
Mountains of Sardinia	16,777	645,882	229	73	2,820
Mountains of Sicily	18,819	3,202,790	323	58	9,916
Northern English Mountains	9,165	968,286	145	63	6,678
Northern Fennoscandia	391,528	746,749	164	2,387	4,553
Ore Mountains	11,923	1,623,221	596	20	3,221
Peloponnesean Mountains	18,586	840,576	121	154	6,947
Pentadaktylos	689	n.a.	46	15	n.a.
Pyrenees	49,279	1,602,172	1,714	29	944
Rhenish Slate Mountains	14,288	2,268,347	899	16	2,526
Sierre Morena	15,773	277,738	84	188	3,306
Southern Scandinavian Mountain Areas	180,368	2171,709	163	1,107	13,323
Sudetes	13,276	889,333	600	22	1,485
Toledo Mountain	20,493	294,096	141	145	2,086
Transmontana - Leonese Plateau	16,491	420,515	564	29	747
Troodos	3,706	119,527	292	13	409
Vosges	5,341	455,317	402	13	1,133
Welsh Mountains	10,393	902,852	289	36	3,124

data in italics = data are not available for all municipalities

Figure 3.9. Mountain ranges (level 1).



Mountain ranges (level 1)

Fenno-Scandia/British islands

- Bothnian Arc
- Cent. Scandinavian mountains
- Highlands & Islands
- Northern English Mountains
- Northern Fennoscandia
- Southern Scandinavian mountains
- Welsh Mountains

Central/western Europe

- Alpine range
- Appennines
- Black forest: SFA
- Bohemian range
- Dinaric Mountains
- Jura
- Massif Central
- Mittelland-Upper Rhine Valley
- Ore mountains
- Rhenish Slate Mountains
- Sudetes
- Vosges

Iberian peninsula

- Basque Mountains
- Betic Systems
- Cantabrian Range
- Catalan Range
- GAP Massif
- Iberic System
- Pyrenees
- Sierra Morena
- Toledo Mountains
- Transm.-Leonese Plateau

Eastern Europe/Balkans

- Balkans
- Carpathian range
- Peloponnesean mountains
- Pentadakylios

Mediterranean islands

- Corsica
- Crete
- Mount. of Sardinia
- Mount. of Sicily
- Troodos
- Study area
- Remaining countries

Source: UNEP-WCMC, NORDREGIO

0 500Km

Administrative boundaries: EuroGeographics, ESRI Romania, NCRO, Oikos, Swiss Federal Statistical Office, Eurostat/GISCO

The number of massifs per country ranges from one massif (Belgium, Slovakia) up to 13 for Spain. Denmark, Malta, the Netherlands, and the Baltic States have no massifs. The national massifs differ significantly in area (Table 3.8). The largest are found in the Nordic countries, Sweden and Norway, but those in the Iberic and Betic Systems in Spain are also of considerable size. The smallest are the German part of the Upper Rhine Valley, Koszeg in Hungary - which are both at the extreme ends of trans-national mountain ranges – and the Slieve Bloom Mountains in Ireland. The ratio between the largest and smallest massifs is about 3,100, i.e., Lappland, the largest massif, is 3,100 times larger than the smallest, the Upper Rhine Valley (Germany).

Table 3.8. Area of largest and smallest massifs

Massif area (km ²)	Country	Massif name
117,625	Sweden	Lappland
82,559	Norway	Finmark and Northern Troms
76,279	Norway	Nordland - Troms
63,479	Spain	Iberic System
58,192	Spain	Betic System
...
96	Switzerland	Schwabian Alb (Swiss)
83	Ireland	Slieve Bloom Mountains
43	Hungary	Koszeg
38	Germany	Upper Rhine Valley

Leaving enclaves and isolated mountain areas aside, the number of municipalities belonging to an individual national massif ranges from 1 (Värmland in Sweden) or 2 (Koszeg in Hungary, Västerbotten in Sweden, Upper Rhine Valley in Germany) up to the maximum number of 2,668 in the Massif Central in France (Table 3.9, Figure 3.10). This is not only due to differences in the size of the massifs, but is also a function of the size of the municipalities in the different countries. For instance, municipalities in Finland, Norway and Sweden are large, so there are only very few municipalities per massif, whereas those in France, Portugal, Norway, Switzerland are relatively small, so there are many municipalities per massif.

Table 3.9. Maximum and minimum number of municipalities belonging to one massif

No. of municipalities	Country	Massif name
2,668	France	Massif Central
1,956	Slovakia	Slovak Carpathian Mountains
1,332	France	Northern Alps Mountains
1,291	Spain	Iberic System
1,265	Portugal	Macico Noreste
...
3	Ireland	Slieve Bloom Mountains
2	Hungary	Koszeg
2	Sweden	Vaesterbotten
2	Germany	Upper Rhine Valley
1	Sweden	Värmland

