ESPON

Ulysses

Using applied research results from ESPON as a yardstick for cross-border spatial development planning

Targeted Analysis 2013/2/10

Annex IV – Case Study 2: Working Community of the Pyrenees Cross-Border Area

Report on Task 2.2 - Multi-scale performance analysis
Version 14/10/2011

EUROPEAN UNION
Part-financed by the European Regional Development Fund
INVESTING IN YOUR FUTURE

This report presents Case study results of a Targeted Analysis conducted within the framework of the ESPON 2013 Programme, partly financed by the European Regional Development Fund.

The partnership behind the ESPON Programme consists of the EU Commission and the Member States of the EU27, plus Iceland, Liechtenstein, Norway and Switzerland. Each partner is represented in the ESPON Monitoring Committee.

This report does not necessarily reflect the opinion of the members of the Monitoring Committee.

Information on the ESPON Programme and projects can be found on www.espon.eu

The web site provides the possibility to download and examine the most recent documents produced by finalised and ongoing ESPON projects.

This basic report exists only in an electronic version.

List of authors

Tecnalia (Spain)

Efren Feliu

Hanna Kuittinen

Eguzkiñe Saénz de Zaitegui

Begoña Sanchez

Carlos Tapia

Itziar Viloria

Mirari Zaldua

Nomenclature

CBA: Abbreviation for the Cross Border Region representing the Trinational Metropolitan Area Upper Rhine

NUTS: Abbreviation of the Nomenclature of Units for Territorial Statistics. It represents a ‘geocode standard’ for referencing the subdivisions of EU space for statistical purposes.

NUTS 1: First level definition of the EU space, corresponding to countries.

NUTS 2: Second level definition of the EU space, corresponding to regions (peripheries for Greece and planning regions for Bulgaria).

NUTS 3: Third level definition of the EU space, corresponding to districts (prefectures for Greece and oblasts for Bulgaria).

NUTS 4: Fourth level definition of the EU space, corresponding to municipalities.

Population Growth: Represents the change of total population over a certain time period.

Population Density: Represents a key geographic parameter expressing the total population per unit area, usually per sq km.

Total Dependency Ratio: Represents the ratio of the combined youth and senior population to the working-age population.

Total Fertility Rate: Represents the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with current age-specific fertility rates.

Table of contents

Chapter 0 - Executive Summary

The Working Community of the Pyrenees Cross Border Area (CBA), is produced by the 686,7 km borderline length between Spain (ES), France (FR) and Andorra (AD). The Working Community of the Pyrenees CBA is located at the North-Eastern part of Spain and the Southern part of France. It comprises of six NUTS2 administrative regions twenty nine NUTS3 administrative regions (*provincias* in the case of Spain and *départements* in the case of France). With 20.115.885 inhabitants in 2009, its density is over corresponding countries and EU27 values.

This case study addresses demography, polycentric development, urban-rural relationship, accessibility and connectivity issues and undertakes a performance analysis concerning the Europe 2020 and Gothenburg goals. A closer look onto the confining regions is placed so as to ascertain any specificity of the Pyrenean domain. For a more detailed analysis, in particular measuring the border effect, more detailed and updated data on NUTS4 level is needed, which is not readily accessible on public and centralised databases and poses significant challenges in terms of comparability.

Demography

Although being a border region, the indicators used show a high attractiveness of the CBA: besides positive natural growth, the CBA (and also the confining NUTS3 regions as a whole) could steadily gain population by migration and hence has an overall positive population growth. However, it is worth mentioning that in more than half of the NUTS3 regions within the CBA, deaths exceed births in the analysed period. Four out of the nine confining NUTS3 regions show negative natural increase. A closer look onto the evolution of net migration shows a steady decrease of net migration since 2005, and a significant drop in 2008. Negative trend migration (2008 value is lower than 2000 value), common to all NUTS3 regions but one (Tarn-et-Garonne – FR628), is accompanied by a drop in 2008 in every NUTS3 region in the Spanish sector. For the first time in the analysed period, emigrants exceeded inmigrants in a significant way in Barcelona (ES511) in year 2008, as it occurred in Guipúzcoa (ES212) and Vizcaya (ES213).

Fertility rates and dependency ratios show a successful policy of the French government regarding families. But still, fertility rates in the three French NUTS2 regions within the CBA are below the French average and the vast majority of regions at NUTS3 level within the CBA are more old age dependent than their corresponding county average.

Polycentric Development

The distribution of the urban population in the area is centrifugal in respect to the Pyrenees mountain range. The urban system on the French side of the CBA is more polycentric than the Spanish one, essentially due to the absence of a clearly dominant FUA such as Barcelona. Focusing only on the confining NUTS3 regions, the Spanish sector seems to rely on a denser network of medium and small-sized towns and cities and makes this are more polycentric than the French sector.

The distribution of the GDP per capita over the FUAs reinforces the primacy of Barcelona. Comparing the population and the GDP distribution of the FUAs, it is worth mentioning that some large Spanish FUA outstrip French centres in the GDP rank-size distribution. French FUAs have more service-oriented economy, while the Spanish FUAs seem to rely more on manufacturing and construction sectors.

Urban-rural relationships

Those regions to both side of the border, where the main water channels are found, are the most agriculturally oriented regions according to the overall surface. From 1990 to 2006, most regions within the CBA lost agricultural surface at a sustained pace, particularly within both sides of the border. This trend is more meaningful in those areas that are more urbanised and under more structural transformations. The economic trend observed in relation to the agricultural sector suggests a decreasing weight of primary activities in relation to the economy as a whole, both in terms of GVA and employment.

Accessibility and connectivity

There is not much information available about regional accessibility, especially about internal accessibility. In alternative, this analysis relies on set of proxy indicators mainly related to physical accessibility and internet connectivity at European level. Cataluña (ES51) appears to be the most connected region according to both variables.

Accessibility by road clearly shows that the Spanish sector of the CBA is comparatively much more isolated from European core areas than French regions. In terms of rail accessibility, those regions that have performed best are Spanish provinces instead of French departments. Concerning air accessibility, those areas ranked on top of the distribution are the most urbanised regions with international airports within their boundaries. The most urbanised areas are ranked highest also in multimodal accessibility. Road density proved to be much higher to the French sector of the CBA, while the rail system seemed to be slightly more developed on Spanish regions. Connectivity between Spain and France through the Central Pyrenees is quite a complex issue. Rail lines are not coincident in some cases, and using high capacity roads is only possible on the most Western and Eastern extremes, where the most of the commercial and passenger exchanges take place. Broadband penetration and internet usage is above the European average in all NUTS2 regions within the CBA.

Europe 2020 strategy and Gothenburg goals

There are different (and diverse) capacities to contribute to innovation, growth and Employment across the CBA NUTS 3 level units.

Environment and energy

The CBA as a whole is above the EU average in soil sealed areas per inhabitant, below the EU average regarding ozone concentration exceedances, shows good capacity for urban waste water treatment and shows significant percentage of NATURA 2000 areas. It also shows good values in solar energy resources, and minor and middle sensitivity to climate change regarding physical, social, economic and cultural aspects in general terms.

Economy

The disparities on both sides of the border within the CBA concerning GDP per capita indexed to the leading region, are weakened if attention is paid onto the confining NUTS3 areas. This way, just two regions out of the ten confining ones are classified as “less developed”.

The catching up analysis illustrates the outstanding position of NUTS3 level units such as Guipúzcoa could reach leading GDP rates in 38 years time.

Social cohesion

Disparities exists but not very pronounced, although it is worth mentioning the situation of Languedoc-Rousillon, which is the weakest in all the variables analysed in this chapter (i.e. long –term unemployment rate, youth unemployment rate, etc).

Research and innovation

Midi Pyrenees outstands clearly in total investment in R&D, with 4,15% in 2004, followed by Languedoc Rousillon with 2,08% in the same year and País Vasco and Navarra with 1,98% and 1,94% respectively in 2009. At the current recession time, the current number of patent applications decreased markedly in both sides of the border. Regions in the Spanish side of the border employ significantly more persons in high and medium tech manufacturing activities than in the French side.

Factor analysis

The results of the factor analysis provided an enlarged picture of the Pyrenees CBA Spain and France (data for Andorra was missing) by comparing it to national averages, to other European cross border regions and to other European NUTS3 regions. In the light of the results, it can be said that the Pyrenees CBA is characterized by few areas (Barcelona and its surroundings; Vizcaya) that outperform the others economically, not only in the level of CBA but also when compared to other European regions. These economically well performing regions are more industry intensive but at the same time they comprise as important service sector concentrations and are rather well connected. As mentioned, this held true only in case of very few areas of the whole CBA, whereas the rest of Pyrenees CBA yield to average

performance when rest of the European regions are considered but however most of these regions were among the well performing regions in their countries.

A closer look to the results of factor analysis also reveals some important differences between the Spanish and French cross border areas. For example, French Pyrenees CBA shows much higher concentration of public administration work than its counter part in Spain. French part of the Pyrenees CBA also demonstrates much higher demographic dynamism level than the Spanish regions, but in national level is not among the most dynamic regions in France. In any case, when compared to other areas of Europe, the Pyrenees CBA is in general characterized by relatively high levels of immigration.

Majority of the regions belonging to Pyrenees CBA are among the leading areas when research, development and innovation intensity is considered. This finding together with rather high level of immigration may imply that there are large expectations for future economic growth in this area.

In general, it can be said that the results of the factor analysis provide value-added in terms of validating the findings of the detailed thematic chapters.

Chapter 1 - Report Objectives and General Overview

1.1. ULYSSES Objectives in the context of this Report

ULYSSES is a Case Study oriented project which has as main aim to use ESPON applied results as a yardstick for decentralized cross-border spatial development planning. Four are the overall objectives of ULYSSES:

- Promote ESPON research results, by raising the awareness among involved stakeholders on the practical utility of decentralised cross-border spatial development,
- Produce multi-thematic territorial analysis for the cross-border areas by making use of available ESPON applied research results and other local analyses / data, taking into consideration future territorial challenges,
- Promote experience and best practices exchange in the field of cross border spatial development, by applying coherent cross-border strategies, and
- Promote a further application of targeted research results in the selected Cross Border Cooperation (CBC) areas and review the general usefulness of applied research results in the context of cross border spatial development.

More specific objectives of ULYSSES are:

- Multi-scale and multi-thematic territorial analysis: To analyse the territorial socioeconomic dynamics and performances of each Case Study region with regards to six targeted themes under analysis and different territorial scales. The objective is to identify the territorial drivers and dynamics.
- Institutional performance analysis: To identify key institutional drivers that could allow building better baseline strategies in order to answer main challenges identified.
- Integrated analysis: To make an integrated analysis of the territorial performance and dynamics and the institutional performance, relating the performance analysis with the policy structures and actions.
- Policy recommendations: To formulated strategic guidelines to cope with identified challenges in each cross-border areas, methodological guidelines for future cross-border analysis and policy recommendations at national and EU level that encourage cross-border area territorial cooperation.

The Case Studies to be examined within the framework of ULYSSES are:

- CS 1: The Upper Rhine cross-border area along the land borders between France, Germany and Switzerland,

- CS 2: The cross-border area along the entire Spanish-French land border (Pyrenees),
- CS 3: The cross-border area along the land border between Greece and Bulgaria,
- CS 4: A cross-border area covering parts of the Northern Finland-Russian land border (Karelia),
- CS 5: A cross-border area along the borders between Poland, Germany (land border) and Sweden (maritime border), and
- CS 6: Extremadura/Alentejo (ES/PT).

This Report is referring to Working Community of the Pyrenees Cross-Border Area (CS 2) and is part of Task 2.2 entitled "Multi-scale Performance Analysis". The main aim of this task is the identification of territorial socioeconomic dynamics and performances for the Working Community of the Pyrenees Cross-Border Area, with regards to six targeted themes under analysis and under different territorial scales.

Based on a series of data indicators developed by ESPON and other data sources, for each case study CBA, a **territorial socioeconomic dynamic analysis** will take place. This analysis will be done under different territorial scales, thus comparing each region to the cross border area as a whole, each region to the entire cross border area within the same country, each region to the whole cross border area in the neighbouring country and each region confining non-border regions within the same country.

The selected indicators to be used for the analysis of territorial socio-economic dynamics are:

- for the demographic analysis,
  - Population (absolute values)
  - Population by age structure
  - Net migration
  - Population density
  - Dependency rates
  - Ageing index
  - Fertility rate (or long range growth rate)
  - Population growth
- for the cross-border polycentric development analysis,
  - Share of population in cities below 50.000 inhabitants
  - Polycentricity index

    - Log linear rank-size distribution
    - Primacy population and/or GDP Rate
    - Potential interaction of urban centres
- for the urban-rural relationship analysis,
    - Land use (Artificial area, Agricultural area, Forest area, etc.)
    - Percent employed in agriculture forestry and fishing
    - Relative rurality based on national classifications
- for the accessibility & connectivity analysis,
    - Length of railway network, km (2001)
    - Length of highroad network (km)
    - Length of road network (km)
    - Number of commercial airports
    - Number of rail stations serving high speed rail lines
    - Households with broadband internet access (NUTS 2)
    - Firms access to fibre backbones (NUTS 2)
    - Time (minute) to the nearest motorway access, by car of the capital or centroid representative of the NUTS3
    - Connectivity to commercial airports by car of the capital or centroid representative of the NUTS3 (HOURS)
    - Connectivity to rail stations (minutes) weighted by surface
    - Traffic in commercial airports (in million passengers/year 2000)/inhabitants (1999)
    - Potential accessibility road, air, train & multimodal (NUTS 3, 2006)
    - Traffic in commercial airports (in million passengers/year 2000)/inhabitans

Based on a series of data indicators developed by ESPON and other data sources, for each case study CBA, a **territorial performance analysis** will take place. This analysis will be done under different territorial scales, thus comparing each region to the cross border area as a whole, each region to the entire cross border area within the same country, each region to the whole cross border area in the neighbouring country and each region confining non-border regions within the same country.

The selected indicators to be used for the analysis of territorial performance are:

- for the economy & employment analysis,

    - Employment by NACE
    - GDP in million euro
    - GDP in million euro per inhabitant
    - GDP in millions euro of Purchasing Power Parities
    - Employment rate by sex
    - Economically active population
- for the innovation & research analysis,
    - Population by age groups and educational level
    - R&D as % of investment
    - Human resources in Science and Technology as % of total employment
    - % of population with tertiary education
    - % of 18 years old participating in education
    - Patent registration by million inhabitants
- for the social cohesion analysis,
    - Expenditure in euro per inhabitant on sickness and health
    - At risk of poverty after social transfers
    - Long-term unemployment rate
    - Youth unemployment rate
- for the environmental analysis,
    - CO_2 emissions
    - Greenhouse gases emissions
    - Emissions of acidifying substances
    - Number of observed forest fires
    - Occurrence of landslides
    - Occurrence of snow avalanches
    - Regional average number of flood events
    - Energy inland consumption renewable sources
    - CO_2 per capita
    - Number of observed forest fires/1000 sq km in NUTS3 region

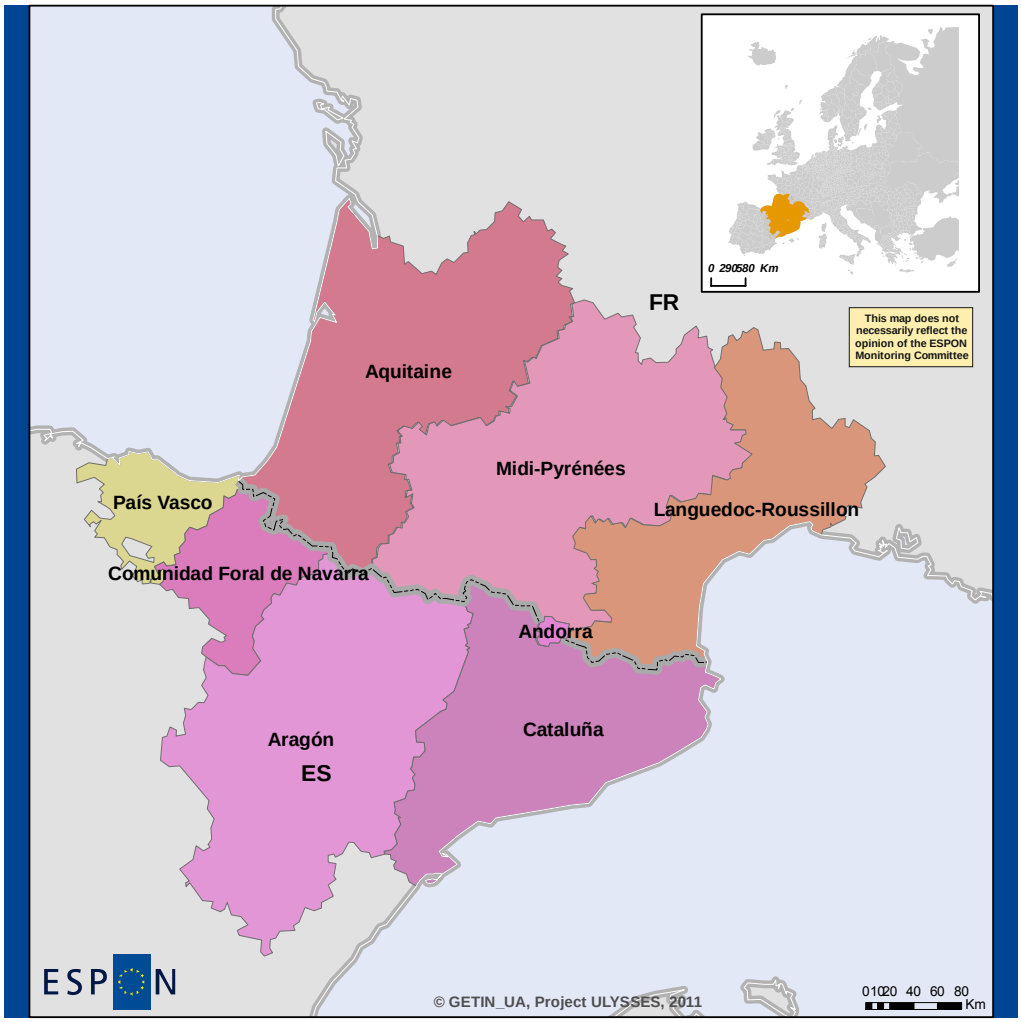
1.2. General Overview of the Working Community of the Pyrenees CBA

The Working Community of the Pyrenees CBA, composed by Spain (ES), France (FR) and Andorra (AD) countries, is produced by the 686,7[1] km borderline length between the three countries. The Working Community of the Pyrenees CBA is located at the North-Eastern part of Spain and the Southern part of France (Figure 1.1.). It comprises of six NUTS2 administrative regions (Figure 1.2):

- País Vasco (ES21),
- Comunidad Foral de Navarra (ES22),
- Aragón (ES24),
- Cataluña (ES51),
- Aquitaine (FR61),
- Midi-Pirénées (FR62), and
- Languedoc-Roussillon (FR81)

[1] ES-FR: 623
AD-FR: 56,6
AD-ES: 63,7

Map 1.1. NUTS2 level units of the Working Community of the Pyrenees CBA.



EUROPEAN UNION
Part-financed by the European Regional Development Fund
INVESTING IN YOUR FUTURE

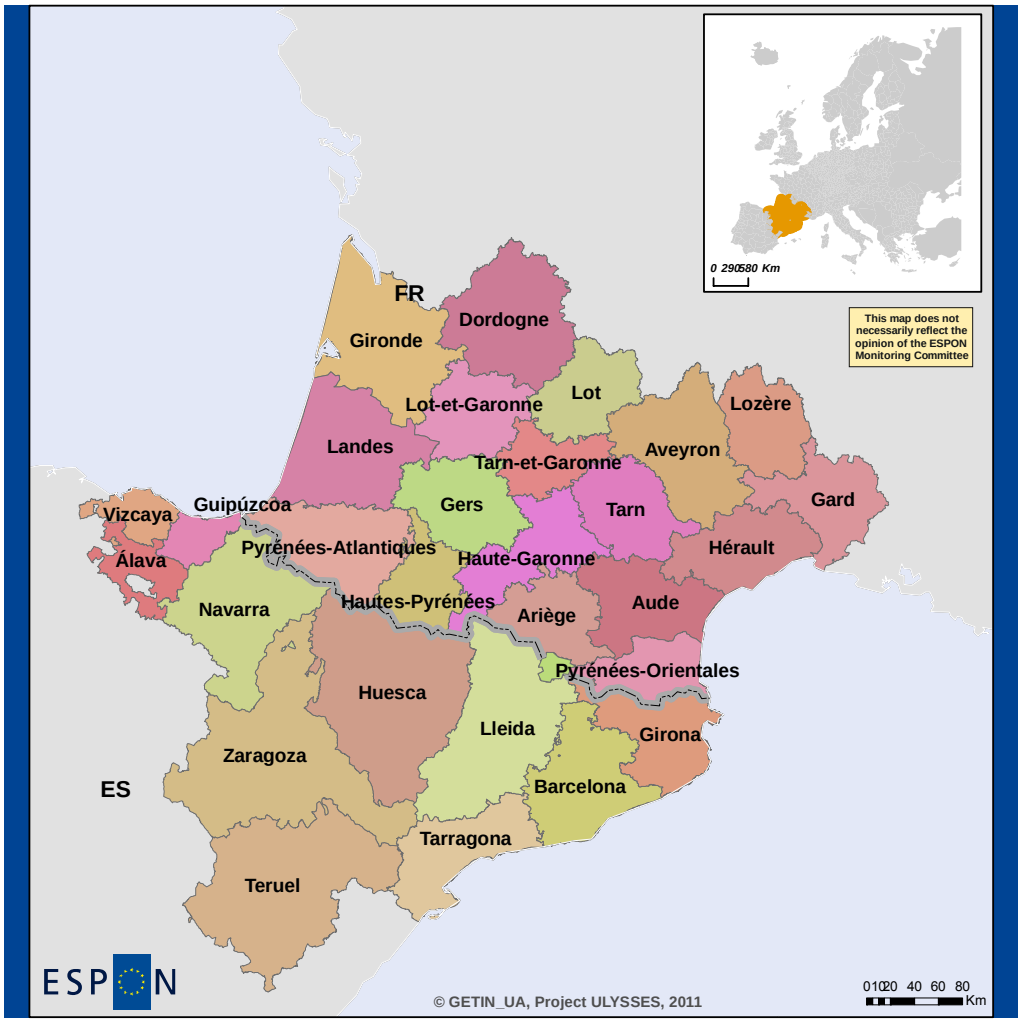
Local level: NUTS 3
© EuroGeographics Association for administrative boundaries

Each NUTS2-level is further divided into a number of NUTS3 level administrative districts (Table 1): 11 NUTS3 administrative districts (provinces) in Spain, respectively, and 18 NUTS3 administrative districts (departments) in France (Figure 2).

Table 1.1. Administrative levels of Working Community of the Pyrenees CBA.

	CODE	NUTS-ID
Spain	ES	NUTS1
País Vasco	ES21	NUTS2
Álava	ES211	NUTS3
Guipúzcoa	ES212	NUTS3
Vizcaya	ES213	NUTS3
Comunidad Foral de Navarra	ES22	NUTS2
Navarra	ES220	NUTS3
Aragón	ES24	NUTS3
Huesca	ES241	NUTS3
Teruel	ES242	NUTS3
Zaragoza	ES243	NUTS3
Cataluña	ES51	NUTS2
Barcelona	ES511	NUTS3
Girona	ES512	NUTS3
Lleida	ES513	NUTS3
Tarragona	ES514	NUTS3
France	FR	NUTS1
Aquitaine	FR61	NUTS2
Dordogne	FR611	NUTS3
Gironde	FR612	NUTS3
Landes	FR613	NUTS3
Lot-et-Garonne	FR614	NUTS3
Pyrénees-Atlantiques	FR615	NUTS3
Midi-Pirénées	FR62	NUTS2
Ariège	FR621	NUTS3
Aveyron	FR622	NUTS3
Haute-Garonne	FR623	NUTS3
Gers	FR624	NUTS3
Lot	FR625	NUTS3
Hautes-Pyrénees	FR626	NUTS3
Tarn	FR627	NUTS3
Tarn-et-Garonne	FR628	NUTS3
Languedoc-Roussillon	FR81	NUTS2
Aude	FR811	NUTS3
Gard	FR812	NUTS3
Hèrault	FR813	NUTS3
Lozère	FR814	NUTS3
Pyrénées-Orientales	FR815	NUTS3
Andorra	AD	NUTS1

Map 1.2. NUTS3 level units of the Working Community of the Pyrenees CBA.



1.3. Total Area of the Working Community of the Pyrenees CBA

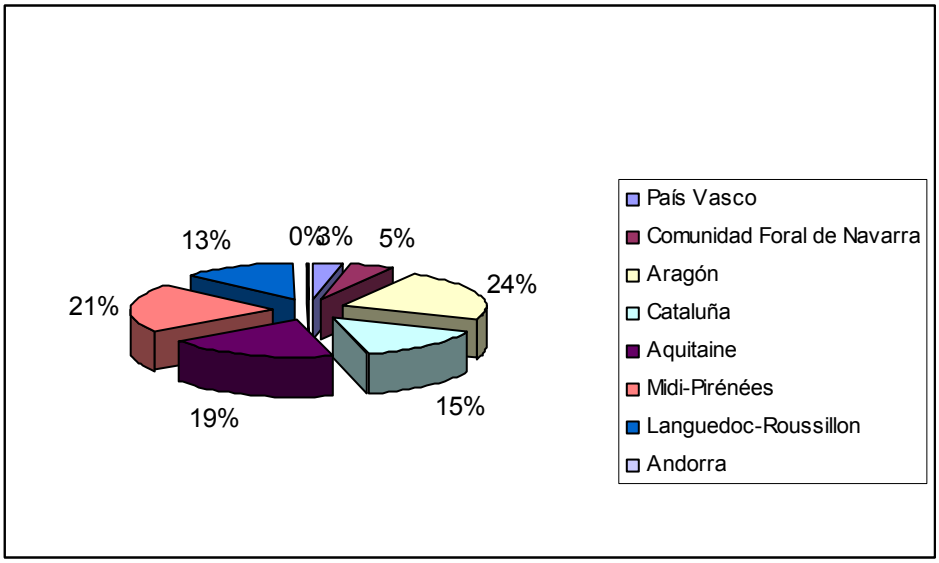
The Working Community of the Pyrenees Cross-Border Area (CBA) occupies a total area of 211.959 sq. Aragón, which covers an area of 47.720 sq km (i.e. 22,51%) and Midi-Pirénées which covers an area of 45.348 sq km (i.e. 21,39%) are the largest regions (NUTS 2 level) in the CBA. These regions are closely followed by Aquitaine and Catalunya, which covers an area of 41.308 sq km (i.e. 19,49%). Comunidad Foral de Navarra and País Vasco are the smallest regions in the CBA with 10.390,4 (i.e. 4,9%) and 7.235 (i.e. 3,41%). Zaragoza (ES243) is the largest NUTS3 level unit of the CBA, occupying 17.274,5 sq km and Guipúzcoa (ES212) the smallest one occupying 1.980 sq km (Table 1.2)

Table 1.2. Total Area of NUTS0, 2 and 3 level units of the Working Community of the Pyrenees CBA.

	CODE	NUTS-ID	Total Area (sq.km)	(%) of CBA
Spain	ES	NUTS1	505.990,7	
País Vasco	ES21	NUTS2	7.235,2	3,41%
Álava	ES211	NUTS3	3.037,5	
Guipúzcoa	ES212	NUTS3	1.980,4	
Vizcaya	ES213	NUTS3	2.217,3	
Comunidad Foral de Navarra	ES22	NUTS2	10.390,4	4,90%
Navarra	ES220	NUTS3	10.390,4	
Aragón	ES24	NUTS3	47.720,3	22,51%
Huesca	ES241	NUTS3	15.636,2	
Teruel	ES242	NUTS3	14.809,6	
Zaragoza	ES243	NUTS3	17.274,5	
Cataluña	ES51	NUTS2	32.113,4	15,15%
Barcelona	ES511	NUTS3	7.728,2	
Girona	ES512	NUTS3	5.909,9	
Lleida	ES513	NUTS3	12.172,5	
Tarragona	ES514	NUTS3	6.302,9	
France	FR	NUTS1	632.833,6	
Aquitaine	FR61	NUTS2	41.308,4	19,49%
Dordogne	FR611	NUTS3	9.060,0	
Gironde	FR612	NUTS3	10.000,1	
Landes	FR613	NUTS3	9.242,6	
Lot-et-Garonne	FR614	NUTS3	5.360,9	
Pyrénees-Atlantiques	FR615	NUTS3	7.644,8	
Midi-Pirénées	FR62	NUTS2	45.347,9	21,39%
Ariège	FR621	NUTS3	4.889,9	
Aveyron	FR622	NUTS3	8.735,1	
Haute-Garonne	FR623	NUTS3	6.309,3	
Gers	FR624	NUTS3	6.256,8	
Lot	FR625	NUTS3	5.216,5	
Hautes-Pyrénees	FR626	NUTS3	4.464,0	
Tarn	FR627	NUTS3	5.757,9	
Tarn-et-Garonne	FR628	NUTS3	3.718,3	
Languedoc-Roussillon	FR81	NUTS2	27.375,8	12,92%

Aude	FR811	NUTS3	6.139,0	
Gard	FR812	NUTS3	5.852,9	
Hèrault	FR813	NUTS3	6.101,0	
Lozère	FR814	NUTS3	5.166,9	
Pyrénées-Orientales	FR815	NUTS3	4.116,0	
Andorra	AD	NUTS1	468	0,22%
Total CBA Area			211.959,4	

Figure 1.1: Area of NUTS 2 level units of the Working Community of the Pyrénées.



Chapter 2 – Demographic Analysis

2.1. Aims, Indicators and Methods

Demographic Analysis of the Working Community of the Pyrenees CBA aims to identify the behaviour of the cross-border region in terms of population spatial distribution and temporal dynamics. The main objective is to understand the influence of the border on the settlement and population patterns of the CBA. The key questions to be answered are: Which is the demographic situation in the CBA (i.e. fertility rates, life expectancy, health status/disabilities, population growth)? How to enhance the position of the CBA in the EU, in particular those of the NUTS3 areas along the Pyrenees and attract population? High quality of life, sustainable development opportunities and potential to attract new economy activities are outlined as some of the strengths of the area for that purpose. Which are the effects of an increasingly ageing society on the provision of services of public interest (e.g. administration, childcare, healthcare & educational services, public transport, waste disposal and management, freshwater provision and sewage treatment, post, etc.)?

To answer to the above questions, a set of indicators has been identified, as the CBA's total population; the population growth; commuters to other regions and other countries; the population density; the total and partial dependency rates; the ageing index; and the fertility rates.

More specifically, the parameters and indicators analysed for the Working Community of the Pyrenees CBA, are shown in Table 2.1.

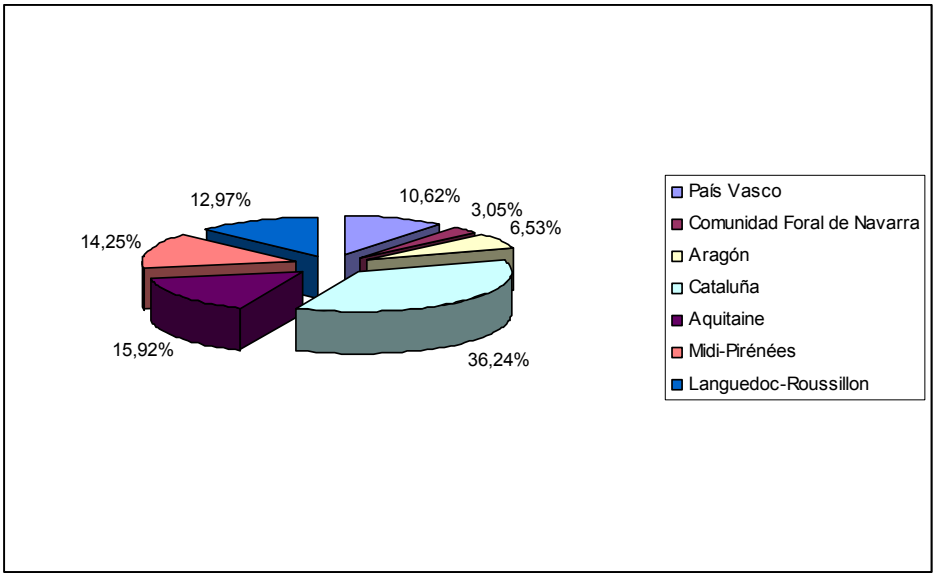
Table 2.1. Demographic Parameters studied for Working Community of the Pyrenees CBA.

Variable name	Geographical scale	Source	Time frame
Total fertility rates	NUTS 2 (NUTS 1 Russia)	EUROSTAT, Russian Statistical Institute	1997-2009
Commuters to other countries among by active population	NUTS 2	EUROSTAT	2009
Commuters to other regions among by active population	NUTS 2	EUROSTAT	2009
Old and young age dependency rates	NUTS 3	EUROSTAT	2009
Net migration, natural growth, total growth	NUTS 3	EUROSTAT, Demipher Project	2000-2009
Population	Several	EUROSTAT, National Statistical Institutes	2000-2009

2.2. Total Population

The total population in 2009 of the Working Community of the Pyrenees CBA was 20.115.885 inhabitants (11.354.614 inhabitants in the Spanish side of the border. This population represents approximately 4% of the total EU27 population (499,705,496 inhabitants in 2009). Further, the Spanish regions within the CBA's population represents 24,78% of the total population of Spain (45.828.172 inhabitants), while the French regions stand for 13,48% of the total population of France (64.369.147 inhabitants). Cataluña is the most populated region in the CBA with 7.290.292 inhabitants, 36,24% of the total population of the CBA. Comunidad Foral de Navarra and Aragon (the largest region in the area in terms of surface occupied) are the less populated regions in the CBA with 614.526 (3,055%) and 1.313.735 (6,53%) inhabitants respectively (see Table 2.2. and Figure 2.1.).

Figure 2.1.: Population in 2009 at NUTS 2 level for the Working Community of the Pyrenees CBA

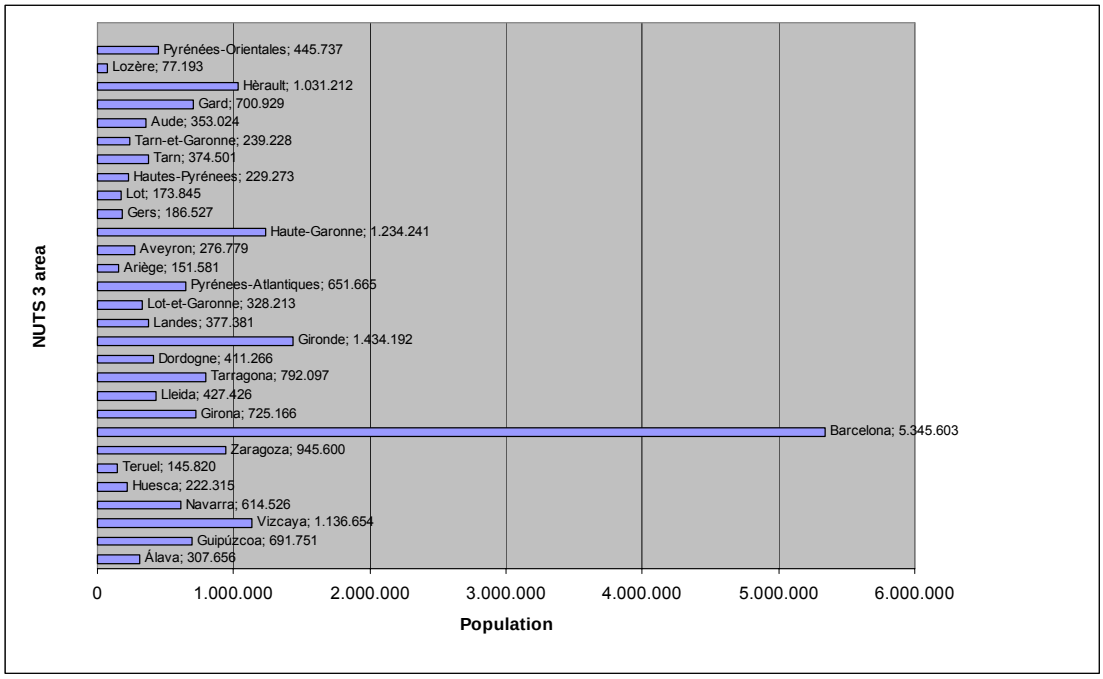


A closer look at NUTS3 level units, shows that Barcelona with 5.345.603 (26.57%) inhabitants stands clearly in the contribution of NUTS3 level units to the total population of the CBA (see Table 2.2. and Figure 2.2.). The population of border NUTS 3 areas (highlighted in blue in this and subsequent tables) represents 26,81% of the total population of the CBA.

Table 2.2. Total Population in 2009 for the Working Community of the Pyrenees CBA.

	CODE	NUTS-ID	2009
Spain	ES	NUTS1	45.828.172
País Vasco	ES21	NUTS2	2.136.061
Álava	ES211	NUTS3	307.656
Guipúzcoa	ES212	NUTS3	691.751
Vizcaya	ES213	NUTS3	1.136.654
Comunidad Foral de Navarra	ES22	NUTS2	614.526
Navarra	ES220	NUTS3	614.526
Aragón	ES24	NUTS3	1.313.735
Huesca	ES241	NUTS3	222.315
Teruel	ES242	NUTS3	145.820
Zaragoza	ES243	NUTS3	945.600
Cataluña	ES51	NUTS2	7.290.292
Barcelona	ES511	NUTS3	5.345.603
Girona	ES512	NUTS3	725.166
Lleida	ES513	NUTS3	427.426
Tarragona	ES514	NUTS3	792.097
France	FR	NUTS1	64.369.147
Aquitaine	FR61	NUTS2	3.202.717
Dordogne	FR611	NUTS3	411.266
Gironde	FR612	NUTS3	1.434.192
Landes	FR613	NUTS3	377.381
Lot-et-Garonne	FR614	NUTS3	328.213
Pyrénees-Atlantiques	FR615	NUTS3	651.665
Midi-Pirénées	FR62	NUTS2	2.865.975
Ariège	FR621	NUTS3	151.581
Aveyron	FR622	NUTS3	276.779
Haute-Garonne	FR623	NUTS3	1.234.241
Gers	FR624	NUTS3	186.527
Lot	FR625	NUTS3	173.845
Hautes-Pyrénees	FR626	NUTS3	229.273
Tarn	FR627	NUTS3	374.501
Tarn-et-Garonne	FR628	NUTS3	239.228
Languedoc-Roussillon	FR81	NUTS2	2.608.095
Aude	FR811	NUTS3	353.024
Gard	FR812	NUTS3	700.929
Hèrault	FR813	NUTS3	1.031.212
Lozère	FR814	NUTS3	77.193
Pyrenees-Orientales	FR815	NUTS3	445.737
Andorra	AD	NUTS1	84.484
Total CBA Population			20.115.885
Total of border NUTS3 regions			**5.393.681**

Figure 2.2.: Population in 2009 at NUTS 3 level for the Working Community of the Pyrenees CBA



2.3. Population Growth

Population growth is the change in CBA's population over time.

Table 2.3. illustrates the total population change and annual population growth rate at EU27, country level, NUTS2-3 unit levels as well as for total CBA. Data for border NUTS3 regions within the CBA has been added at the end of the table.

Overall, the Working Community of the Pyrenees CBA increased its population by 2.186.665 or 12,20% from 2000 to 2009, which is greatly influenced by the intense growth experienced by Andorra (28,06%). This growth almost doubles the population growth in France, (6,32%) but is below the 14,43% growth acknowledged in Spain. It is also by far above the EU27 population growth (3,51%). The Spanish side of the CBA as a whole increased their population in a greater manner (13,21%) than the French one, where the corresponding value is 10,56%. Border NUTS3 regions (without considering Andorra) increased their population in 13,86%, so slightly more than the overall CBA (considering Andorra), almost reaching the growth experienced by Spain.

Annual population growth rate has been used to undertake a deeper analysis at NUTS2 and NUTS3 level. Annual population growth rate is defined as:

$$Annual\ Growht\ Rate = \left(\frac{V_{t2}}{V_{t1}}\right)^{\frac{1}{t2-t1}} - 1$$

Where $V_{(0)}$ original value $V_{(n)}$ final value and tn-to is the years in-between the values.

All regions at NUTS2 and NUTS3 levels show positive annual population growth rates in the analysed timeframe as it is clearly illustrated by Figure 2.3.

Cataluña and in particular Girona, Lleida and Tarragona are the Spanish CBA regions at NUTS3 levels, where population has grown more intensely than in Spain as a whole. Annual growth rates in these NUTS3 regions are by far higher than at country level, with 3,22%, 2,06%, 3,32% annual growth rates respectively. It is worth mentioning that Girona and Lleida are border NUTS3 regions and contribute in a significant way to the high population growth of NUTS3 regions along the border. Annual population growth rate in border NUTS3 regions as a whole is 1,45%, so higher than in the CBA, EU27 and France, but still lower than in Spain. On the contrary, Vizcaya is the NUTS3 region with the lowest annual population growth.

Annual population growth rates in all French regions at NUTS2 level are higher than the population growth rate at country level. As for NUTS3 level, Dordogne, Aveyron, Hautes Pyrenees and Lozère are the only regions where population has grown less than in country level, with 0,58%, 0,48%, 0,29% and 0,49% respectively. When comparing the population growth rates in the EU27 to the ones in the CBA, it can be observed that País Vasco, in particular Guipúzcoa and Vizcaya, and Hautes Pyrenees are the only regions within the CBA where annual population growth rate is lower than in the EU27.