Figure 3.10. Number of municipalities per massif

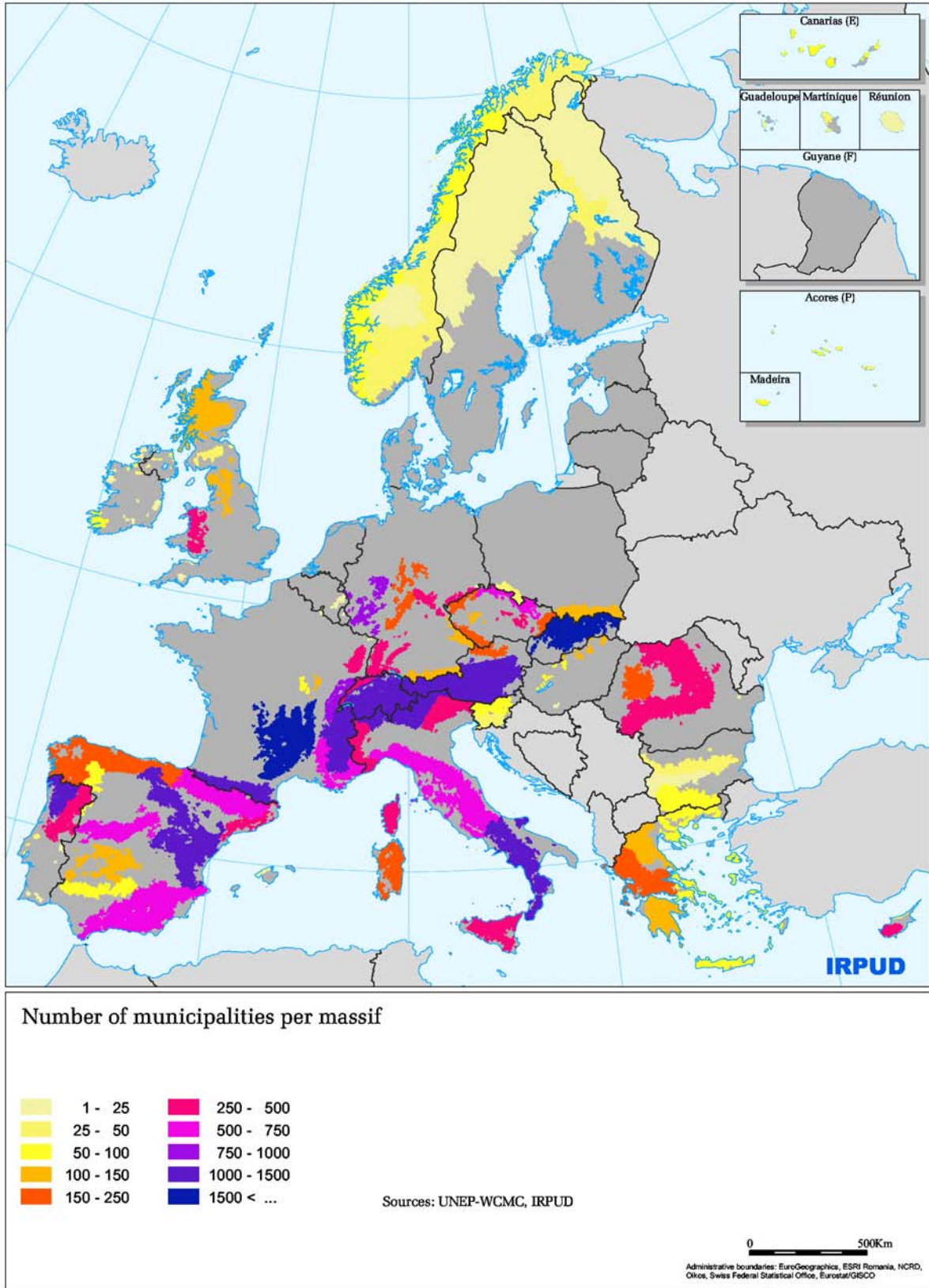


Figure 3.11 shows the ranges in size in massif area for each country. The diagram plots the maximum, minimum, and country-averages of the massif areas. The average for the overall study region is also indicated as a blue line. When comparing these data, it should be stressed that the number of massifs, as defined for this study, for some countries is very small; and that this number is much smaller than many national perceptions.

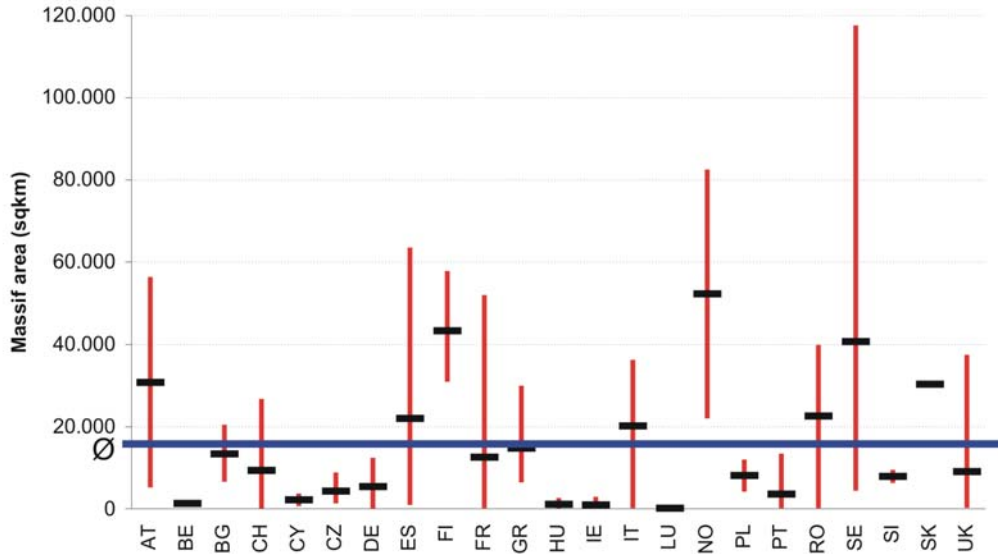


Figure 3.11. Range of massif areas by country

There are substantial differences not only between the absolute largest and smallest massifs, but also within certain countries, such as Sweden, Norway, Spain, and France. On the other hand, there are also countries with relatively little variation in the area of mountain ranges, such as the Czech Republic, Germany, Poland and Portugal.

The national averages of about one third of the countries are higher than the study average: 15,734 km². These countries are Austria, Spain, Finland, Italy, Norway, Romania, Sweden and Slovakia. For all other countries, the national averages are below the average for the countries considered in the study.

As shown in Figure 3.12, there is no clear relation between the area of the mountain range and the number of municipalities within it. While some relatively large massifs have very many municipalities (e.g., Massif Central in France), some of the largest cover only very few municipalities (e.g., Lappland in Sweden). Again, this is largely a reflection of national differences in the area of municipalities.

Figure 3.13 gives the proportion of the mountain ranges in comparison to the total mountain area of a country (only for those countries with more than one massif: Belgium, Luxembourg, and Slovakia are not shown).