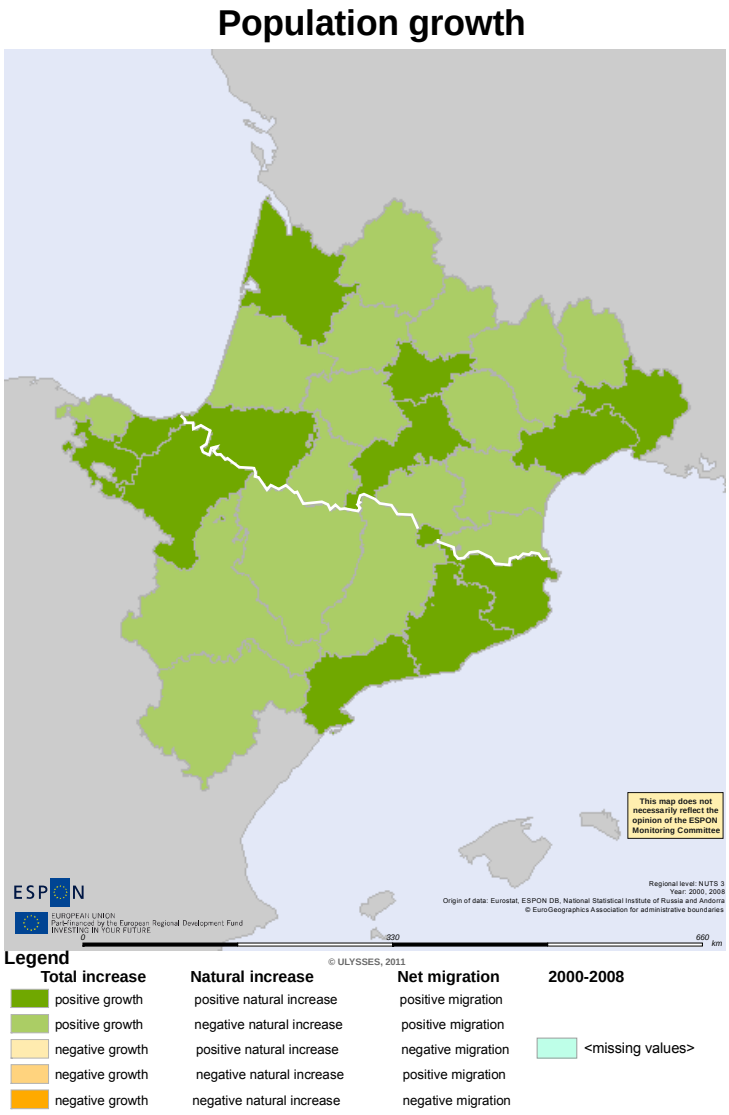
Table 2.3. Population Growth at country and NUTS2-3 unit levels in the Working Community of the Pyrenees CBA.

Region name	Region code (NUTS 3)	Total population 2000	% of CBA	Total population 2009	% of CBA	Total population change 2000 to 2009	%[2]	Total population change 1999 to 2009 (EU27)	Average Annual CBA population growth rate 2000-2009	Annual population growth rate 1999-2009 (EU27)
Spain	ES	40.049.708		45828172		5.778.664	14,43%		1,51%	
País Vasco	ES21	2.070.300	11,55%	2.136.061	10,62%	65.761	3,18%		0,35%	
Álava	ES211	281.600	1,57%	307.656	1,53%	26.056	9,25%	18.087.739	0,99%	0,38%
Guipúzcoa	ES212	668.700	3,73%	691.751	3,44%	23.051	3,45%		0,38%	
Vizcaya	ES213	1.120.000	6,25%	1.136.654	5,65%	16.654	1,49%		0,16%	
Navarra	ES22	546.700	3,05%	614.526	3,05%	67.826	12,41%		1,31%	
Navarra	ES220	546.700	3,05%	614.526	3,05%	67.826	12,41%		1,31%	
Aragón	ES24	1.196.000	6,67%	1.313.735	6,53%	117.735	9,84%		1,05%	
Huesca	ES241	205.600	1,15%	222.315	1,11%	16.715	8,13%		0,87%	
Teruel	ES242	136.000	0,76%	145.820	0,72%	9.820	7,22%		0,78%	
Zaragoza	ES243	854.400	4,77%	945.600	4,70%	91.200	10,67%		1,13%	
Cataluña	ES51	6.216.700	34,67%	7.290.292	36,24%	1.073.592	17,27%		1,79%	
Barcelona	ES511	4.724.900	26,35%	5.345.603	26,57%	620.703	13,14%		1,38%	
Girona	ES512	545.400	3,04%	725.166	3,60%	179.766	32,96%		3,22%	
Lleida	ES513	355.800	1,98%	427.426	2,12%	71.626	20,13%		2,06%	
Tarragona	ES514	590.600	3,29%	792.097	3,94%	201.497	34,12%		3,32%	
France	FR	60.545.022		64369147		3.824.125	6,32%		0,68%	
Aquitaine	FR61	2.933.223	16,36%	3.202.717	15,92%	269.494	9,19%		0,98%	
Dordogne	FR611	390.272	2,18%	411.266	2,04%	20.994	5,38%		0,58%	
Gironde	FR612	1.299.777	7,25%	1.434.192	7,13%	134.415	10,34%		1,10%	
Landes	FR613	331.510	1,85%	377.381	1,88%	45.871	13,84%		1,45%	
Lot-et-Garonne	FR614	307.415	1,71%	328.213	1,63%	20.798	6,77%		0,73%	
Pyrénees-Atlantiques	FR615	604.249	3,37%	651.665	3,24%	47.416	7,85%		0,84%	
Midi-Pirénées	FR62	2.578.254	14,38%	2.865.975	14,25%	287.721	11,16%		1,18%	
Ariège	FR621	138.199	0,77%	151.581	0,75%	13.382	9,68%		1,03%	
Aveyron	FR622	265.065	1,48%	276.779	1,38%	11.714	4,42%		0,48%	

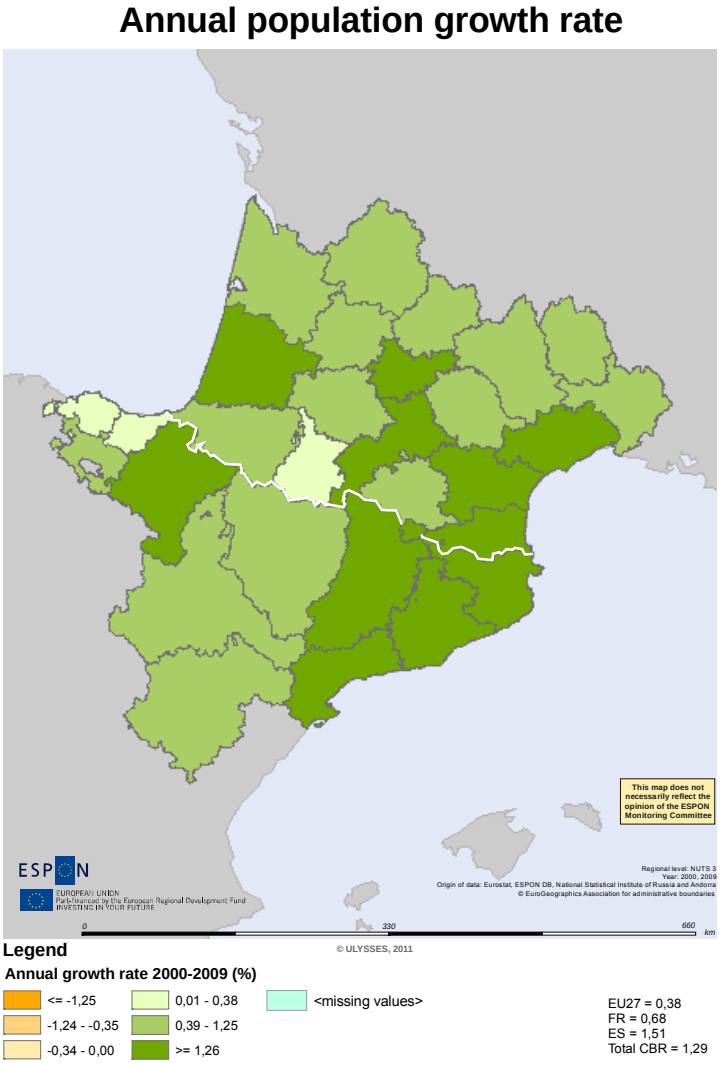
[2] (Population in 2009 – population in 2000)/Population in 2000

Haute-Garonne	FR623	1.062.514	5,93%	1.234.241	6,14%	171.727	16,16%		1,68%
Gers	FR624	173.522	0,97%	186.527	0,93%	13.005	7,49%		0,81%
Lot	FR625	161.375	0,90%	173.845	0,86%	12.470	7,73%		0,83%
Hautes-Pyrénees	FR626	223.299	1,25%	229.273	1,14%	5.974	2,68%		0,29%
Tarn	FR627	345.859	1,93%	374.501	1,86%	28.642	8,28%		0,89%
Tarn-et-Garonne	FR628	208.421	1,16%	239.228	1,19%	30.807	14,78%		1,54%
Languedoc-Rousillon	FR81	2.322.072	12,95%	2.608.095	12,97%	286.023	12,32%		1,30%
Aude	FR811	313.341	1,75%	353.024	1,75%	39.683	12,66%		1,33%
Gard	FR812	630.051	3,51%	700.929	3,48%	70.878	11,25%		1,19%
Hèrault	FR813	907.747	5,06%	1.031.212	5,13%	123.465	13,60%		1,43%
Lozère	FR814	73.851	0,41%	77.193	0,38%	3.342	4,53%		0,49%
Pyrenees-Orientales	FR815	397.082	2,21%	445.737	2,22%	48.655	12,25%		1,29%
Andorra	AD	65.971	0,37%	84.484	0,42%	18.513	28,06%		2,79%
Total CBA		17.929.220		20.115.885		2.186.665	12,20%		1,29%
Total of border NUTS3 regions		4.541.943	25.33%	5.171.366	25,63%	629.423	13,86%		1,45%

Map 2.1.Population growth of the Working Community of the Pyrenees CBA (2000-2009)



Map 2.2. Annual population growth rate of the Working Community of the Pyrenees CBA (2000-2009)



Population growth (ΔP) is determined by four factors, births (B), deaths (D), immigrants (I), and emigrants (E). Population growth may be determined using a formula expressed as:

$$\Delta P \equiv B - D + I - E \qquad (3)$$

Table 2.4. presents the decomposed population change of NUTS3 level units of Working Community of the Pyrenees CBA for the period 2000-2008. Population change is decomposed into natural increase (births – deaths) and the net migration (inmigrants – emigrants). Results show that net migration is the main responsible for the population increase in the CBA and all the regions within it in both sides of the border, as it occurs in Spain if total values are considered. On the contrary, natural increase is the main responsible for the population increase at country level in France. Aragón is the only region at NUTS2 level that shows negative natural increase. 16 regions at NUTS3 level out of the 29 that form the Working Community of the Pyrenees show negative natural increase, while all of them show positive net migration. This trend is

replicated when border NUTS3 regions are looked at. Positive net migration is acknowledged in all of them (10) while negative natural increase is found in half of them (Huesca, Lleida, Ariège, Haute Pyrenees and Pyrenees Orientales).

Table 2.4. Decomposed population change of NUTS3 level units of Working Community of the Pyrenees CBA for the period 2000 – 2008.

Region name	Region code (NUTS)	Years 2000 to 2008		Period 2000-2008	Period 2000-2008
		Natural Increase	Net Migration	Categorization (+ +, + -, - +, - -)	Impact on the total population change
Spain	ES	704.544	5.073.920	++	Positive growth
País Vasco	ES21	4.519	61.201	++	Positive growth
Álava	ES211	3.977	21.980	++	Positive growth
Guipúzcoa	ES212	5.937	17.263	++	Positive growth
Vizcaya	ES213	-5.395	21.958	-+	Positive growth
Comunidad Foral de Navarra	ES22	9.918	57.892	++	Positive growth
Navarra	ES220	9.918	57.892	++	Positive growth
Aragón	ES24	-14.513	132.084	-+	Positive growth
Huesca	ES241	-5.596	22.235	-+	Positive growth
Teruel	ES242	-5.034	14.628	-+	Positive growth
Zaragoza	ES243	-3.883	95.221	-+	Positive growth
Cataluña	ES51	151.898	921.849	++	Positive growth
Barcelona	ES511	120.253	502.684	++	Positive growth
Girona	ES512	16.946	162.120	++	Positive growth
Lleida	ES513	-309	71.600	-+	Positive growth
Tarragona	ES514	15.008	185.445	++	Positive growth
France	FR	2.438.347	1.385.778	++	Positive growth
Aquitaine	FR61	25.390	244.104	++	Positive growth
Dordogne	FR611	-11.689	32.683	-+	Positive growth
Gironde	FR612	38.904	95.511	++	Positive growth
Landes	FR613	-588	46.459	-+	Positive growth
Lot-et-Garonne	FR614	-1.461	22.259	-+	Positive growth
Pyrénees-Atlantiques	FR615	224	47.192	++	Positive growth
Midi-Pirénées	FR62	36.534	251.187	++	Positive growth
Ariège	FR621	-3.151	16.533	-+	Positive growth
Aveyron	FR622	-4.812	16.526	-+	Positive growth
Haute-Garonne	FR623	54.635	117.092	++	Positive growth
Gers	FR624	-4.361	17.366	-+	Positive growth
Lot	FR625	-4.037	16.507	-+	Positive growth
Hautes-Pyrénees	FR626	-4.068	10.042	-+	Positive growth
Tarn	FR627	-838	29.480	-+	Positive growth
Tarn-et-Garonne	FR628	3.166	27.641	++	Positive growth
Languedoc-Roussillon	FR81	35.181	250.842	++	Positive growth
Aude	FR811	-2.225	41.908	-+	Positive growth
Gard	FR812	14.274	56.604	++	Positive growth
Hèrault	FR813	26.689	96.776	++	Positive growth
Lozère	FR814	-1.399	4.741	-+	Positive growth
Pyrenees-Orientales	FR815	-2.158	50.813	-+	Positive growth
Andorra	AD	4.922	8.524	++	
Total CBA		253.849	1.927.683	++	Positive growth

A closer look onto the evolution of natural increase at NUTS3 level in the period 2000-2008 , underlines the high natural increase of Barcelona (Figure 2.5).

Concerning net migration (Figure 2.6), País Vasco and the three NUTS3 level regions within it and Barcelona are the only Spanish regions in the CBA with a negative trend in the net migration (2008 value is lower than 2000 value). The significant decline of natural net migration in Barcelona in 2008, which dropped from 68.097 in 2007 to -18.148 in 2008 deserves a special mention. In fact, this is the only region within the

CBA, together with Guipúzcoa and Vizcaya, where emigrants exceeded the inmigrants in 2008. On the contrary, every French region within the CBA but Tarn-et-Garonne has decreased their net migration values.

Figure 2.3. Trend of natural increase at NUTS3 level and Andorra (2000-2008)

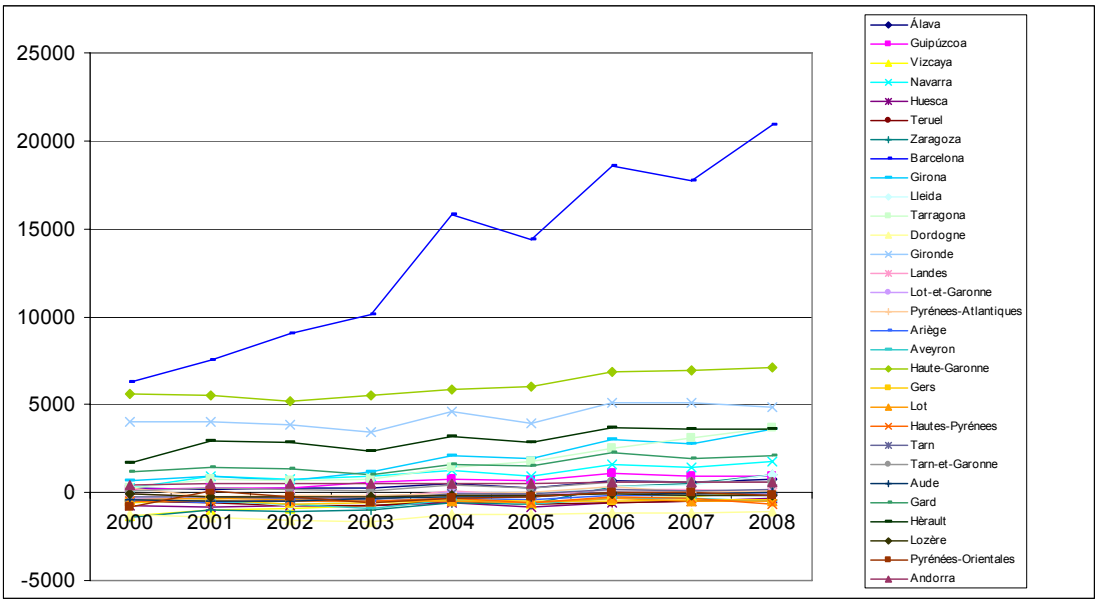
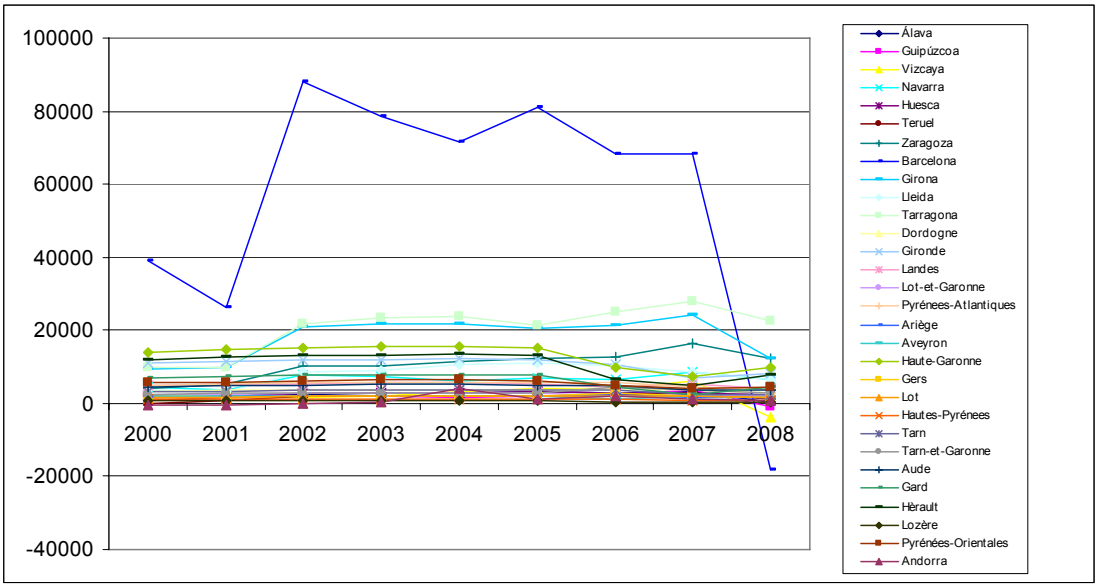


Figure 2.4. Trend of net migration at NUTS3 level and Andorra (2000-2008)



If the evolution of both natural increase and net migration in the Working Community of Pyrenees CBA as a whole and NUTS3 regions along the border (Figures 2.7. and 2.8.) are compared, it can be observed that natural increase is more intense in the CBA (influenced by the significant natural increase in Barcelona) as a whole than in border NUTS3 regions. As for the net migration in border NUTS3 regions, after the steady increase in the first years of the observed period and specially in 2004, it has decreased from 67.789 in 2004 to 40.775 in 2008, being the net migration in 2008 lower than the value in 2000 (43.965). The evolution of net migration in the CBA as a whole is greatly influenced by the significant decrease of net migration in Barcelona in 2008.

Figure 2.5. Natural increase in the CBA and border NUTS3 regions

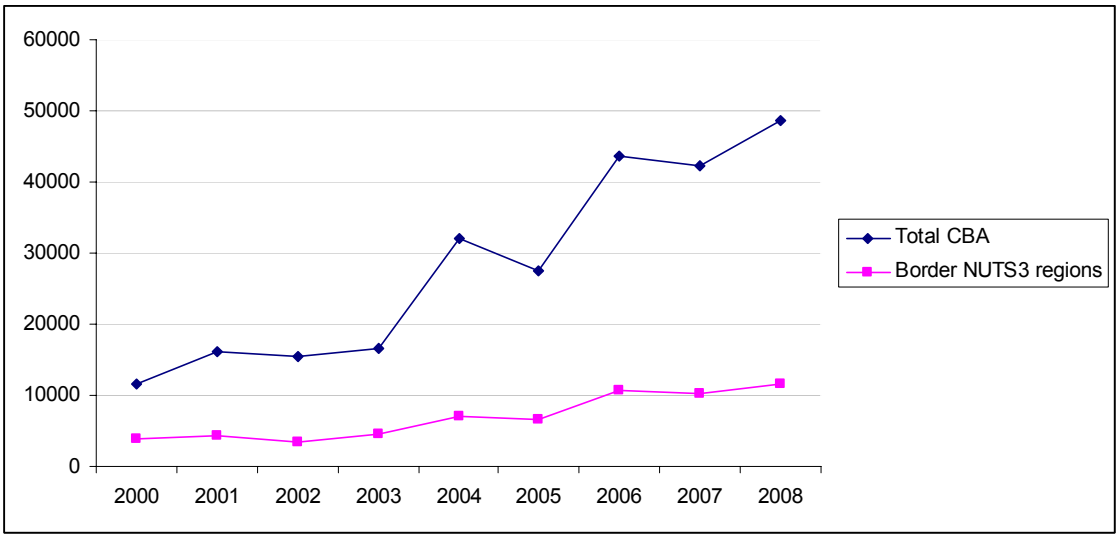
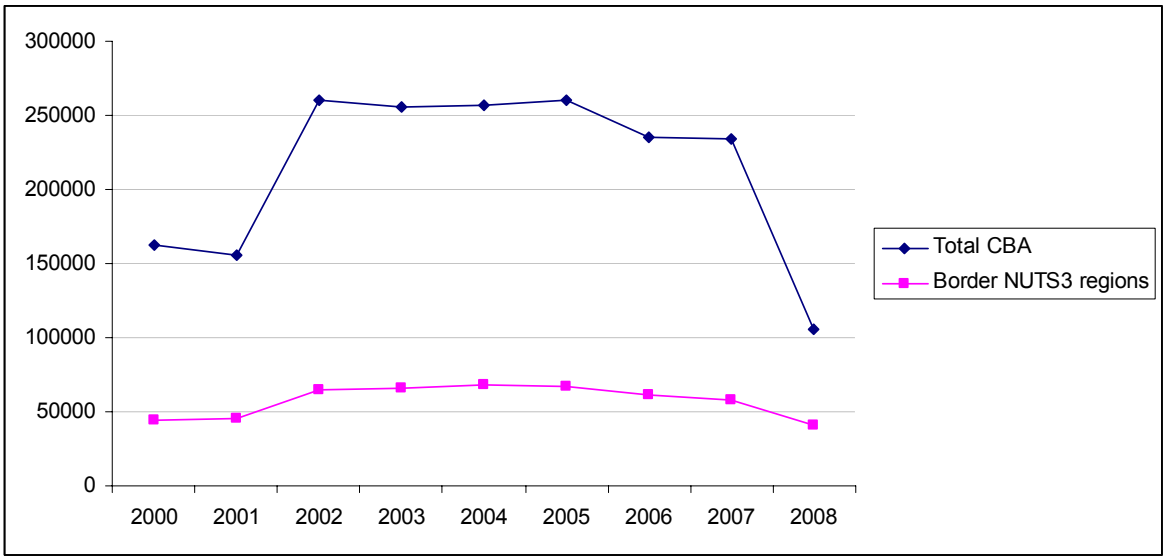


Figure 2.6. Net migration in the CBA and border NUTS3 regions



The actual development outperforms by far the expected net migration. The expected decrease both in natural increase and net migration is being a fact in the last years.