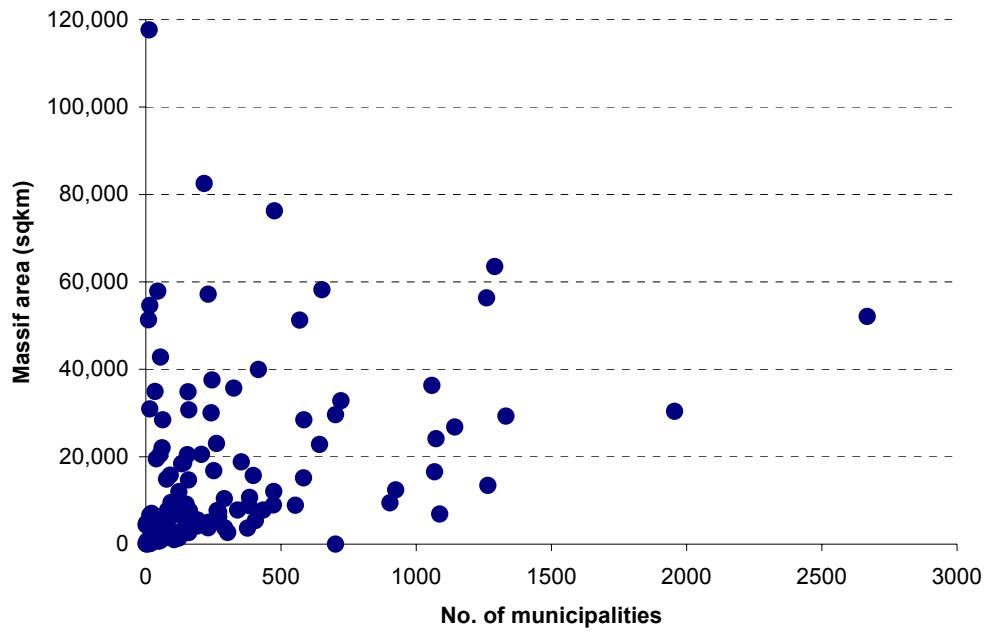


Figure 3.12. Massif area and number of included municipalities

Mountain Areas in Europe – Final Report

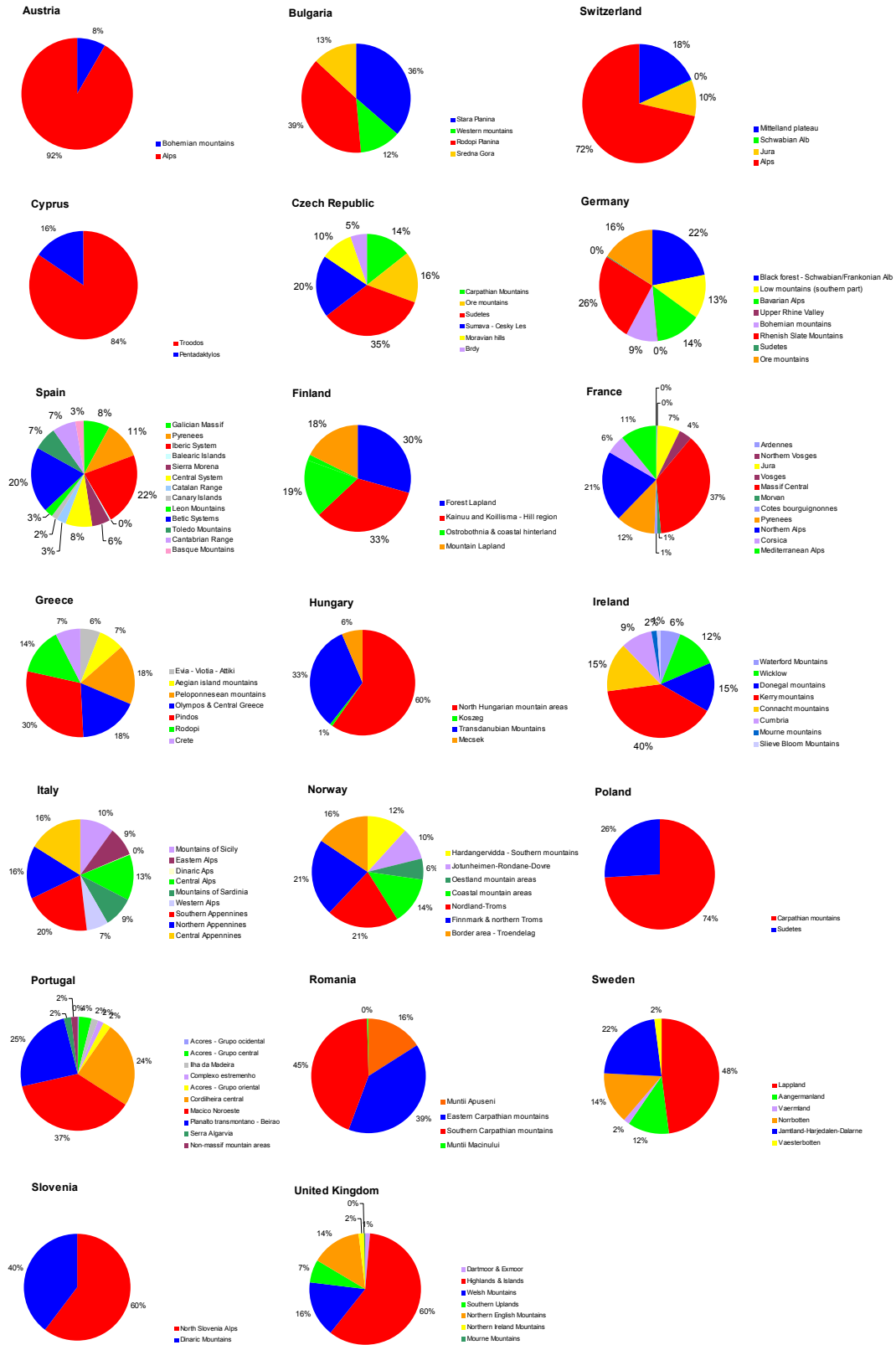


Figure 3.13. Share of massifs in comparison to the total mountain area of a country

3.5 Transition areas

Based on the mountain delineation and massif identification described above, transition areas have been defined. These are assumed to have functional spatial-temporal linkages to the mountain areas they surround. Three buffer rings around mountains were generated: with 10 km, 20 km and 50 km radius. It is assumed that the greater the distance to the mountains, the lower is the functional linkage. Nevertheless, whether these transition areas really play an important role as intermediate space between mountains and lowland areas is still to be proved.