Figure 2.7. Expected population development in the CBA

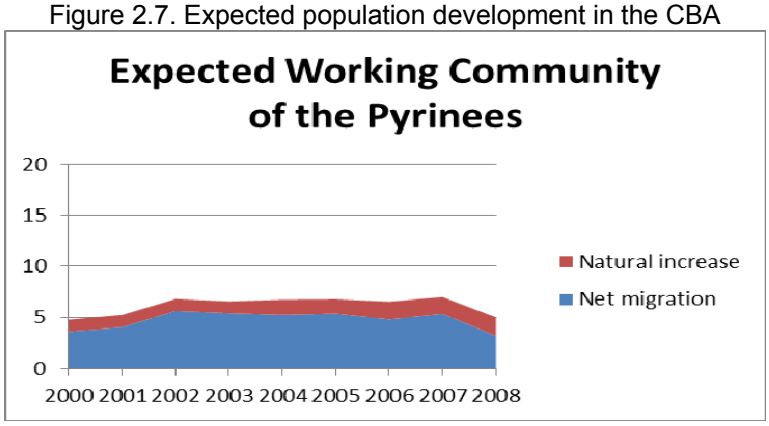
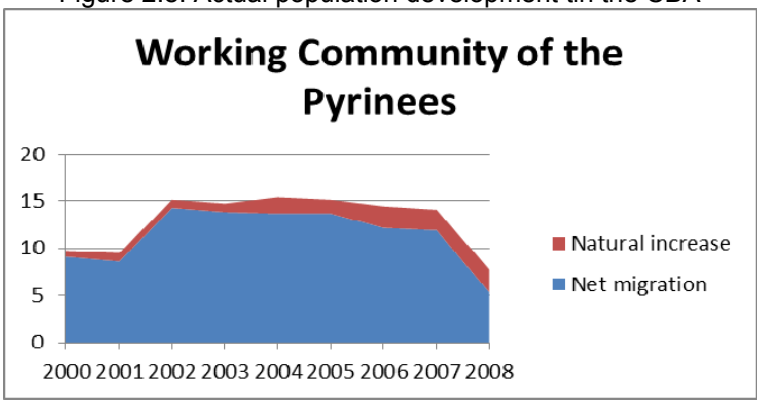


Figure 2.8. Actual population development tin the CBA



2.4. Commuters

Commuting is regular travel between one's place of residence and place of work or full time study. Sometimes refers to any regular or often repeated travelling between locations when not work related. Commuting has had a large impact on modern life. It has allowed cities to grow to sizes that were previously not practical, and it has led to the proliferation of suburbs. Many large cities or conurbations are surrounded by commuter belts, also known as metropolitan areas, commuter towns, dormitory towns, or bedroom communities. The prototypical commuter lives in one of these areas and travels daily to work or to school in the core city. Commuting has implications for other themes addressed in subsequent chapters, such as polycentric development, urban-rural relationships, accessibility and connectivity and Gothenburg strategy,

Due to data shortages at NUTS3 level, NUTS2 unit is the reference level for the analysis concerning commuters to other countries, within the region and to other regions.

Table 2.5 and Figure 2.11 illustrate the commuters to other countries per active population in the period 2000-2009. Every region within the CBA shows similar rates. If these rates are compared to the national rates, it can be observed that the average yearly commuters to other countries in all Spanish NUTS2 regions within the CBA, but Cataluña, are below the Spanish average, being Aragónthe regions with less commuters. Due to the vast cross-border area in France (Belgium, Switzerland, Luxembourg, Germany and Italy, in addition to Spain and Andorra), the commuters to other countries in this country are rather high and the French regions within the CBA are far below its rates.

Table 2.5. Commuters to other countries / Active population

Region name	Region code (NUTS)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Average
Spain	ES	0,16	0,20	0,30	0,23	0,20	0,19	0,17	0,26	0,23	0,18	0,21
País Vasco	ES21	0,14	0,20	0,26	0,19	0,29	0,10	0,15	0,19	0,14	0,25	0,19
Comunidad Foral de Navarra	ES22	0,20	0,27	0,12	0,04	0,26	0,14	0,21	0,13	0,03	0,13	0,15
Aragón	ES24	0,10	0,08	0,16	0,21	0,14	0,14	0,10	0,16	0,11	0,03	0,12
Cataluña	ES51	0,18	0,12	0,19	0,18	0,24	0,22	0,19	0,30	0,28	0,16	0,21
France	FR	1,01	1,07	1,24	1,34	1,00	0,96	0,91	0,97	0,99	1,15	1,06
Aquitaine	FR61	0,18	0,12	0,08	0,12	0,22	0,09	0,03	0,22	0,02	0,21	0,13
Midi-Pirénées	FR62	0,04	0,16	0,15	0,18	0,08	0,30	0,02	0,06	0,06	0,09	0,11
Languedoc-Roussillon	FR81	0,19	0,20	0,08	0,21	0,06	0,06	0,05		0,02	0,11	0,10
Andorra	AD											
Total CBA		0,15	0,15	0,16	0,17	0,19	0,17	0,12	0,19	0,15	0,15	0,15

Figure 2.9.: Commuters to other countries / Active population

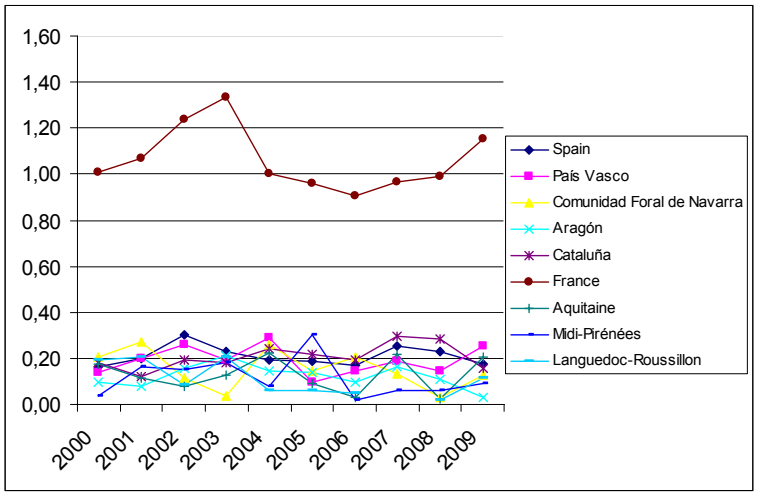


Table 2.6 and Figure 2.12 illustrate the commuters within the region per active population in the period 2000-2009. Every region in the CBA has increased the number of commuters within the same region in the analysed period. Languedoc-Rousillon although still being the region with less commuters in the same region, the significant increase in the observed period had lead it to almost achieve the value of the corresponding country.

Table 2.6. Commuters in the same regions / Active population

Region name	Region code (NUTS)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Average
Spain	ES	83,19	84,89	88,14	87,23	87,24	87,71	89,08	89,71	89,91	87,01	87,41
País Vasco	ES21	84,85	86,81	89,13	89,50	89,50	89,09	90,67	91,11	91,95	91,87	89,45
Comunidad Foral de Navarra	ES22	89,32	92,25	92,89	91,76	92,32	92,10	90,00	91,25	91,39	89,52	91,28
Aragón	ES24	89,67	91,81	93,86	93,00	92,24	93,35	92,46	92,73	93,20	91,35	92,37
Cataluña	ES51	88,74	90,70	90,97	89,52	89,51	89,86	92,61	92,88	92,99	90,72	90,85
France	FR	83,76	85,15	85,87	85,33	85,48	85,22	85,22	85,05	85,91	86,42	85,34
Aquitaine	FR61	85,49	85,94	86,54	87,70	85,54	85,75	87,60	86,50	87,90	87,32	86,63
Midi-Pirénées	FR62	86,63	86,99	88,32	88,79	87,34	88,46	89,12	87,84	87,62	90,14	88,13
Languedoc-Roussillon	FR81	77,29	77,56	81,53	80,90	83,89	82,52	81,13	81,77	82,51	84,18	81,33
Andorra	AD											

Figure 2.10.: Commuters in the same region / Active population

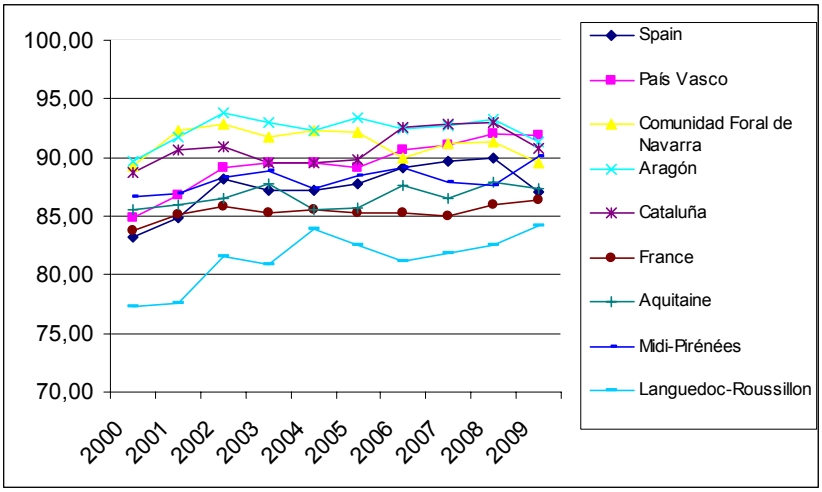
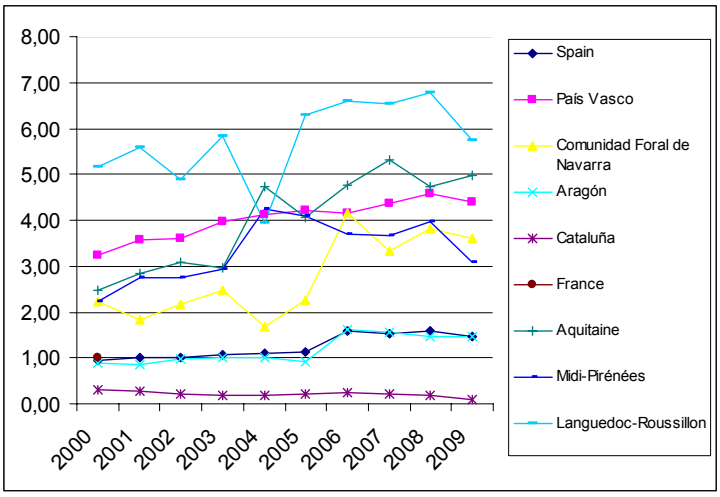


Table 2.7 and Figure 2.13 illustrate the commuters to another region per active population in the period 2000-2009. Cataluña is the only region within the CBA where commuters per active population in 2009 are less than in 2000. Languedoc-Rousillon is the region with greatest number of commuters to another region even though not being the region with highest border area (Midi-Pirénées). This may be cuased of the weak position that this region shows in other variables such as employment rate, which obligues its inhabitants to find their working place in another region.

Table 2.7. Commuters to another region / Active population

Region name	Region code (NUTS)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Average
Spain	ES	0,95	0,99	1,00	1,07	1,09	1,14	1,60	1,52	1,59	1,48	1,24
País Vasco	ES21	1,09	0,86	0,83	0,72	0,75	1,11	1,85	1,72	1,79	1,44	1,22
Comunidad Foral de Navarra	ES22	2,23	1,84	2,17	2,48	1,68	2,25	4,16	3,34	3,81	3,61	2,76
Aragón	ES24	0,88	0,84	0,99	1,01	1,01	0,91	1,61	1,57	1,46	1,47	1,18
Cataluña	ES51	0,31	0,27	0,21	0,19	0,20	0,22	0,24	0,22	0,18	0,10	0,22
France	FR	3,25	3,56	3,60	3,96	4,11	4,21	4,17	4,35	4,59	4,41	4,02
Aquitaine	FR61	2,47	2,84	3,09	2,97	4,73	4,05	4,76	5,30	4,73	4,98	3,99
Midi-Pirénées	FR62	2,22	2,75	2,75	2,94	4,24	4,08	3,70	3,67	3,97	3,08	3,34
Languedoc-Roussillon	FR81	5,16	5,60	4,89	5,83	3,93	6,29	6,58	6,55	6,79	5,74	5,74
Andorra	AD											

Figure 2.11.: Commuters to another region / Active population



2.5. Population Change and Projections

The Working Community of Pyrenees total population has increased during last ten-year period expressed by a linear regression model (see Figure 2.14).

The equation:

Working Community of Pyrenees CBA Total Population = -258,072 (Year – 2000) + 2 × 10^7 (5)

allows the projection of CBA's total population for the year 2020. For this CBA it is estimated to be around 23 million inhabitants (22.997 514). The corresponding linear regression equations and the produced projections for year 2020 for all the regions are provided in Table 2.8. It demonstrates that the population is projected to increase in all CBA regions. However, the regions are different in terms of projected population growth. For example according to the projection, the population of Girona and Andorra will grow over 30% by 2020, where as in Vizcaya and in Hautes-Pyrénees the projected growth rate is rather modest (2,3% and 3,6%, respectively)

Figure 2.12. Total population change of Working Community of the Pyrenees CBA for the period 1999 – 2009 and linear regression for population projection.

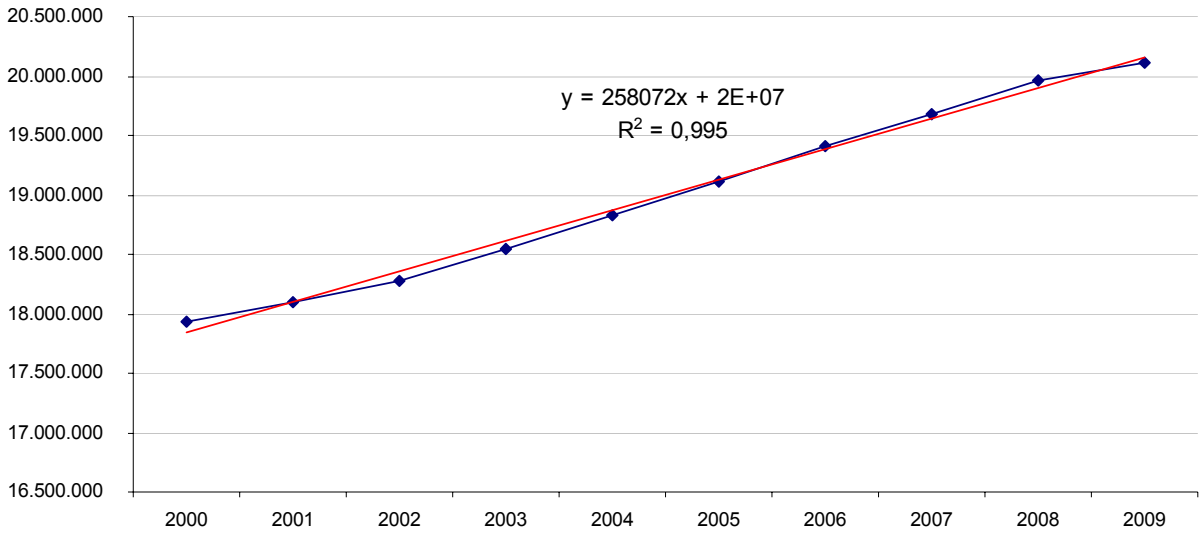


Table 2.8. Linear regression models for NUTS3 level units of the Working Community of the Pyrenees CBA and year 2020 population projections.

Region name	Region code (NUTS)	Linear Regression Model	R2	Year 2020 projection	% change 2009-2020
Álava	ES211	3065,3(t) + 277646	0,9943	342019	11,2%
Guipúzcoa	ES212	2684,7(t) + 665552	0,9874	721930	4,4%
Vizcaya	ES213	2259,7(t) + 1115490	0,9068	1162943	2,3%
Navarra	ES220	7725,4(t) + 535262	0,9934	697495	13,5%
Huesca	ES241	2024,4(t) + 201453	0,9735	243967	9,7%
Teruel	ES242	1216,1(t) + 132925	0,9378	158463	8,7%
Zaragoza	ES243	10446,8(t) + 833594	0,9669	1052976	11,4%
Barcelona	ES511	77270,2(t) + 4613181	0,9858	6235856	16,7%
Girona	ES512	21257,0(t) + 510676	0,9889	957073	32,0%
Lleida	ES513	8596,4(t) + 340016	0,9793	520541	21,8%
Tarragona	ES514	23261,9(t) + 550029	0,9838	1038530	31,1%
Dordogne	FR611	2372,7(t) + 387601	0,9985	437429	6,4%
Gironde	FR612	15230,2(t) + 1285043	0,9987	1604878	11,9%
Landes	FR613	5176,1(t) + 326158	0,9996	434857	15,2%
Lot-et-Garonne	FR614	2373,4(t) + 305062	0,9979	354904	8,1%
Pyrénees-Atlantiques	FR615	5383,3(t) + 598886	0,9989	711935	9,2%
Ariège	FR621	1514,1(t) + 136193	0,9940	167989	10,8%
Aveyron	FR622	1332,4(t) + 263775	0,9982	291757	5,4%
Haute-Garonne	FR623	19434,2(t) + 1045069	0,9971	1453188	17,7%
Gers	FR624	1472,8(t) + 171572	0,9931	202502	8,6%
Lot	FR625	1406,3(t) + 159876	0,9992	189409	9,0%
Hautes-Pyrénees	FR626	711,6(t) + 222605	0,9910	237550	3,6%
Tarn	FR627	3253,3(t) + 342428	0,9989	410747	9,7%
Tarn-et-Garonne	FR628	3457,9(t) + 203867	0,9940	276484	15,6%
Aude	FR811	4524,6(t) + 308706	0,9985	403723	14,4%

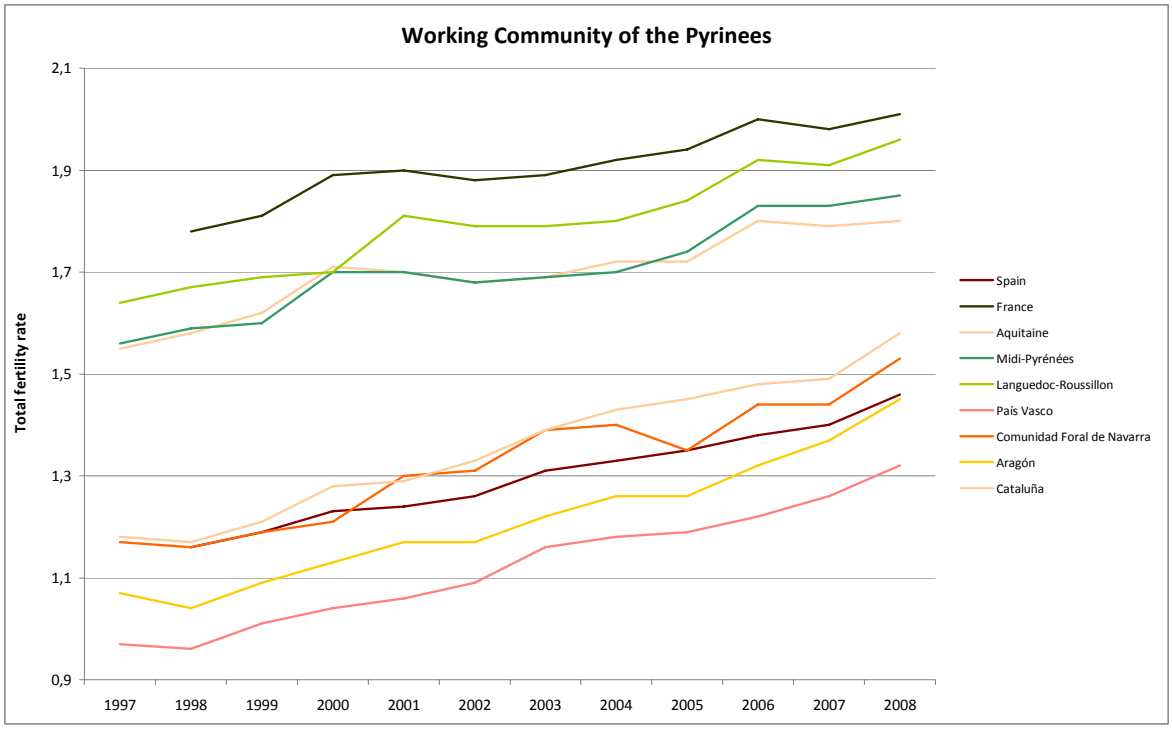
Gard	FR812	8100,8(t) + 623249	0,9932	793366	13,2%
Hèrault	FR813	14129,6(t) + 895883	0,9923	1192606	15,7%
Lozère	FR814	385,1(t) + 73711	0,9592	81799	6,0%
Pyrenees-Orientales	FR815	5576,2(t) + 391654	0,9971	508755	14,1%
Andorra	AD	2429,3(t) + 60828	0,9481	111844	32,4%
TOTAL CBA		258071,9(t) + 17578004	0,9950	22997514	14,3%
TOTAL Border NUTS3					

2.6. Total Fertility Rates

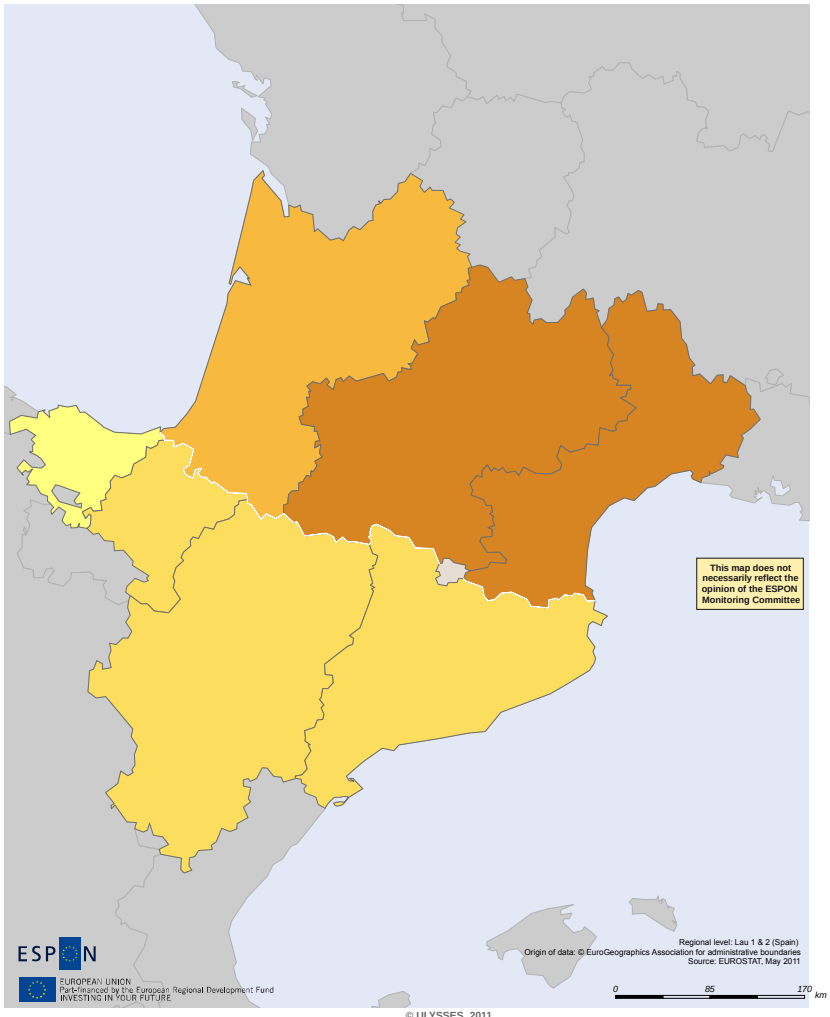
Total Fertility Rate represents the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with current age-specific fertility rates. For the Working Community of the Pyrenees CBA, fertility rates are reported only at NUTS2 level units[3]. The mean fertility rate for the CBA is 1.64. Fertility rates in the French side of the CBA are higher than the rates in the Spanish side of the border. País Vasco exhibits the lowest fertility rate in the CBA (1,32 in 2008) followed by Aragon (1,45 in 2008), both of them lower than the corresponding NUTS 0 value. Languedoc-Rousillon is the region with the highest fertility rate in the CBA (1,96). It is worth mentioning that the fertility rates in the three French NUTS2 regions within the CBA are below the French average (2,01 in 2008). The temporal evolution of fertility rates at NUTS2 level for the period 1997 – 2008 shows a gradual increase of these rates in all regions of the CBA (Figure 2.15.).

[3] The value for Andorra is missing

Figure 2.13. Evolution of Fertility rate on NUTS2 level and national level (1997-2008)



Map 2.3. Total fertility rates on NUTS2 level units (year 2008)



2.7. Population Density

Population density is a key geographic parameter expressing the total population per unit area, usually per sq km.

For the Working Community of Pyrenees CBA, population density is reported at NUTS0, 2 and 3 level units. The mean population density of the CBA for the year 2009 is 128,45 inhabitants per sq km, significantly higher than the mean value of Spain (90,57 inhabitants per sq km) and France (101,72 inhabitants per sq km). CBA's population density is slightly higher than the mean EU27 corresponding value (116 inhabitants per sq km).

Table 2.9. Population density at country, NUTS2 and NUTS3 level

	CODE	NUTS-ID	Density 2009
Spain	ES	NUTS1	90,57
País Vasco	ES21	NUTS2	295,23
Álava	ES211	NUTS3	101,29
Guipúzcoa	ES212	NUTS3	349,30
Vizcaya	ES213	NUTS3	512,63
Comunidad Foral de Navarra	ES22	NUTS2	59,14
Navarra	ES220	NUTS3	59,14
Aragón	ES24	NUTS3	27,53
Huesca	ES241	NUTS3	14,22
Teruel	ES242	NUTS3	9,85
Zaragoza	ES243	NUTS3	54,74
Cataluña	ES51	NUTS2	227,02
Barcelona	ES511	NUTS3	691,70
Girona	ES512	NUTS3	122,70
Lleida	ES513	NUTS3	35,11
Tarragona	ES514	NUTS3	125,67
France	FR	NUTS1	101,72
Aquitaine	FR61	NUTS2	77,53
Dordogne	FR611	NUTS3	45,39
Gironde	FR612	NUTS3	143,42
Landes	FR613	NUTS3	40,83
Lot-et-Garonne	FR614	NUTS3	61,22
Pyrénees-Atlantiques	FR615	NUTS3	85,24
Midi-Pirénées	FR62	NUTS2	63,20
Ariège	FR621	NUTS3	31,00
Aveyron	FR622	NUTS3	31,69
Haute-Garonne	FR623	NUTS3	195,62
Gers	FR624	NUTS3	29,81
Lot	FR625	NUTS3	33,33
Hautes-Pyrénees	FR626	NUTS3	51,36
Tarn	FR627	NUTS3	65,04
Tarn-et-Garonne	FR628	NUTS3	64,34
Languedoc-Roussillon	FR81	NUTS2	95,27
Aude	FR811	NUTS3	57,51

Gard	FR812	NUTS3	119,76
Hèrault	FR813	NUTS3	169,02
Lozère	FR814	NUTS3	14,94
Pyrenees-Orientales	FR815	NUTS3	108,29
Andorra	AD	NUTS1	180,52
Average CBA density			128,45
Average border NUTS3 regions density			105,20
European Union 27	EU27		116[4]

País Vasco and Cataluña are the NUTS2 level regions with higher population density, with 295,23 and 227,02 inhabitants per square km. respectively. Those values are significantly higher than the EU27, country and CBA average. In NUTS3 level units, population density appears mostly affected by the existence of urban centres in some regions such as Barcelona and Vizcaya as well as other determinants factors such as intensity of industry. Population density in the French NUTS2 level units within the CBA are below the EU, country and CBA averages. At NUTS3 level, Gironde (FR612), Haute Garonne, Gard, Hérault and Pyrenees-Orientales are the regions where population density is over 100 inhabitants per km. All of them are over the country average, but only Gironde and Haute Garonne exceed the CBA average, with 143,42 and 195,62 inhabitants per square km respectively. Mean population density of the CBA has increased from 116,26 inhabitants per square km in 2002 to 128,45 inhabitants per square km in 2009. Density in NUTS3 regions along the border is lower than the CBA average, as it is illustrated by Figure 2.17.

[4] 2008 value

Figure 2.14. Mean population density evolution for the Working Community of the Pyrenees CBA and NUTS3 regions along the border

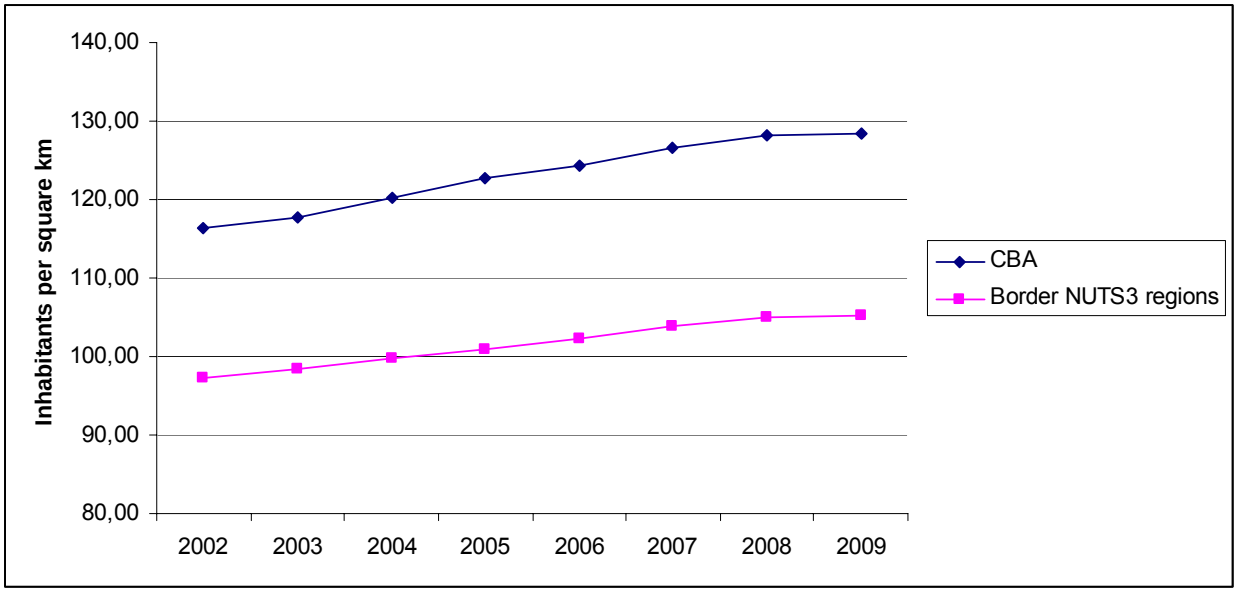
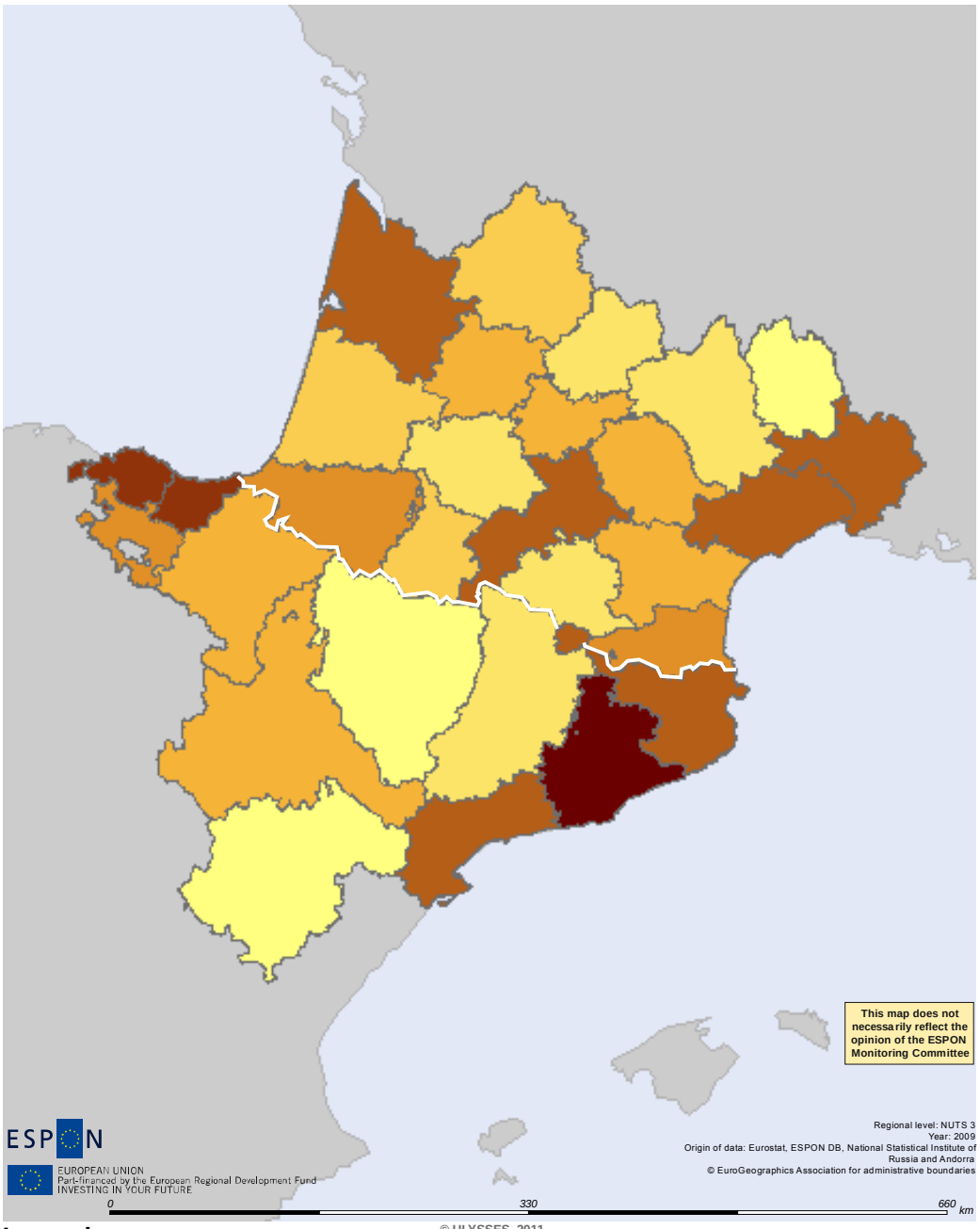


Figure 2.15 shows the spatial distribution at NUTS3 level throughout the CBA, for the year 2009.

Map 2.4. Population density of NUTS3 level units of the Working Community of the Pyrenees CBA.



Legend

Population density 2009* (inhabitants per km2)

- <= 20,42
- 20,43 - 39,63
- 39,64 - 51,36
- 51,37 - 65,04
- 65,05 - 116,00
- 116,01 - 224,43
- 224,44 - 518,17
- >= 518,18
- <missing values>

EU27 = 116,00
FR = 101,72
ES = 90,57

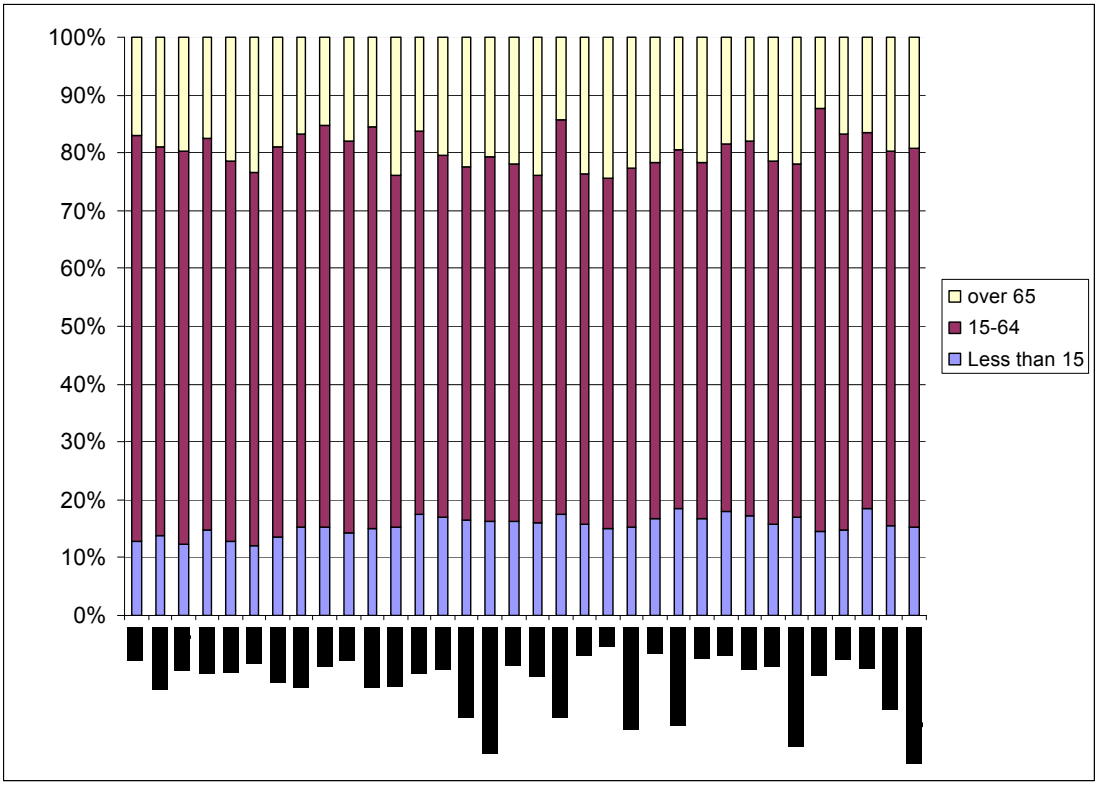
*EU27 yer is 2008

2.8. Dependency Ratios

Three age classes were considered in the analysis: a) total population aged between 0-14 years old; b) total population aged between 15-64 years old; and c) total population aged over 65 years old.

The average proportions of total population of the CBA in the three above defined age classes are in 2009: 15,48% (between 0 and 14 years old), 64,77% between 15 and 64 years old and 19,75% (over 65 years old). Similar proportions are found in the border NUTS 3 regions. The proportion of population over 65 years old in the CBA is higher than the country averages (16,65% in Spain and 16,50% in France). At the same time, the population in this age class is even higher than the CBA average in 16 NUTS3 level regions (out of the 29 that form the CBA). Population aged between 0 and 14 years old in every Spanish NUTS3 level region is lower than the average for the CBA (15,48%). Only Navarra, Barcelona, Girona and Tarragona are over the population aged between 0-14 years old in Spain (14,75%). On the contrary, population aged between 0 and 14 years old is over the CBA average in all the French NUTS 3 level regions, but Dordogne, Lot, and Hautes Pyrenees. However, they are all below the country average in France (18,51%). Population aged between 15-64 years old in Andorra is higher than in any other region in the CBA (73,27%), while the population over 65 years old is by far lower than in any other region.

Figure 2.16.: Relative proportions of the three age classes for each NUTS3 level unit of the CBA (year 2009)



The total demographic dependency ratio is the ratio of the combined youth population (0 to 14 years) and senior population (65 or older) to the working-age population (15 to 64 years). It is expressed as the number of “dependents” for every 100 “workers”:

$$Total\ Dependency\ Ratio = \frac{(Number\ of\ \ people\ aged\ 0-14)+(Number\ of\ \ people\ aged\ over\ 65)}{(Number\ of\ \ people\ aged\ \ 15-64)} \quad (6)$$

The (total) dependency ratio can be decomposed into the child dependency ratio and the aged dependency ratio, as:

$$Child\ \ Dependency\ \ Ratio = \frac{(Number\ of\ \ people\ aged\ 0-14)}{(Number\ of\ \ people\ aged\ \ 15-64)} \quad (7)$$

$$Aged\ \ Dependency\ \ Ratio = \frac{(Number\ of\ \ people\ aged\ over\ 65)}{(Number\ of\ \ people\ aged\ \ 15-64)} \quad (8)$$

$$Ageing\ Index = \frac{(Number\ of\ \ people\ aged\ over\ 65)}{(Number\ of\ \ people\ aged\ \ 0-14)} \quad (9)$$

Changes in demographic dependency ratios highlight changes in the age composition of the population.

Table 2.10 presents total, young and aged dependency rates at NUTS3 unit, country and EU27 level. It occurs that the total dependency ratio of the CBA (54,83%), appears higher than the corresponding EU27 (48,90%), Spain (45,77%) and France values (53,88). However, the total dependency ratio of the border NUTS3 regions (53,79%) is slightly below the French value. Total dependency ratio in every NUTS3 level region in the Spanish side of the CBA is below the country and CBA average. On the contrary, total dependency ratio in every NUTS3 level region in the French side is over the country average (except in Haute Garonne - FR623), and exceeds the CBA average (except in Haute Garonne and Hérault). Maximum total dependency ratios are found in Gers and Lot. Minimul total dependency ratios are found in Álava, Girona and Andorra.

In all NUTS3 level units of the Working Community of Pyrenees CBA, the child dependency ratios were found lower than the aged dependency ratios, except in Gironde, Haute Garonne and Andorra. This shows that the young population of the CBA represents a smaller portion of total population, as compared to the aged population of the CBA in the majority of the NUTS3 level units. This also occurs in EU27 and Spain, but not in France. Highest differences exist in Teruel (17,50) and Lot (15,45).

Table 2.10. Total, child and aged dependency ratios and ageing indices for the NUTS3 level units of the Working Community of the Pyrenees CBA.