Figure 3.15 shows the massif areas, surrounded by the three rings of transition. For some countries (e.g., Austria, Bulgaria, Greece, Ireland, Italy, Spain) massif ranges together with the transition areas cover all or almost all of the country, whereas for other countries the transition areas do not extend the massif areas very much (e.g., Finland, France, Poland, Sweden). For some other countries, certain parts of the country come into focus (e.g., southern Germany; and Wales, Scotland and northern England for the UK). This visual observation is underlined by Figure 3.14, which gives the proportions of the five spatial categories (massif areas, 10 km buffer, 20 km buffer, 50 km buffer, remaining lowland) in relation to the overall country area. Denmark, Malta and the three Baltic states of Estonia, Lithuania, and Latvia do not have any mountains, nor transition areas. However, although the Netherlands also do not have any mountains, a small part of the country falls into transition areas of neighbouring Belgium and Germany.

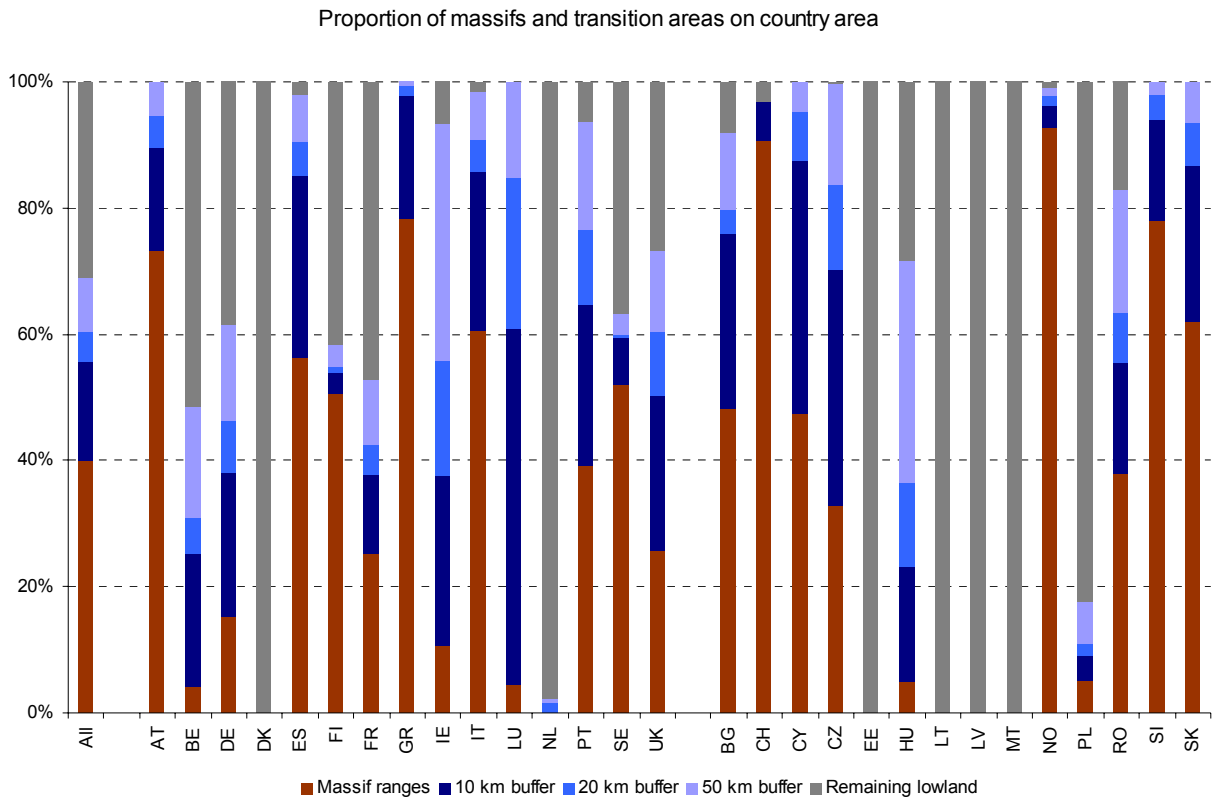
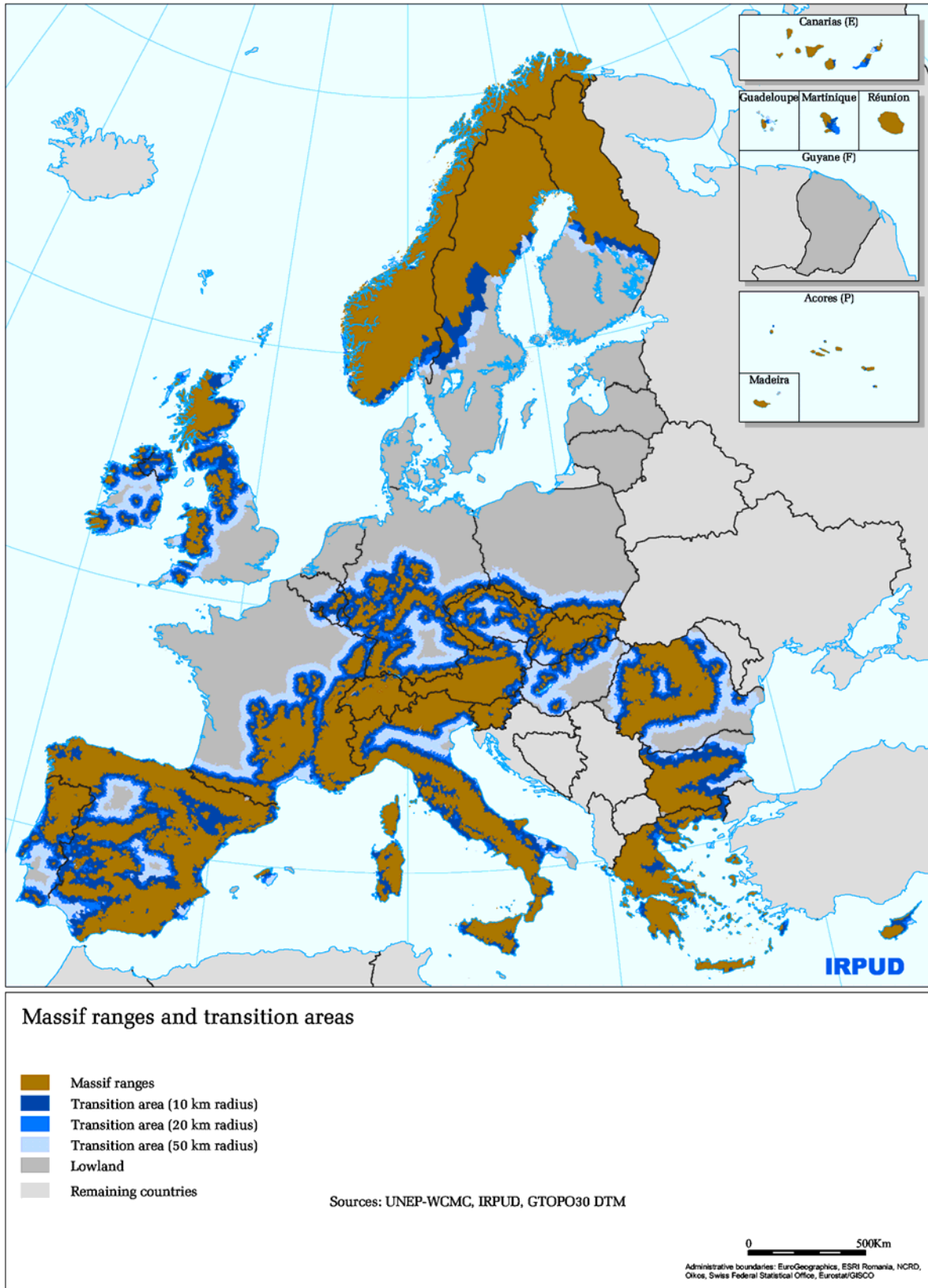