	CODE	NUTS-ID	Child dependency Ratio	Aged dependency Ratio	Total dependency Ratio
Spain	ES	NUTS0	21,50%	24,27%	45,77%
Álava	ES211	NUTS3	18,41%	24,33%	42,74%
Guipúzcoa	ES212	NUTS3	20,39%	28,14%	48,52%
Vizcaya	ES213	NUTS3	18,18%	29,22%	47,39%
Navarra	ES220	NUTS3	22,00%	26,02%	48,02%
Huesca	ES241	NUTS3	19,49%	32,78%	52,27%
Teruel	ES242	NUTS3	18,93%	36,42%	55,35%
Zaragoza	ES243	NUTS3	20,01%	28,27%	48,28%
Barcelona	ES511	NUTS3	22,37%	24,82%	47,19%
Girona	ES512	NUTS3	21,96%	22,18%	44,13%
Lleida	ES513	NUTS3	21,02%	26,71%	47,73%
Tarragona	ES514	NUTS3	21,57%	22,19%	43,76%
France	FR	NUTS0	28,49%	25,39%	53,88%
Dordogne	FR611	NUTS3	24,96%	39,18%	64,14%
Gironde	FR612	NUTS3	26,19%	24,54%	50,73%
Landes	FR613	NUTS3	27,26%	32,56%	59,82%
Lot-et-Garonne	FR614	NUTS3	26,83%	36,64%	63,47%
Pyrénees-Atlantiques	FR615	NUTS3	25,69%	32,66%	58,36%
Ariège	FR621	NUTS3	26,46%	35,42%	61,88%
Aveyron	FR622	NUTS3	26,40%	39,59%	65,99%
Haute-Garonne	FR623	NUTS3	25,59%	20,85%	46,44%
Gers	FR624	NUTS3	25,87%	39,15%	65,02%
Lot	FR625	NUTS3	24,86%	40,31%	65,17%
Hautes-Pyrénees	FR626	NUTS3	24,67%	36,67%	61,35%
Tarn	FR627	NUTS3	27,41%	35,46%	62,87%
Tarn-et-Garonne	FR628	NUTS3	29,58%	31,24%	60,82%
Aude	FR811	NUTS3	27,26%	35,12%	62,38%
Gard	FR812	NUTS3	28,45%	28,99%	57,45%
Hèrault	FR813	NUTS3	26,48%	27,91%	54,39%
Lozère	FR814	NUTS3	25,10%	34,10%	59,20%
Pyrenees-Orientales	FR815	NUTS3	27,59%	35,86%	63,46%
Andorra	AD	NUTS0	19,73%	16,75%	36,48%
CBA Total			24,02%	30,80%	54,83%
Border NUTS3 regions			23,65%	30,14%	53,79%
EU27			23,28%	25,61%	48,90%

Figure 2.17. Scatter diagram of child vs. aged dependency ratios for year 2009 in Working Community of the Pyrenees CBA.

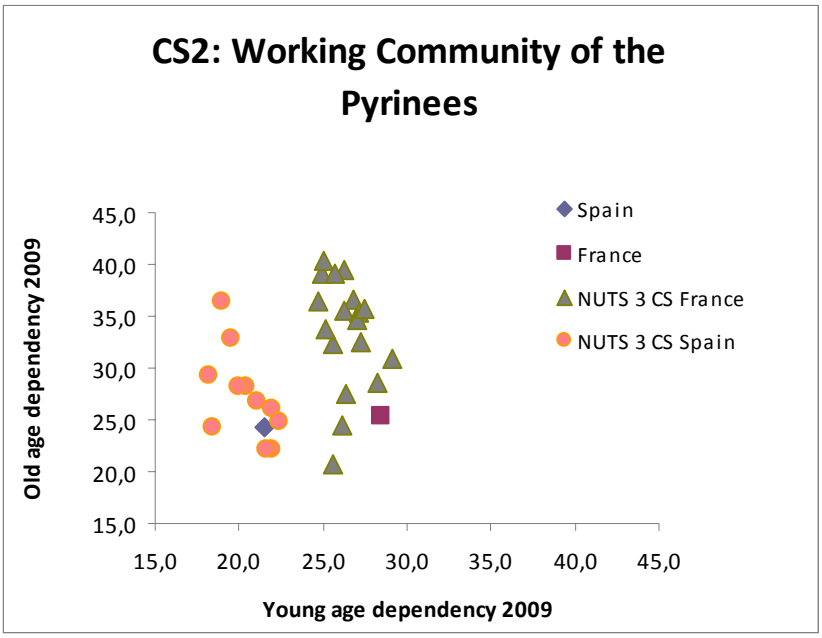


Figure 2.20 illustrates the scatter diagram of child vs. aged dependency ratios for year 2009 for the CBA at NUTS0 and d 3 level units. Old age dependency varies significantly among regions in both sides of the border. This rate varies from 22,2% to 32,8% in the Spanish NUTS3 regions ,while they vary from 20,7% to 39,4% in the French ones. Young age dependency just varies from 18,2% to 22,4% in the case of the Spanish regions and from 24,7% to 29,2% in the case of the French regions, showing that the French regions at NUTS3 level are more young age dependent than the Spanish ones. The majority of the NUTS3 regions are more old age dependent than their corresponding county average.

2.9. Chapter Conclusions

As general conclusion for this chapter, it can be said that:

1. Every region at NUTS2 and NUTS3 levels has increased its population in the period 2000-2009. Population growth in the CBA is higher than the corresponding values in France and EU27, although below the value in Spain. Population growth is even more intense in NUTS3 regions along the border, especially in Girona and Lleida.

2. Net migration, which is positive in every region in the period 2000-2008, is the main responsible for the population increase in the CBA and all the regions within it. However, a closer look onto the evolution of migration shows a negative trend in the case of the CBA as a whole and NUTS3 regions along the border (average), which means that net migration in 2008 is lower than in 2000. This happens in every French region within the CBA but Tarn-et-Garonne, and also País Vasco and the three NUTS3 level regions within it and Barcelona. The significant increase of net migration in 2002 in this latter region (the net migration value was multiplied by 3,35) was followed by a moderate decrease until 2007. Net migration dropped in a significant way in 2008, and for the first time in the analysed period, emigrants exceeded inmigrants in this region as it occurred in Guipúzcoa and Vizcaya.

3. Although natural increase is positive in the CBA and NUTS3 regions along the border as a whole, and show a positive evolution over the years, in more than half of the NUTS3 regions within the CBA, deaths exceed births in the analysed period.

4. The mean fertility rate for the CBA is 1.64. Fertility rates in the French side of the CBA are higher than the rates in the Spanish side of the border, which may be linked to country level policies. But still, fertility rates in the three French NUTS2 regions within the CBA are below the French average. The temporal evolution of fertility rates at NUTS2 level for the period 1997 – 2008 shows a gradual increase of these rates in all regions of the CBA.

5. The mean population density of the CBA for the year 2009 is 128,45 inhabitants per sq km, significantly higher than the mean value of Spain (90,57 inhabitants per sq km) and France (101,72 inhabitants per sq km). Regions in the Spanish side of the border, and in particular Vizcaya and Barcelona with 512,63 and 691,70 inhabitands per square km, are the ones which mostly contribute to this high population density.

6. In all NUTS3 level units of the CBA, the child dependency ratios were found lower than the aged dependency ratios, except in Gironde, Haute Garonne and Andorra. This shows that the young population of the CBA represents a smaller portion of total population, as compared to the aged population of the CBA in the majority of the NUTS3 level units. This also occurs in EU27 and Spain, but not in France. French regions at NUTS3 level within the CBA are more young age dependent than the Spanish ones, which means that the latter ones are more old age dependent. This is linked to other variables such as fertility rate. The majority of regions at NUTS3 level are more old age dependent than their corresponding county average.

CHAPTER 3 - Polycentric Development

3.1. Concept and definition

According to ESPON definition, polycentricity is a self-explanatory concept, as opposed to monocentricity, on the one hand, and dispersal and sprawl on the other. The concept has a twofold dimension with two complementary aspects:

- morphological, i.e. the physical distribution of urban areas in a given territory, including the number of cities, their hierarchy and distribution, and;
- relational, referring to the functional links between the urban areas, i.e. the networks of flows and cooperation.

The morphological dimension operates more at the European and national scales. At this level polycentricity occurs when the urban system is characterised by several cities at different levels, rather than just being dominated by one city. At the regional or local scales the relational dimension of polycentricity dominates the equation, as at this level polycentricity occurs when two or more cities have complementary functions allowing them to co-operate and act jointly as a larger city. As a result of all this, polycentricity is a scale-dependant concept, as it must be contextualised within a concrete spatial scale (*micro*, *meso* and *macro*) and it assumes slightly different meanings at each level (ESPON 1.1.1).

3.1.1. The policy context

Polycentricity has been one of the flagships or the EU spatial planning strategy since the publication of the European Spatial Development Perspective (Commission of the European Union, 1999; From here onwards ESDP). To develop a balanced and polycentric urban system has been an underlying guideline for the spatial orientation of policies at the European level since then. Polycentricity is presented by the ESDP as a means to pursuit a regionally balanced development, contributing *to avoid further excessive economic and demographic concentration in the core area of the EU. All this assuming that the economic potential of all regions of the EU can only be utilised through the further development of a more polycentric European settlement structure* (ESDP p. 20). In parallel, the ESDP introduced a new approach to the urban-rural interface, recognising it as a key for polycentric development in Europe.

Later in 2007, the Leipzig Charter on Sustainable European Cities (EC, 2007) stressed this notion of urban-rural partnerships beyond administrative territories, promoting an approach focused on balanced cooperation between cities and rural areas, with enhanced coordination at regional and city-levels. All these views converged with official cohesion policies, which gradually shifted towards a place-based approach. In this regard, the Green Paper on Territorial Cohesion (2008) identified territorial cohesion as *a means of*

transforming diversity into an asset that contributes to sustainable development of the entire EU (p. 4), thus allowing regions to mobilize their intrinsic development potential.

Furthermore, also in 2007 The Lisbon Treaty added territorial cohesion to the goals of economic and social cohesion. As a result, the European cohesion policy has paid more attention to the role of cities and *functional geographies* and, unlike in the past, when the Community Initiatives LEADER and URBAN were skewed towards rural or urban settings, current regional policies favour larger functional areas with interdependencies.

The Fifth Cohesion Report by the European Commission (2010) can be considered a totemic example of this new approach. This report supports the Europe 2020 Strategy for smart, sustainable and inclusive growth (2010) by showing how regions and Cohesion Policy can contribute to achieving its objectives. The report stresses that headline targets of the Europe 2020 strategy will not be achievable by policies formulated at the EU or national levels alone. In contrast, overcoming territorial disparities through the right mix of national, regional and local governing structures will play critical roles in defining and implementing policy measures based on territorial specificities and *flexible geographies*. In this context, urban areas are seen *as engines of growth and hubs for creativity and innovation* (Fifth Cohesion Report, p. XXIV).

This approach has been further stressed by the revised Territorial Agenda of European Union (2011), stating that it is important to avoid polarization between capitals, metropolitan areas and medium sized towns on the national scale, thus encouraging cities *to form networks in an innovative manner, which may allow them to improve their performance in European and global competition and promote economic prosperity towards sustainable development* (TA2020, p. 7). This strategy calls for new policies contributing to reduce the strong territorial polarisation of economic performance, avoiding large regional disparities in the European territory, thus fostering the territorial competitiveness of the EU territory also outside the core 'Pentagon area'.

3.1.2. The academic debate

The debate about the concept of polycentricism has been quite intense among academics. Many authors have discussed the implications of polycentricity for territorial structures, that is, its potential advantages from the economic and social points of view, and even the very definition of polycentricism and its main characteristics has been strongly debated (Burgalassi, 2010).

As a result of these debates and unlike in the normative arena, the consensus about the supposed advantages of polycentric regions has not been reached among scholars, to the point that many authors have considered such advantages highly unsubstantial, ambiguous and badly defined (ESPON, 1.4.3). Davoudi (2003 pp 991–995) claims that ESDP's approach to polycentricity is highly normative, not as an existing condition that can be measured. In fact, it is not straightforward why and how polycentric development should encourage *competitiveness, cohesion and sustainability* at different scales (Davoudi, 2003; Meijers, 2008a and 2008b). There is simply not enough evidence supporting this hypothesis.

Furthermore, to Meijers and Sandberg “assumed positive relationship between a polycentric urban system and limited regional disparities lacks both a strong theoretical underpinning and empirical justication" (2006, 1). And, as noted by Burgalassi (2010, p. 39), “the uncertainty about the benefits of polycentricity is strongly related to the fuzziness of its definition, which is far from being univocal.”

Fewer empirical and conceptual contestations deserved the environmental justification for more polycentric urban systems in regions, given that, as authors such as Camagni et al. (2002) have shown, regions formed by networked compact cities favour less urban dispersion, maintaining open space between cities, while contributing to reduced private transportation.

In any case, the polycentricity as the FOCI TPG has stated, the “debate becomes more useful for territorial planning in case it is embedded in the territorial synergies approach” (ESPON, 2010 p. 527). Territorial cooperation among cities and regions is believed to enhance clustering and complementarities of activities by integrating infrastructures through shared planning implementation. From this scope, cooperation constitutes a very important aspect of the territorial governance.

3.2. ESPON’s approach to polycentricity

Several ESPON project have analysed polycentricism as a means to achieve a more balanced territorial development across Europe. Concretely, ESPON projects 1.1.1 of 2004, *Potentials for Polycentric Development in Europe*, and 1.4.3 of 2007, *Study on Urban Functions*, have set the conceptual basis for the analysis of the polycentric development at the European scale.

ESPON Project 1.1.1

ESPON 1.1.1 was the first ESPON initiative to define a methodology that come up with a complete list of Functional Urban Areas (FUAs) for all countries falling within ESPON space. This project relied on a morphological definition of FUAs, defining the concept as a municipality (or a cluster of municipalities forming an urban agglomeration) and its related labour basin. These areas were identified according to either travel-to-work areas, commuter catchments areas, or urban poles, in those countries that had already developed such definitions. Elsewhere, the definition of FUAs was based on insights provided by individual national experts on the basis of their knowledge of spatial functional relations. This was the case in 11 out of the 29 ESPON countries, making the delimitation of the FUAs not totally comparable across Europe. Globally, the selection criteria was that each FUA ought to have at least an urban core of at least 15.000 inhabitants and over 50.000 in total population, for larger countries, or at least 15.000 inhabitants and more than 0,5% of the total population, for those countries with less than 10 million inhabitants. All in all, 1595 FUAs with more than 20000 inhabitants were identified in the study area.

ESPON 1.1.1 also mapped the functional specialisation of the FUAs in relation to the following topics:

- population;
- transport;
- tourism;
- manufacturing;
- knowledge;
- decision-making in the private sector;
- decision-making in the public sector.

Those FUAs that achieve the highest scores on indicators representing key urban functions (all the above except tourism and administration) were designated as Metropolitan European Growth Areas (MEGAs), which were further analysed and classified in relation to the levels of population, competitiveness, connectivity and knowledge basis. 76 MEGAs were identified in Europe.

ESPON 1.1.1 thereafter calculated the Potential Urban Strategic Horizons (PUSH), those municipalities of which at least a 10% of the area can be reached within 45 minutes by car from the closest FUA centre. Finally, the Project introduced the concept of Potential Integration Areas (PIAs), including those neighbouring FUAs with overlapping PUSH areas by at least 1/3 of their total area. Each PUSH area belongs to one PIA only, the largest neighbouring city being preferred when there are multiple overlaps. The hypothesis made by ESPON 1.1.1 was that the physical proximity of cities might provide them with better opportunities for functional integration. The report recommends that national spatial planning strategies should support the development of PIAs especially in the regions outside the Pentagon.

Relying on this conceptual underpinning, the polycentric patterns of Europe were analysed at the European, national, regional and -to a limited extent- local scales. At the sub-national level, PUSH areas were classified into four categories:

- monocentric;
- polycentric;
- sprawl;
- sparsely populated (rural).

At the national scale, a polycentric index for each ESPON country was produced, basing on the three dimensions of polycentricity: size and location as morphological aspects, and connectivity representing the relational dimension of polycentricity.

ESPON Project 1.4.3

This ESPON initiative was built upon the previous project as an attempt to validate and improve further the concepts and knowledge developed by 1.1.1. The main focus was put on the internal structure of the FUAs, as it was recognised that despite the growing importance of the functional dimension of the city networks, the morphological aspects of the urban patterns remained a central concept.

In order to capture this physical dimension, the project developed the concept of Morphological Urban Areas (MUAs), defined as continuously urbanised areas or patches of built up surfaces, irrespectively of their administrative limits, characterised by high population density. As it is claimed by ESPON 1.4.3, those FUAs that have better opportunities are those having a strong MUA in the centre, especially if the latter has some good quality historical and cultural heritage.

The delimitation of the MUAs allowed the Project to compare them to the FUAs designated by ESPON 1.1.1. This lead to the identification of some drawbacks and inconsistencies in the data provided by ESPON 1.1.1 which in the majority of the cases could be explained by the choice that ESPON 1.1.1 of administrative boundaries instead of labour pools. Taking into account these limitations, ESPON 1.4.3 selected those FUAs bigger than 50,000 inhabitants from ESPON 1.1.1 and characterised them at the according to comparable criteria, namely population density at the LAU 2 level. More importantly, despite ESPON 1.4.3 did not produce a new exhaustive list of FUAs, it did accomplished an initial identification and characterization of cross-border FUAs, which were left out by ESPON 1.1.1, as this project used national-based data for its analysis.

ESPON FOCI project

Although it was not directly focused on polycentricity, the FOCI project finalised in 2010 has experimented with relevant and novel approaches to quantitative analysis of urban issues. These approaches included the use of the classic official data (NUTS and Urban Audit), but sometimes in innovative ways, as well as the collection and analysis of new data sources, notably transport time tables and firm network data.

The project relayed on an approximation used by DG Region, which allows to use a NUTS-3 unit if a certain percentage of the total population lives in the Larger Urban Zones (LUZ), a concept developed by Eurostat at the occasion of the Urban Audit 2004. This approximation allowed FOCI project to use a NUTS-3 proxy to European cities under these criteria:

1. Only LUZs with over 250,000 inhabitants were included in the analysis
2. Only LUZs exceeding 70% of the population threshold of NUTS-3 unit were included. In case of LUZs consisting of more than one NUTS-3, only regions with at least 50% of the population living within LUZ were considered as part of the metropolitan area.
3. Poly-nuclear metropolitan areas have been defined in the following circumstances:

- The distance between LUZ's core cities have been smaller than 60 km in case of LUZ bigger than 500,000 inhabitants or 30km in case of smaller LUSz
- Rule 2 applies to the whole poly-nuclear metropolitan area.

On this basis, the project has analysed several dimensions of the urban setting in all of Europe, attempting at furthering the empirical knowledge on European cities on the following fronts:

- Urban extension and urban form. Two new classifications of European cities were developed:
    - a typology of population development between core cities and LUZs;
    - a typology of urban spatial development based on Corine Land Cover.

- Social cohesion. Basing on the (somehow limited) data available, the interface between the social and economic dimensions was analysed across European cities. Concretely, FOCI assessed the relationship between economic development and diverse social cohesion indicators, particularly unemployment. In addition to these subjects, socio-spatial polarisation was analysed as well.

- Economic development: FOCI developed a new typology of the sectoral structure of Europe's cities as this sectoral structure can be seen both as a factor of competitiveness, but also as a proxy for the historical paths these cities have taken. The study also included some new approaches to urban economies, mostly based on innovative data, like the insertion of the cities into global and European networks, be it research or global firm networks, based on CORDIS and ORBIS data; (ii) their respective contactability for one-day business trips based on a collection of time table data, and; (iii) the link between urban economic performance and the respective national context.

- City-hinterland relationships: under this topic, FOCI discussed the question to what extent cities play a role of motor of economic development for their wider hinterland. For that scope, (i) it was analysed the convergence processes in metropolitan macroregions; it was produced a Typology of metropolitan macroregions in terms of the correspondence of demographic processes, structural changes and labour market fluctuations, and; (iii) the mechanisms underlying metropolis-region relations were analysed basing on both quantitative methods and qualitative case studies.

- Cities and polycentric cooperation: FOCI recognises that the current knowledge about polycentric development is very limited, and generally based on a morphological approach, and thus aims at moving towards a more functional view in order to enhance the empirical base of the polycentricity debate. On those grounds, several case studies were analysed aiming at measuring functional polycentricity across Europe and some interesting indicators related with polycentricity were produced as well a number of analytical outputs, namely:

- o A typology of polycentric potentials urban systems
- o A delimitation of the service areas of the FUAs at 90 minutes time-distance.
- o FUAs road link intensity from “regional” to lower level centres.
- o Cities networking through firms links at MEGA and FUA levels
- o Cities networking through research links
- o Cities networking through transport networks
- o Commuting and the lower level links among cities

3.3. Cross-border polycentricity in the Working Community of the Pyrenees

As it has been said before, according to previous ESPON projects, polycentricity has a twofold nature:

- morphological, referring to the physical distribution of urban areas in a given territory, and;
- relational, referring to the functional links between the urban areas.

While data availability related to the morphological dimension of polycentricity is relatively abundant from previous ESPON projects, the dynamic aspects of the city systems are very poorly covered by ESPON databases and local statistics offices. Therefore, although some attempts to analyse relations between cities within the Pyrenees CBA have been made relying on functional proxy data, the focus has been put on its morphological aspects.

3.3.1. Morphological polycentricity

Functional Urban Areas found in the Pyrenees CBA

According to ESPON 1.4.3, as well as to our own estimates[5], the FUAs over 20,000 inhabitants found in the Working Community of the Pyrenees CBA are listed in the following table:

[5] Any FUA has been considered to be part of the CBA (defined at NUTS2 level) if more than 60 % of its area is overlapping with that the CBA or if most of their Morphological Urban Area (MUA) is within the limits of the CBA. See Section 2 for a complete explanation on the method followed. The FUA have been ranked according to the estimated population in the year 2006. No FUA / MUA has been defined for Andorra, as no national FUA classification could be found for this country.

Table 3.1. Complete list of the FUAs found on the Pyrenees CBA

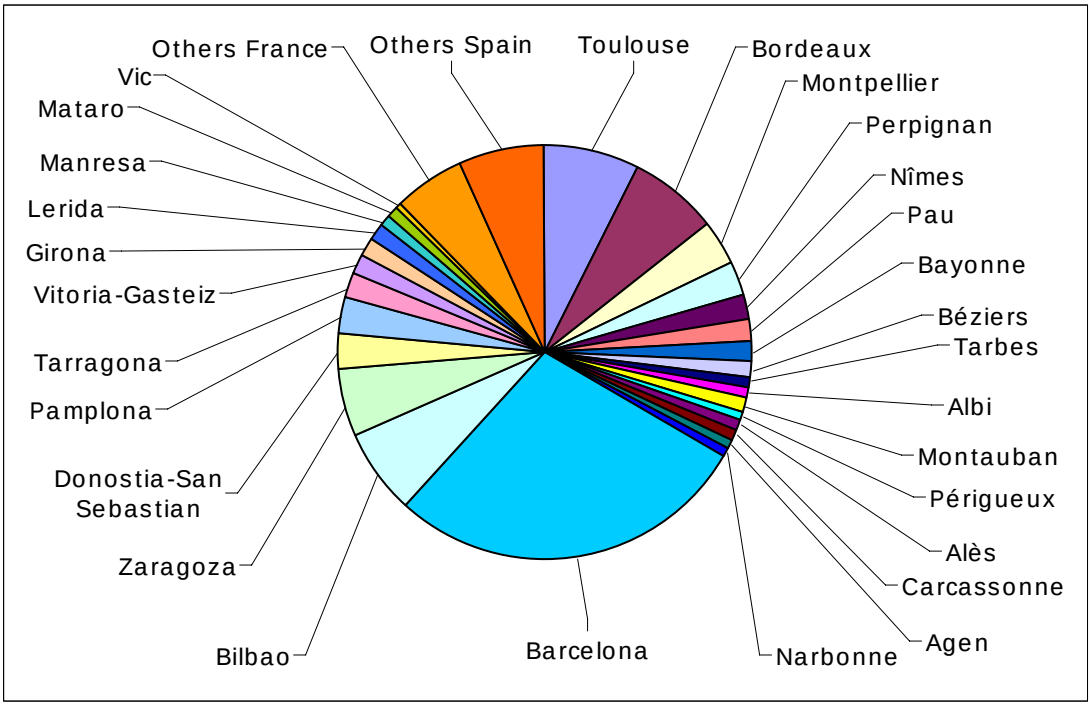
No.	Country	FUA	FUA area (km^2)	FUA Population 2001	FUA Population 2006	Population increase 2001_2006	Compactness 2001 (MUApop/FUApop)
1	Spain	Barcelona	2916.77	4045853	4435116	9.6	81
2	France	Toulouse	6225.57	1038647	1188281	14.4	66
3	France	Bordeaux	5938.34	1003358	1089706	8.6	65
4	Spain	Bilbao	2198.89	1015004	1030627	1.5	80
5	Spain	Zaragoza	15064.9	780928	832166	6.6	79
6	France	Montpellier	2188.11	503442	563273	11.9	64
7	Spain	Donostia-San Sebastian	665.91	438607	455397	3.8	58
8	Spain	Pamplona	6544.93	370016	403863	9.1	71
9	France	Perpignan	1717.13	326591	363619	11.3	38
10	Spain	Tarragona	1054.39	275448	322722	17.2	73
11	France	Nîmes	1516.48	285617	317635	11.2	47
12	France	Pau	2432.96	260109	277460	6.7	50
13	France	Bayonne	1390.32	241292	260997	8.2	59
14	Spain	Vitoria-Gasteiz	2653.8	246392	260956	5.9	88
15	Spain	Girona	1095.15	171020	205447	20.1	58
16	Spain	Lerida	2053	182310	204580	12.2	62
17	France	Béziers	1001.16	156021	171569	10	48
18	Spain	Manresa	626.97	125552	141176	12.4	51
19	France	Tarbes	1214.44	135033	138618	2.7	52
20	France	Albi	1537.37	126133	135062	7.1	47
21	France	Montauban	1466.08	118444	132680	12	44
22	Spain	Mataro	53.17	116717	130204	11.6	91
23	France	Périgueux	1854.86	123040	128911	4.8	36
24	France	Alès	929.85	116802	124393	6.5	44
25	France	Carcassonne	1568.6	110580	119144	7.7	40
26	France	Agen	1238.79	108157	118500	9.6	41
27	France	Narbonne	943.33	97369	111075	14.1	48
28	Spain	Vic	627.71	95425	109033	14.3	34
29	France	Rodez	1713.01	92476	98169	6.2	26
30	Spain	Blanes	91.42	71216	95661	34.3	92
31	France	Castres	1100.61	91243	94820	3.9	48
32	France	Mont-de-Marsan	2267.11	84983	90753	6.8	35
33	France	Libourne	690.99	81008	85924	6.1	27
34	France	Sète	162.8	75125	84542	12.5	86
35	Spain	Igualada	587.36	69820	78620	12.6	62
36	France	Bergerac	1048.45	69197	72309	4.5	38
37	Spain	Huesca	3021.14	66841	70894	6.1	69
38	Spain	Figueres	934.01	57429	67244	17.1	58
39	Spain	Vilanova i la Geltrú	47.87	56388	66266	17.5	96
40	Spain	Vendrell, El	138.84	46456	64641	39.1	80
41	France	Arcachon	421.72	56202	63038	12.2	61
42	Spain	Vilafranca del Penedès	277.68	52767	62594	18.6	59
43	France	Cahors	1630.75	56065	59408	6	36
44	France	Auch	1585.18	55538	57918	4.3	39
45	France	Villeneuve-sur-Lot	639.56	55236	57755	4.6	41
46	Spain	Tudela	644.86	53326	57352	7.5	56
47	Spain	Cambrils-Salou	61.05	36428	51563	41.5	97
48	Spain	Tortosa	742.07	44423	51004	14.8	65
49	Spain	Mondragon o Arrasate	264.21	49898	49307	-1.2	46

50	Spain	Olot	563.79	44551	49298	10.7	63
51	Spain	Eibar	68.5	50288	49094	-2.4	90
52	Spain	Teruel	3864.04	45707	48559	6.2	68
53	Spain	Pineda de Mar	31	36858	46116	25.1	94
54	France	Agde	150.86	36309	40316	11	55
55	Spain	Durango	94.74	36961	39093	5.8	68
56	Spain	Valls	327.47	33766	38761	14.8	60
57	France	Millau	996.06	33015	34836	5.5	65
58	Spain	Sant Pere de Ribes	40.88	23134	26859	16.1	100
59	Spain	Sitges	43.72	19893	25642	28.9	100
60	France	Lunel	29.74	23269	25201	8.3	96

Source: Own elaboration based on ESPON FUA database.

The FUAs are distributed almost equally on both sides of the border: France shelters 31 of them and Spain the remaining 29. However, in terms of population the Spanish FUAs have a bigger overall weight as compared to the French ones. Almost 9.6 million people (61% of the total) reside in Spanish FUAs, as compared to the 6.2 million people (39% of the total population) dwelling the French sector in 2006. This is essentially due to the weight of Barcelona urban area, which accounts for almost half (46.3%) of the population residing in the FUAs falling to the Spanish side of the border, and to almost 30% of the entire urban population of the Pyrenees CBA.

Figure 3.1. Distribution of the total FUA population amongst the Pyrenees' FUA. Year 2006.



Source: Own elaboration based on ESPON FUA database.

Excluding the two biggest urban areas from the analysis (Barcelona and Toulouse), the distribution of the population among both national sectors of the CBA looks much more balanced: 5.1 million FUA inhabitants in the Spanish sector of the CBA and 4.9 million in the French sector, which represents 51.1% of the FUAs'

population residing in Spain and 48.9% in France. These figures suggest a moderately balanced distribution of the urban population within the FUAs, as it will be discussed in the following pages.

If one would consider only the urban centres found within the NUTS-3 cross-border regions[6], thus those included in a restricted Pyrenean domain, only 16 FUAs would be picked out, even though some of those still showing a doubtful Pyrenean vocation, as a result of being located at considerable distances from the mountain range (and from the border itself), especially on the Spanish side, like Lerida and Tudela, that fall more than a 100 km away from the international boundary.

Table 3.2. Zoom-up on the FUAs within the confining NUTS-3 regions

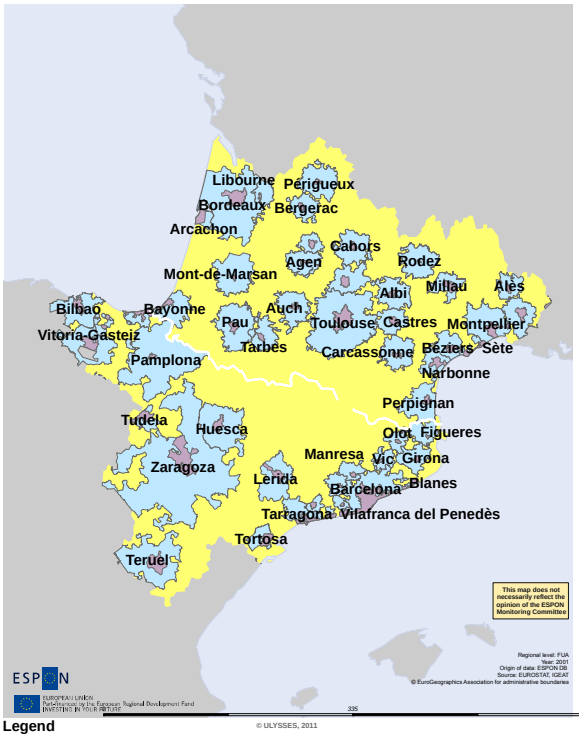
No.	Country	FUA	FUA area (km^2)	FUA Population 2001	FUA Population 2006	Air distance of the FUA centroid to the international boundary (km)
1	France	Toulouse	6225.57	1038647	1188281	84.7
2	Spain	Donostia-San Sebastian	665.91	438607	455397	16.9
3	Spain	Pamplona	6544.93	370016	403863	29.9
4	France	Perpignan	1717.13	326591	363619	21.9
5	France	Pau	2432.96	260109	277460	50.6
6	France	Bayonne	1390.32	241292	260997	16.3
7	Spain	Girona	1095.15	171020	205447	38.9
8	Spain	Lerida	2053	182310	204580	120.2
9	France	Tarbes	1214.44	135033	138618	57.2
10	Spain	Blanes	91.42	71216	95661	71.8
11	Spain	Huesca	3021.14	66841	70894	71.1
12	Spain	Figueres	934.01	57429	67244	13.5
13	Spain	Tudela	644.86	53326	57352	110.4
14	Spain	Mondragon o Arrasate	264.21	49898	49307	67.2
15	Spain	Olot	563.79	44551	49298	16.8
16	Spain	Eibar	68.5	50288	49094	59.0

Source: Own elaboration based on ESPON FUA database.

As shown by Maps 3.1 and 3.2, all the FUAs in the CBA are distributed in a peripheral position, being the central sector occupied by the Pyrenees mountain range. The orientation of the Pyrenees chain imposes constraints not only on the distribution of the population over the area, but also on the flows of diverse nature that secularly have been concentrated on both extremes of the mountain chain, to the detriment of the central area.

[6] These regions are: Guipúzcoa, Navarra, Huesca, Girona and Lleida, in Spain, and Pyrénées-Atlantiques, Ariège, Haute-Garonne, Hautes-Pyrénées and Pyrénées-Orientales, in France.

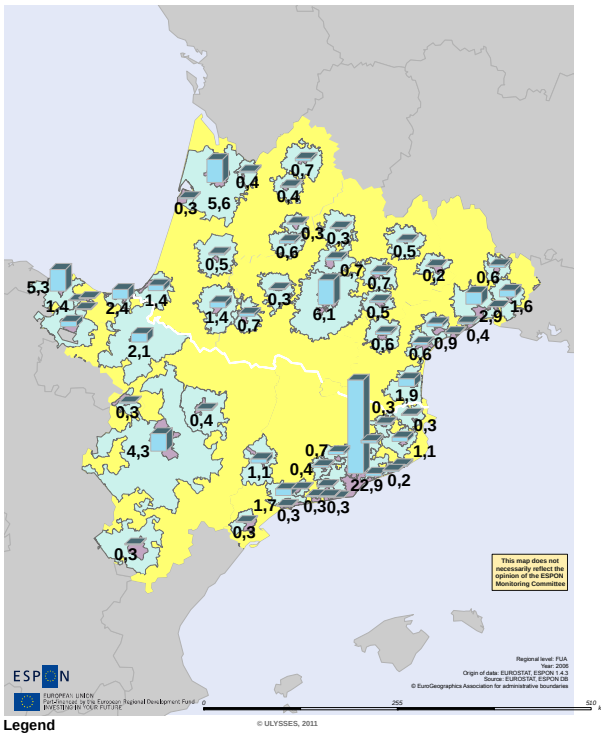
Map 3.1. Morphological and Functional Urban Areas



Legend

Morphological Urban Areas and Functional Urban Areas, according to the ESPON 1.4.3 (established from data from 2001)

Map 3.2. Share of population in FUA



Legend

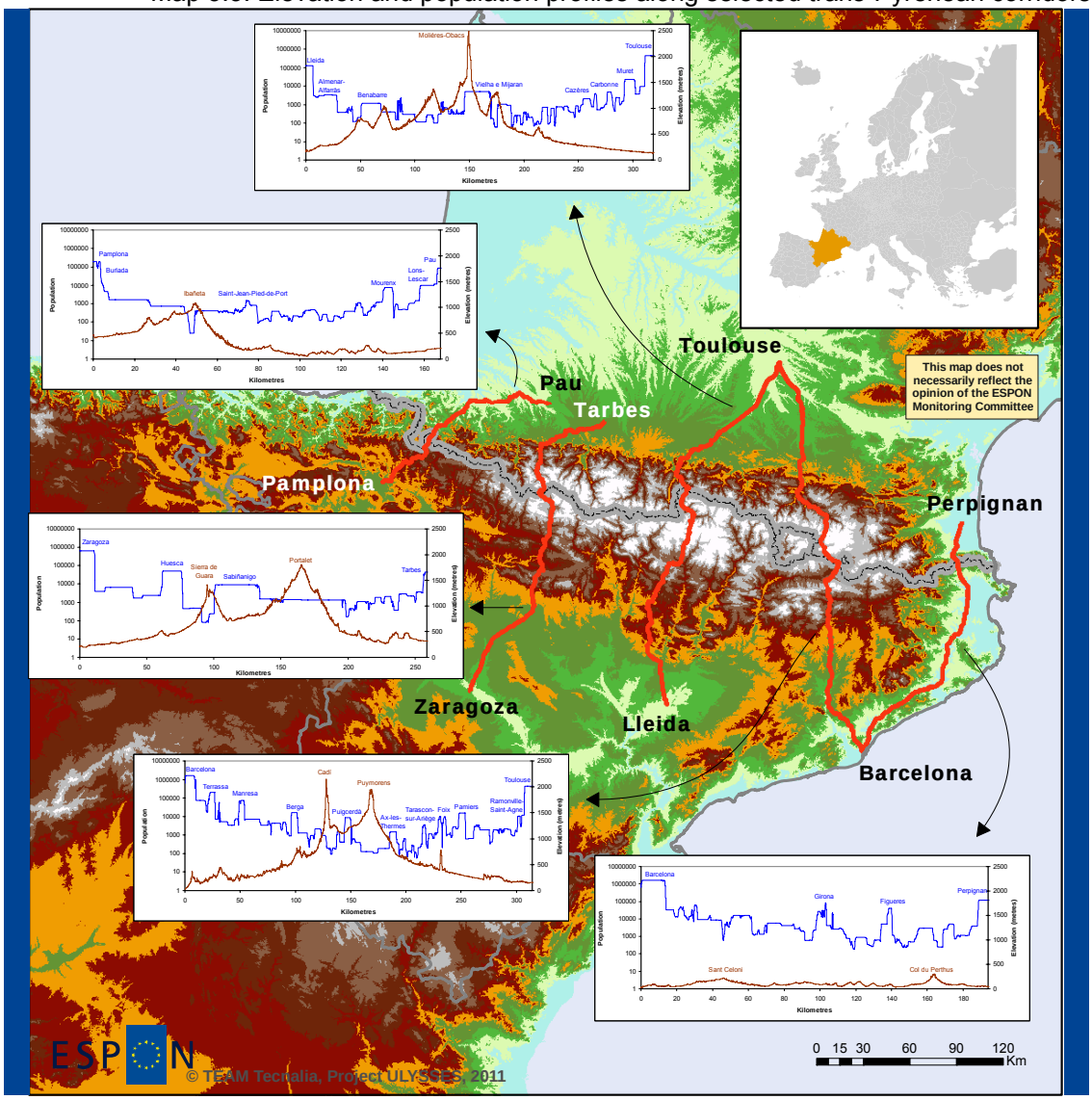
Percentage of FUA population by total population of the Cross Border Area in 2006

<Morphological Urban Area>

<Functional Urban Area>

Indeed, the distribution of the urban centres is highly conditioned either by the slopes found in most sectors of the CBA as well as by the elevation itself, both of which act as important obstacles for urban development. While the average slope in Andorra is above 24.4%, as a result of this country being located in the core of the Pyrenees, in the Spanish subset of the CBA the figure is a just third of the former (8.0%), and in the French sector even smaller, just a 5.4%. Considering only the NUTS-3 confining regions located over the border, the average slope results 10.7%.

Map 3.3. Elevation and population profiles along selected trans-Pyrenean corridors



EUROPEAN UNION
Part-financed by the European Regional Development Fund
INVESTING IN YOUR FUTURE

Source:
DEM: Jarvis, A., H.I. Reuter, A. Nelson, E. Guevara, 2008, Hole-filled SRTM for the globe Version 4, available from the CGIAR-CSI SRTM 90m Database. Shortest paths generated with navigation data from YOURS project, 2011. 2006 population data at LAU2 level obtained from ESPON 2013 Local database.

Legend (map)

Elevation over sea level (m)

- 0 - 100
- 101 - 200
- 201 - 300
- 301 - 500
- 501 - 700
- 701 - 900
- 901 - 1.100
- 1.101 - 1.500
- 1.501 - 2.000
- over 2.000

Legend (graphs)

- Elevation profile
- Population at LAU2 level, 2006

As for the elevation, it goes without saying that Andorra is the highest subsector of the CBA, with an average elevation of almost 2 000 metres above the sea level. The Spanish area comes next, with an average elevation of 705 metres, while the elevation in the French sector is significantly smaller, 375 metres on average. Finally, the NUT-3 regions sharing at least a segment of international boundary are 731 metres above the sea level on average.

Map 3.3 illustrates how the urban population is distributed along some of the most important axes that traverse the Pyrenees to its central and western parts[7]. The graphics attached to the map clearly show an indirect correlation between elevation and population at LAU2 level. In general terms, it can be inferred that the closer a municipality is to the mountainous range, the smaller the population it shelters. As a result of this mountainous obstacle, it can be evidenced that the distribution of the FUAs (as well as the urban population in general) clearly shows a triangular distribution pattern along three well-defined axes[8]:

- The Garonne-Adour corridor
- The Ebro corridor
- The Mediterranean corridor

Due to the outstanding influence of Barcelona's FUA, the most urbanised axis in the CBA is the Mediterranean corridor (Tarragona-Montpelier) accounting for over 50% of the FUAs' overall population (51.2%), followed by the Garonne-Adour corridor (accounting for 27.5% of the population) and the Ebro corridor (21.4% of the total population).

Rank-size distribution of the FUA population

All the figures shown above do not directly inform about the degree of polycentricity of the urban system within the region. For that particular purpose more specific indicators have to be provided. Of those, the most common one is the rank-size distribution of the urban centres, which is used to visualise the distribution of the cities in a certain area. In order to estimate this indicator, the FUA of the CBA must be ranked according to their population and then the following equation can be estimated:

$$\ln (pop) = \alpha + \beta \ln (rank)$$

The latter is the so-called rank-size equation in the Lotka form (Parr, 1985). The rank-size is an approximation used to visualise Zipf's Law in a log-linear form. Zipf Law (Zipf, 1949) is an empirical evidence which shows a relationship between rank and size of cities. The largest city should be n-times as larger as the nth largest city: the size of each city is measured by its population and the city with largest population has rank 1, the second rank 2, and so on. This Law has performed surprisingly well for the size distribution of cities in most industrialised countries (Gabaix, 1999).