Figure 3.14. Proportion of massifs and transition area zones in each country

Figure 3.15. Massif ranges and transition areas



The proportion of population living in massifs and in transition areas also varies significantly, as shown in Figure 3.16. In Austria, Greece, Switzerland, Slovenia, and Slovakia, 90-100% of the population lives either in massifs or within the 10 km transition zone. On the other side of the spectrum, for Poland, Sweden or Belgium these two categories account only for 10% of the population. On average, almost 20% of the total population of the study area live in mountain ranges (excluding enclaves); another 25% live within 10 km of massifs; another 5% within 20 km; and a further 10% within 50 km. Thus, about 60% of the overall population in the study area lives in or close to massifs.

Figure 3.16. Population by spatial categories

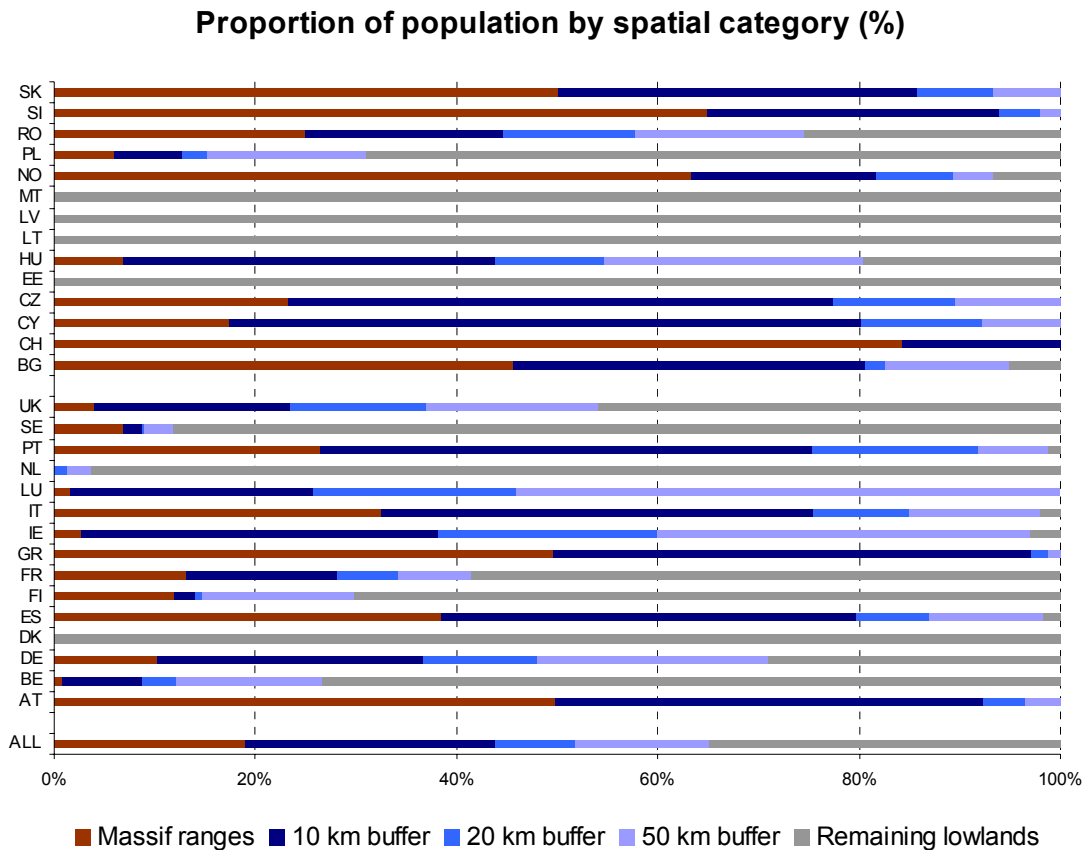


Table 3.10 presents population densities by country and spatial category. In all countries except for Hungary, the mountain ranges have the lowest population density compared to the other categories. At the massif level, the lowest population density in mountain ranges is 2.65 people/km² for Sweden. In contrast, the highest level in mountain ranges (i.e., the most densely populated area) is about 163.8 people/km² in Switzerland. The average of the total study area is 47.0 people/km², compared to 169.6 people/km² in the 10 km buffer, 184.1 people/km² in the 20 km buffer, and 159.6 people/km² in the 50 km buffer. The average population density in the remaining lowland areas for the whole of the study area is 115.0 people/km².

Table 3.10. Population density (people/km²) in massifs, buffer zones, lowlands, and countries

Country	Massif ranges	10 km buffer	20 km buffer	50 km buffer	Remaining lowland	National average
Study Area	47.0	169.6	184.1	159.6	115.0	105.2
EU15	49.1	176.9	217.8	187.7	131.7	115.7
Austria	64.0	252.3	76.3	63.2	33.5	95.7
Belgium	64.7	126.0	198.2	277.9	477.5	335.2
Denmark*	..	..	..	..	..	123.7
Finland	3.6	9.2	342.8	62.0	21.5	15.9
France	60.4	130.6	136.3	78.6	99.7	94.0
Germany	157.6	265.8	40.4	368.0	189.2	229.7
Greece	51.8	201.2	9.8	148.6	84.1	81.8
Ireland	13.7	74.4	68.8	53.5	26.4	55.8
Italy	100.6	317.5	81.0	316.6	255.8	186.6
Luxembourg	59.1	72.4	104.5	606.0	..	338.0
The Netherlands	..	..	..	..	..	388.0
Portugal	75.8	215.8	142.8	45.1	23.6	112.1
Spain	55.2	117.3	115.5	119.8	74.6	80.6
Sweden	2.5	4.6	34.0	13.1	34.6	19.8
UK	40.0	179.4	165.3	305.0	415.4	236.5
Acceding/candidate countries						97.8
Bulgaria	67.9	90.4	40.4	71.0	46.2	78.4
Cyprus	35.0	257.9	153.9	136.3	..	74.8
Czech Republic	92.6	187.1	4.3	85.5	56.0	129.7
Estonia*	..	..	..	..	31.6	31.8
Hungary	158.5	211.4	110.6	80.0	76.6	110.8
Lithuania*	..	..	..	..	56.6	56.6
Latvia*	..	..	..	..	..	37.5
Malta**	..	..	..	..	..	1786.8
Poland	139.4	217.7	165.3	290.3	103.7	124.0
Romania	61.6	105.6	153.9	80.3	139.3	93.3
Slovenia	81.8	179.2	96.5	99.4	..	98.3
Slovakia	86	169	111	116	..	110.3
Norway	7.8	56.7	34.0	16.9	60.2	13.9
Switzerland	163.8	454.5	..	..	114.5	176.4

*Source: EUROSTAT NewCronos data 2000

**Source: NSO Malta

As has been shown particularly for the Alps (Perlik, 2001), the lowland zone immediately adjacent to mountain areas has long been a location for the development of services serving both lowland and mountain people. Furthermore, access to energy sources and natural resources (e.g., timber, minerals) deriving from the mountains, combined with ease of access to lowland markets, has meant that many industries have been developed adjacent to mountain areas. Another increasingly important factor relates to peoples' choice of residence location. Due to difficult physical and

climatic conditions and limited potential for settlement, much of the area of most massifs is only sparsely populated. However, mountains are also an important attraction factor (e.g., for leisure activities, sports, recreation) for many people. Usually, the physical and climatic conditions are not as severe as within the mountains, potentials for settlement are usually greater, and the outer parts of mountain ranges, as well as higher destinations along good transport corridors, can be accessed relatively easily. For these diverse reasons, transition areas offer certain potentials as residence locations: population densities increase in buffer zones surrounding the massifs (in particular within a radius of 10 and 20 km). Many urban agglomerations are located in these transition areas (historically founded at these locations probably because of similar criteria as outlined above), for example Munich in Bavaria, and Milan and Turin in northern Italy.

With regard to population densities for the outer 50 km buffer zone and the remaining lowland areas, these decrease again, except in Belgium, France, Norway, Romania and countries with no mountain ranges, such as the Baltic states and Malta. This underlines the observation that transition areas around mountains often offer specific locational advantages.

This observation is also important with respect to infrastructure supply (e.g., universities, hospitals, airports, schools) within mountain areas and within the fringe of transition areas. To some extent, the lack of infrastructure in many mountain areas could be compensated by additional infrastructure within the transition areas; hence economic and also social activities may be re-located to the transition areas. This is further investigated in Chapter 7.

3.6 Comparison with other European delineations

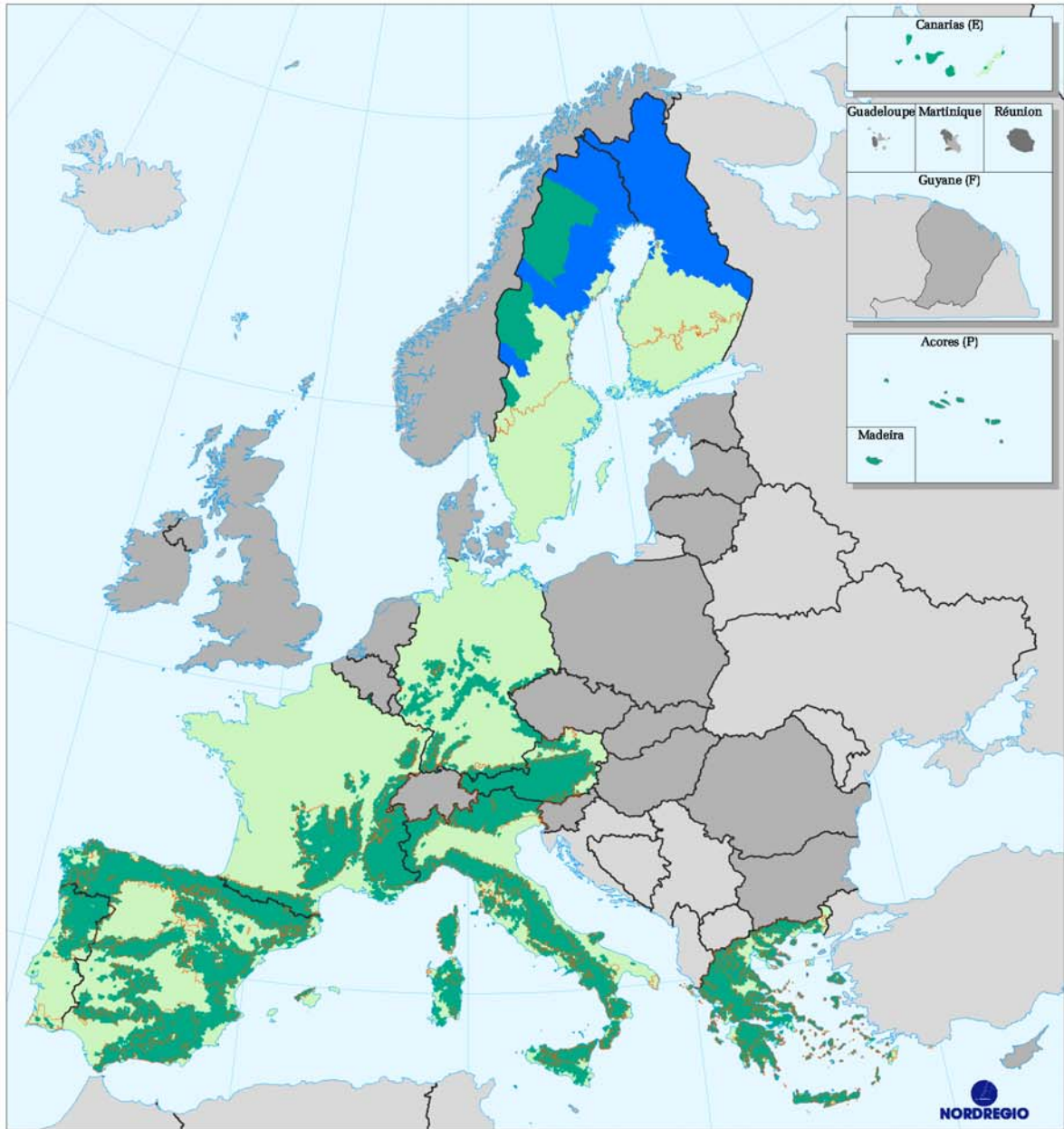
The classification of Less Favoured Areas according to Article 23 (Mountainous areas)

The classification of Less Favoured Areas according to Article 23 of regulation (EC) 950/97 (Mountainous areas) was made according to different criteria in each country, the aim being to identify “local government districts or parts thereof [...] characterised by a considerable limitation of the possibilities for using the land and an appreciable increase in the cost of working it”. This regulation includes a climatic criterion that states that “areas north of the 62nd parallel and certain adjacent zones are to be included as mountain areas”.

Comparing the two delineations of mountain areas in relevant Member States (Figure 3.17), it is clear that selecting areas with a less favourable temperature contrast index than in mountain areas with the most difficult climatic conditions considerably reduces the extent of areas considered mountainous in the Nordic Member States.

Other major differences can be observed in Germany, where only areas above 600 meters were considered when delimiting mountains according to Article 23. The approach of the present study, which seeks to identify topographic constraints regardless of altitude, implies that much of central Germany can be characterised as mountainous. The same phenomenon can be observed in parts of Spain (Valencia) and Italy (Sardinia, southern Sicily).

Figure 3.17: Mountainous municipalities and less favoured areas according to Art. 23 of the regulation (EC) 950/97 (mountainous areas)



Mountainous municipalities and less favoured areas according to Art. 23 of the regulation (EC) 950/97 (mountainous areas)

- Member states in which Art. 23 has been applied
- Municipalities defined as mountainous according to topographic criteria
- Municipalities defined as mountainous according to climatic criteria
- Less favoured areas according to Art. 23 (mountainous areas)

- Data not available
- Study area
- Other countries

Source: Eurostat/GISCO, DG Agri for boundaries

0 500Km

Administrative boundaries: EuroGeographics, ESRI Romania, NCRD, Otkor, Swiss Federal Statistical Office, Eurostat/GISCO

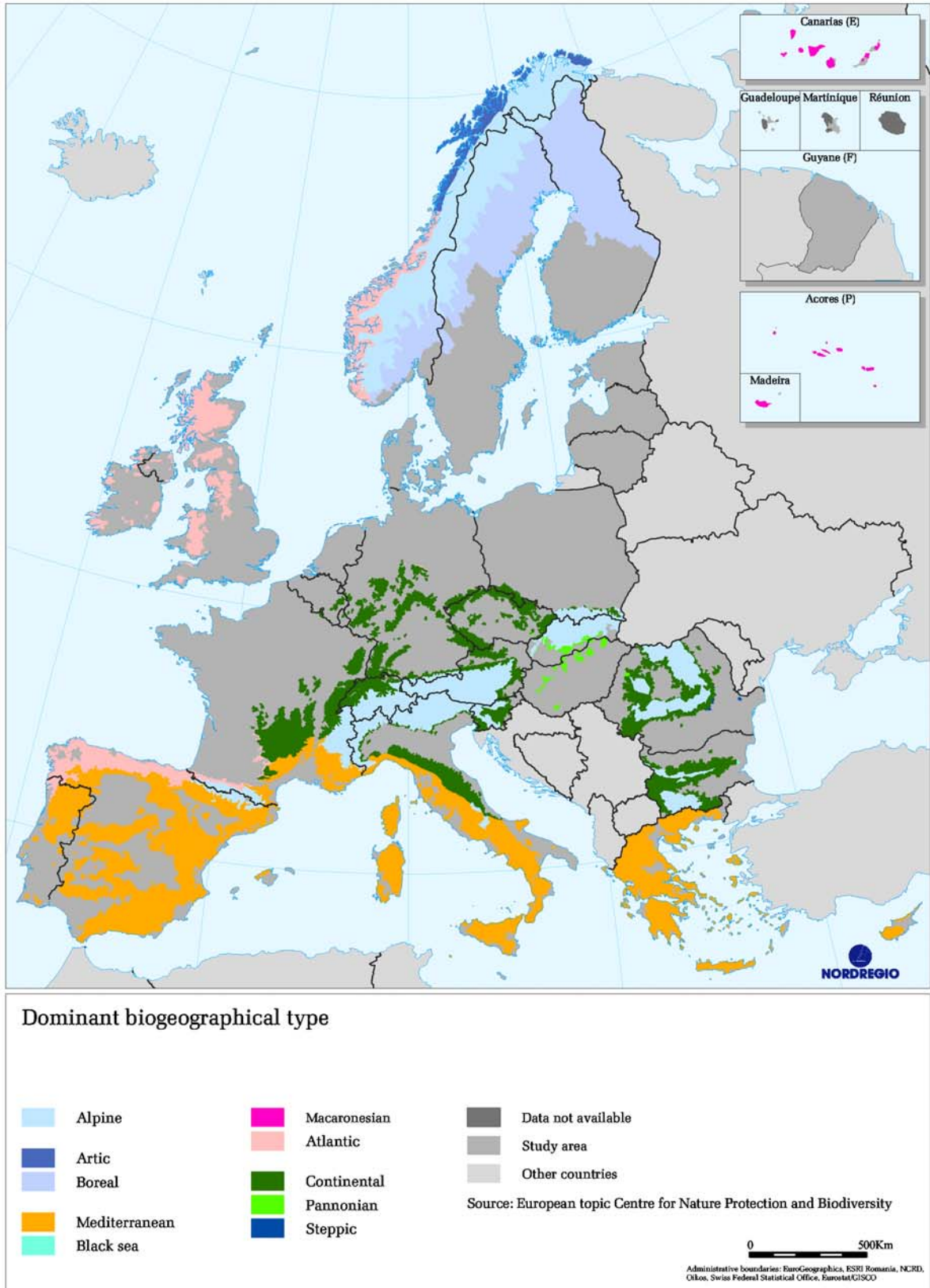
The delineation of bio-geographical regions

A classification of mountain municipalities according to the indicative map of bio-geographical regions identified by the European Topic Centre for Nature Protection and Biodiversity for DG Environment's *Natura 2000* network shows that individual massifs often belong to more than one type of region (Figure 3.18). This confirms the idea that local contrasts are a fundamental characteristic of mountain areas, which often form contact points between different bio-geographical areas (e.g. Pyrenees, Alps).

The Alpine bio-geographical region is the only one that is explicitly linked to high altitudes; nonetheless, it only concerns a minority of municipalities identified as mountainous by this study. The main bio-geographical regions encountered (Atlantic, Continental, Alpine, Boreal, and Mediterranean) form transnational groups of mountain areas. To some extent, in each of these groups, altitude, and slope influence economic and social activities in a different way.

The delineation of bio-geographical regions in upland areas also helps to reveal how mountain ranges have contributed to shaping the European space. The limits of climatic and topographic zones often correspond to important cultural, linguistic or political border areas. The analysis of such pivot areas is particularly important in a European integration perspective.

Figure 3.18: Preliminary classification of European mountain municipalities according to bio-geographical regions



3.7. Comparison with national approaches to mountain areas

The definition of policy areas is an interactive process in which delineation criteria and policy content influence each other. In the case of mountains, this can be observed in a number of countries, where an agricultural delineation based on topographic criteria or soil characteristics has progressively been used as a spatial context for rural or regional development. Three countries with significant mountain areas have no delineation at all (Table 3.11). Some countries have only reached the first stages of this iterative process (Table 3.12), while others are more advanced (Table 3.13).

Countries with no mountain definition

Table 3.11. Countries with no definition of mountain areas

Name of country	Comment
Finland	No administrative definition
Norway	No administrative definition. Debates about specific measures for “forestless mountains”.
Poland	Delineations existed in the Mountain Act, which was the basis for Polish mountain policies between 1986 and 1989.

In Norway, there is a well-embedded cultural understanding of mountains as areas where altitude prevents the growth of forests. Consequently, there have been no national attempts to delimit mountain agriculture. On the other hand, the mountain delineation issue has recently been raised in environmental debates about the need for a specific protection of non-forested uplands. This may lead to demands for a general policy in these areas, balancing economic development through tourism, secondary housing and environmental imperatives.

In Finland, relevant policy measures refer to northern peripheries assimilated to mountain areas rather than to mountains as such. There is, however, no unified delineation for these initiatives.

Poland is a specific case, as the Mountain Act of 1986 was implemented only until 1989. The delineation criteria and policy measures used by this Act are nonetheless of interest when trying to identify possible approaches to mountain areas in Poland.

Countries with a mountain definition mainly for agricultural, forestry-related and/or environmental policy purposes

Trends towards a more comprehensive approach to mountain areas can be observed either in public debates and official enquiries and reports (Czech Republic, UK), or through the actual implementation of rural development measures in agriculturally-defined mountain areas (Slovenia, Portugal). In Sweden, while most interviewees agree that the current mountain policies fail in their implementation because development and preservation concerns are approached separately, there is hardly any public debate about the need for an integrated approach to mountain areas.

In Ireland, Hungary, Slovakia and Spain, the approach is focused on mountain agriculture.

Table 3.12. Countries with a mountain definition mainly for agricultural, forestry-related and/or environmental policy purposes

Name of country	Comment
Czech Republic	Current debates about extending mountain policies to Regional development plans and Horizontal Rural Development Plan
Hungary	A delineation is currently being implemented, based on the Council Regulation (EC) No 1257/1999 on support for rural development from the European Agricultural Guidance and Guarantee Fund
Ireland	Domestic definitions of mountainous areas based on those outlined in EC Council regulation 1257/1999
Portugal	Delineation mainly used for agricultural compensatory allowances, but also rural development measures.
Slovakia	Delineation based on ecological soil units, with “high mountain” and “low mountain” categories.
Slovenia	Delineation initiated by Ministry of Agriculture, but also used for regional development policies.
Spain	Zones of mountain agriculture defined by Ministry of Agriculture and Autonomous Communities
Sweden	Environmental programme for “bare mountains”; specific policies for forests close to bare mountain areas.
UK	Multiple approaches to upland areas at national, regional and local scales

Countries with a mountain definition for regional development and/or more general policy purposes

Bulgaria, France, Italy and Switzerland have a more integrated approach to mountain areas. Further analysis of these policies is presented in Chapter 8.

Table 3.13. Countries with a mountain definition for regional development and/or more general policy purposes

Name of country	Comment
Bulgaria	Delineation at the infra-municipal scale; criteria are currently being redefined.
France	Policy fields targeted by the Mountain Law are agriculture, forests, environment, tourism, infrastructure, housing, training an education, employment, economy and risk management.
Italy	Criteria defined at the regional level since 1990, with varied policy purposes. Delineations are currently evolving.
Switzerland	Federal Agricultural land zoning also used for housing improvement, fiscal equalisation, road investment and regional aids.