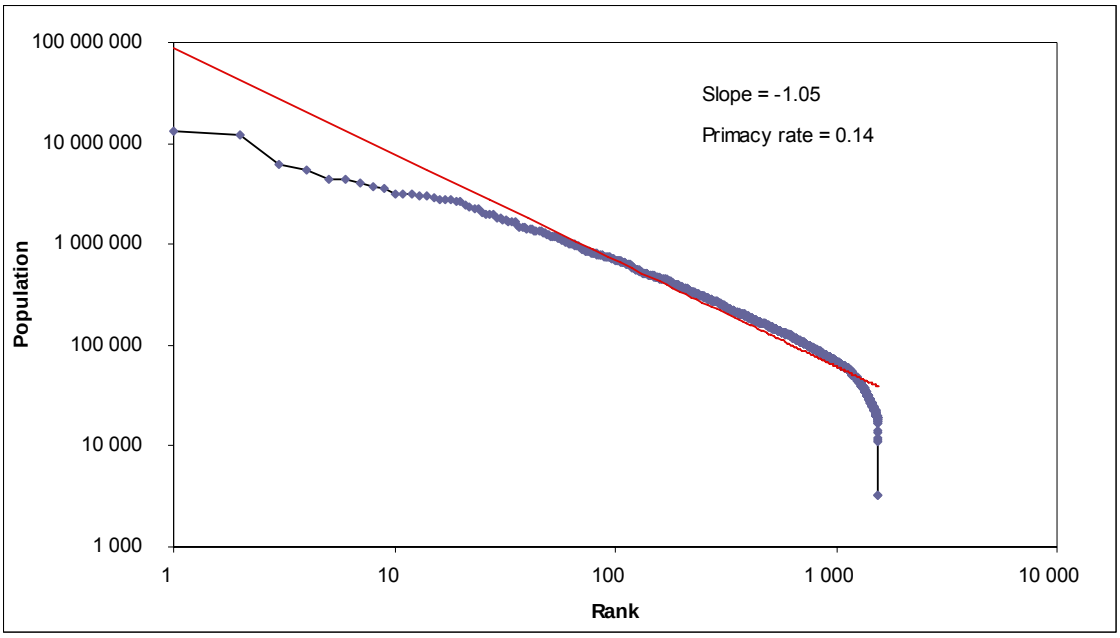
[7] The San Sebastian – Bayonne corridor has not been represented here as the elevation remains constantly small along it.

[8] The axes have been defined as follows:

- Garonne-Adour corridor: Agen, Albi, Bordeaux, Arcachon, Auch, Bayonne, Bergerac, Cahors, Carcassonne, Castres, Libourne, Millau, Montauban, Mont-de-Marsan, Pau, Périgueux, Rodez, Tarbes, Toulouse, Villeneuve-sur-Lot.
- Ebro corridor: Bilbao, Donostia-San Sebastian, Durango, Eibar, Huesca, Mondragon o Arrasate, Pamplona, Tortosa, Teruel, Tudela, Vitoria-Gasteiz, Zaragoza.
- Mediterranean corridor: Agde, Alès, Barcelona, Béziers, Blanes, Girona, Cambrils-Salou, Figueres, gualada, Lerida, Lunel, Manresa, Mataro, Montpellier, Narbonne, Nîmes, Olot, Perpignan, Pineda de Mar, Sant Pere de Ribes, Sète, Sitges, Tarragona, Valls, Vendrell, El, Vic, Vilafranca del Penedès, Vilanova i la Geltrú.

If the Zipf Law holds, the size distribution of cities follows a statistical log-linear distribution, and the value of β is -1. In this case, the largest city in a region would be twice as large as the second, three times the size of the third, etc. In general terms, the slope of the rank-size equation, given by the estimated β, indicates the level of hierarchy of the urban system, and thus the level of polycentricity within a region: the lower the absolute value of estimated β, the higher the level of polycentricity.

Figure 3.2. Rank-size distribution of the FUA population in the EU 27 + CH + NO (year 2006)



Source: Own elaboration based on ESPON FUA database.

For the ESPON space's FUA, β = -1.0521, which is very close to -1, the value corresponding to the Zipf's law regularity. It is also interesting to observe how the city system of the ESPON countries lacks hierarchy at the upper end of the rank size distribution. In this case, the biggest city according to the regression should have an estimated population equal to e 18.297 ≈ 89 417 105 inhabitants, which is a much higher value than the approximate 13 million inhabitants of the London FUA (the biggest in the ESPON space).

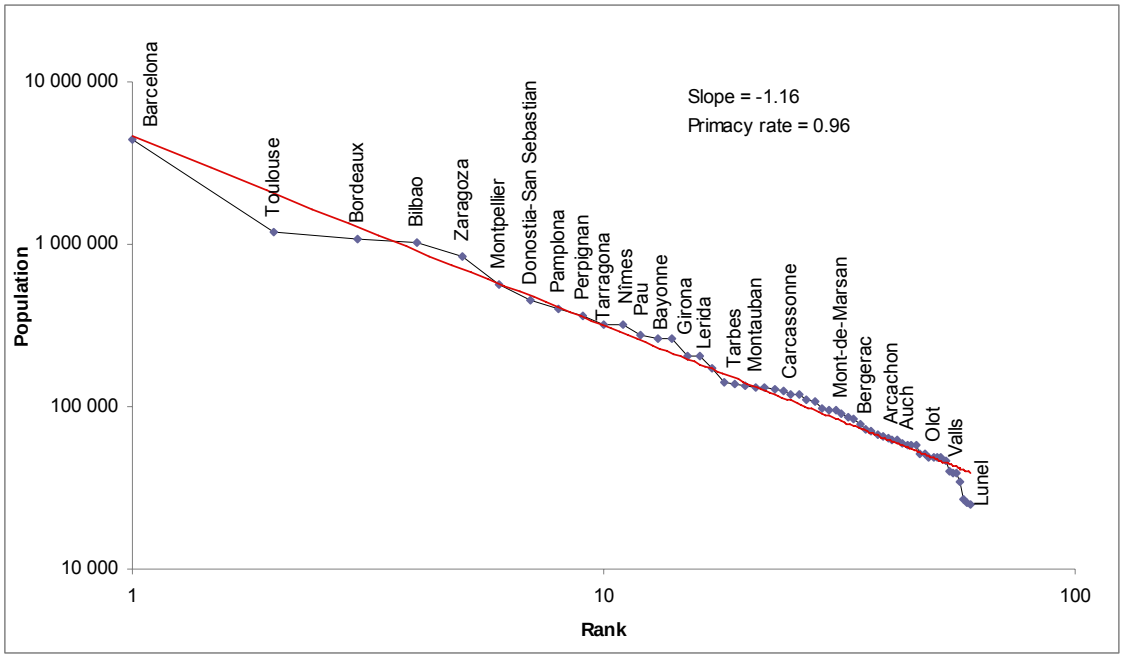
Equally to the ESPON area, in the Pyrenees CBA the rank-size distribution is also quite compatible with the Zipf's Law, being the slope of the regression equation (-1.16) very close to -1. However, the distribution of the population among the FUAs seems to be more hierarchical than other cross-border areas under analysis due to the impact of Barcelona's FUA.

Remarkably, the population within this FUA fits almost perfectly with the one estimated by the rank-size equation (4 435 116 to 4 686 86, respectively). This fact is also confirmed by the Primacy rate of Barcelona's FUA. This rate measures the degree to which the size of the largest city of a given region deviates from the regression line of the rank-size distribution of the region, considering all but the largest city. If this indicator is above 1, the main city's population is above the value that would be expected according the rank-size

distribution of the FUA of the region. If the primacy rate is below 1, the main FUA is smaller than the expected value. This means that, while regions in which one big city dominates the city system tend to have high primacy rates, the opposite holds true for more polycentric regions.

In the Pyrenees CBA the resulting Primacy rate is 0.96, meaning that that the expected main FUA is smaller than the real primacy city, Barcelona. Still, it is a quite high value, considering that frequently the rank-size distributions tend to lack hierarchy at the upper end of the rank-size plot. In fact, this rate is the second highest recorded in all case studies under examination in this research and suggests a quite hierarchic urban structure.

Figure 3.3. Rank-size distribution of the FUA population within the Pyrenees CBA (year 2006)



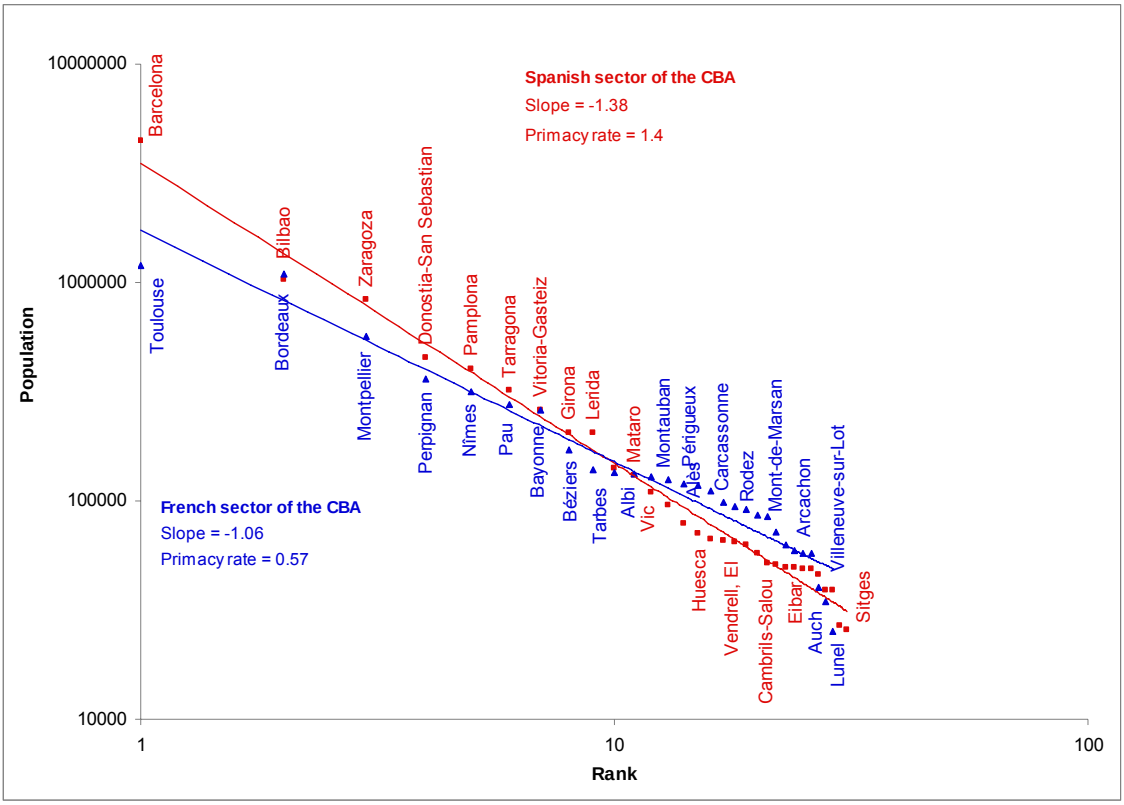
Source: Own elaboration based on ESPON FUA database.

Toulouse and Bordeaux, the two cities following Barcelona in the rank-size distribution, show meaningful negative deviations from the regression line. Both are significantly smaller than expected. On the contrary, the subsequent two cities, Bilbao and Zaragoza, show a positive deviation from the regression line. Morphologically speaking, this suggests a more polycentric urban structure on the French side of the border in relation to the Spanish one. This can be confirmed by the separated rank-size distributions of the FUAs on both sides of the border (Figure 3.4).

In general terms, the regression slope of the French sector of the CBA is smaller than the Spanish one, evidencing a more balanced distribution of the urban population across all the urban centres and thus a stronger polycentric structure of its urban network. Generally speaking, the Spanish cities found to the upper half of the rank-size distribution are bigger than the French ones. Not only Barcelona is much bigger than Toulouse, but also Zaragoza is meaningfully more populated than Montpelier (rank 3), San Sebastian is

bigger than Perpignan (rank 4), Pamplona than Nimes (rank 5) and so forth. The only exception to this general trend is Bilbao FUA, which is slightly smaller than Bordeaux one, on rank 2.

Figure 3.4. Rank-size distribution of the FUA population found on both sides of the Pyrenees (year 2006)



Source: Own elaboration based on ESPON FUA database.

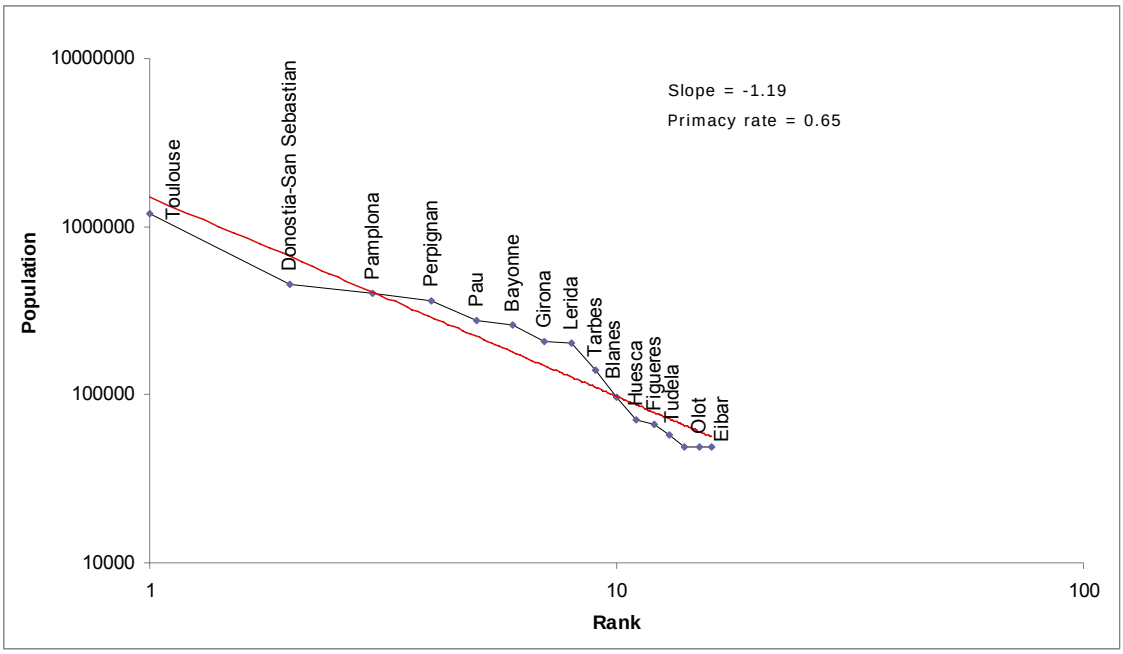
What is more important, the French FUAs to the lower end of the rank-size distribution are bigger than the Spanish ones, generating a more balanced distribution based on a stronger network of small and medium-sized cities (SMC). As it has been previously argued by previous ESPON 1.4.1 project (ESPON, 2006), a denser network of SMCs can contribute to the achievement of a more balanced territorial development and a higher level of territorial performance. If this assumption holds, the French sector of the CBA should be benefited by a richer network of SMCs and perform better than the Spanish side, particularly its rural area.

Figure 3.5 includes only those FUAs located in NUTS-3 regions located closest to the border. In this case the regression line of the rank-size distribution shows an interesting pattern: while the biggest[9] and the smallest urban centres are located under that line, medium-sized cities are in all cases located over it. The biggest cities, Toulouse, San Sebastian and Pamplona are also positioned under the regression line. Yet more remarkably, all the smallest cities in this area belong to the Spanish sector of the CBA. This means that within the restricted Pyrenean domain the Spanish sector shelters more small -sized cities, while on the French sector bigger FUAs are more frequent. From this two conclusions can be drawn. Firstly, in contrast with the overall trend observed in the CBA as a whole, the sheer Pyrenean domain seems to adopt a more polycentric urban structure on the Spanish sector than in the French one, relying on a well developed

[9] The primacy rate is 0.65, well under the expected value of 1.

network of medium and small -sized cities and towns. Secondly, the French area is allegedly more ruralised in this sector in comparison to the Spanish one, as no urban centre adds up enough population to be considered a FUA.

Figure 3.5. Zoom-up on the confining NUTS-3 regions: distribution of the FUA population (year 2006)



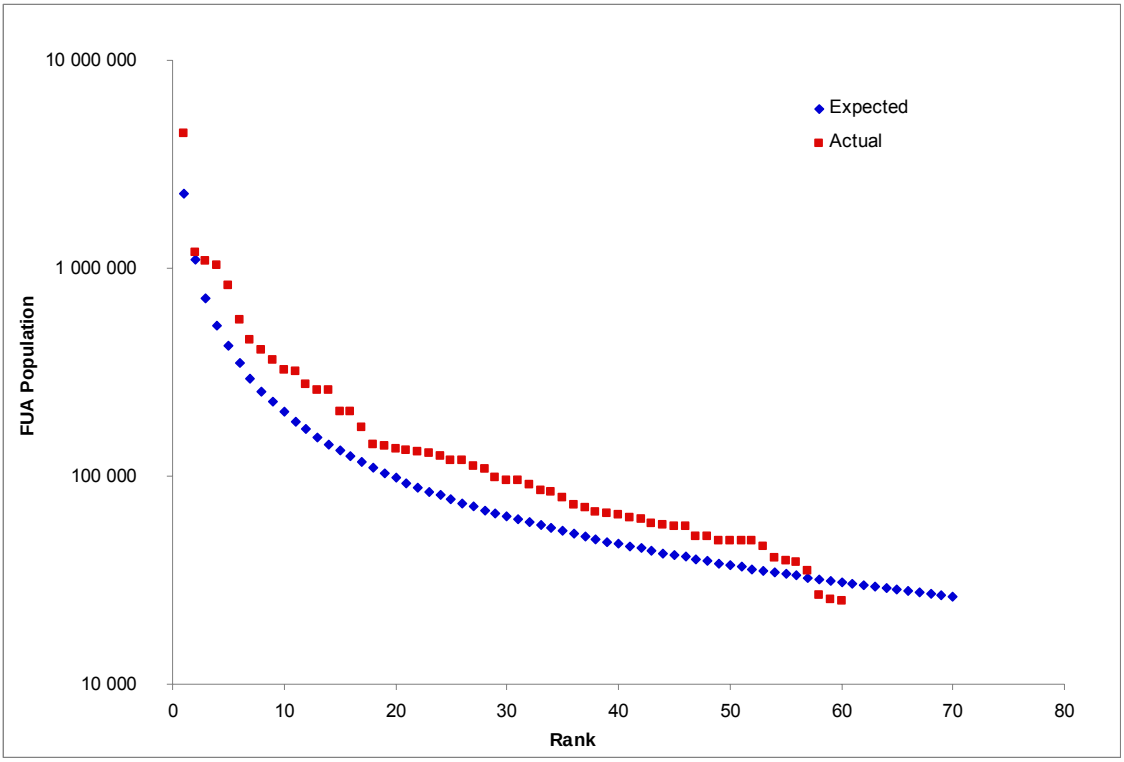
Source: Own elaboration based on ESPON FUA database.

An additional perspective is given by comparing the actual rank-size distribution of all FUAs with their expected distribution if the CBA would follow the rank-size distribution of the ESPON countries taken as a whole (Figure 3.6)[10]. Under this scenario, the expected population of the primacy city would be less half of Barcelona's actual size (2 291 519 instead of 4 435 116), while there would be 73 FUAs instead of 60. The first indicator may be interpreted as trace of a less hierarchic than expected urban network. This has actually been already detected in the previous analysis, given that Barcelona's primacy rate is too high by most standards, given that, as it has been said before, it is usually found a lack of hierarchy to the upper end of the rank-size distribution.

In contrast, the lower end of the expected rank-size distribution offers some important clues about how the urban network is structured within the CBA. In this regard, the comparison between the actual and expected values suggests a comparatively less developed city network in comparison with ESPON space as, according to its population, the CBA would be expected to house 73 FUAs over 20 000 instead of 60, which is the actual value. What's more relevant, the comparison suggests that the aforementioned lack of articulation of the urban network is concentrated to the lower end of the rank-size distribution, as some smaller than expected FUAs are found here, where two Spanish (FUAs Sant Pere de Ribes and Sitges) and one French (Lunel) FUAs are remarkably smaller than expected.

[10] Please refer to Section 2 of the Interim Report for a full explanation on the methodology followed to perform this analysis.

Figure 3.6. Expected and actual rank-size distribution of FUAs within the CBA (year 2006)



Source: Own elaboration based on ESPON FUA database.

Over the long run, this dislocation might bring about important consequences on the territorial performance of the area, particularly on the rural areas served by smaller FUAs, which are likely to remain ill-articulated by too week and dispersed urban centres. As emphasised by the Background Document for the Territorial Agenda of the European Union 2020 (EC, 2011b), in more sparsely populated regions such as the Pyrenees, the SMC are expected to "act as poles for development of rural areas and provide services of general interest", labelling SMC as "important nodes with diverse development potentials" (*Ibid*., p. 54).

Thus, SMC are called to play a crucial role in most ruralised areas, acting as links between local communities and the national hubs that give access to a globalised economy. In this regard, some of the expected consequences of such a lack of a balanced network of SMC within the CBA might be (i) a potential isolation and exclusion of the least accessible areas; (ii) a weaker economic performance in general; (iii) inability to unlock local economic potentials and thus to improve the development perspectives in the mean term, and ultimately; (iv) depopulation and social stagnation. Some of these issues will be further analysed in the following chapter, Accessibility and connectivity.

Rank-size distribution of FUA GDP

Another crucial perspective from which morphological polycentricity may be analysed is the economic weight of the urban centres. Similarly to population, a quite straightforward measure indicative of the distribution of economic roles of FUAs across any given area is the rank-size distribution of the sum of goods and services produced within every urban centre. Figure 3.7 shows this distribution for the entire CBA. As in the previous

examples, data for this representation have been obtained from the ESPON Functional Areas Database. According to the Technical Report of this project (ESPON 2011, p 11), the GDP indicator has been computed by using the NUTS-3 values[11] on which a population ratio between the NUTS-3 and the intersection of the FUA and the NUTS-3 was applied, considering that the LAU2 composition of the FUAs had been previously assessed, thus enabling a bi-directional link between the two. The downscaling of GDP from NUTS-3 to LAU2 was made assuming that the productivity is equal everywhere inside each NUTS-3, which as claimed by the report, "is not a bold assumption" (*Ibid* p 13). For the Pyrenees CBA, all GDP values for the entire FUAs were calculated, except for Eibar, Sant Pere de Ribes and Sitges, that were not included in the FUA database. Accordingly, these three FUAs have been excluded from the GDP rank-size distributions showed in this report.

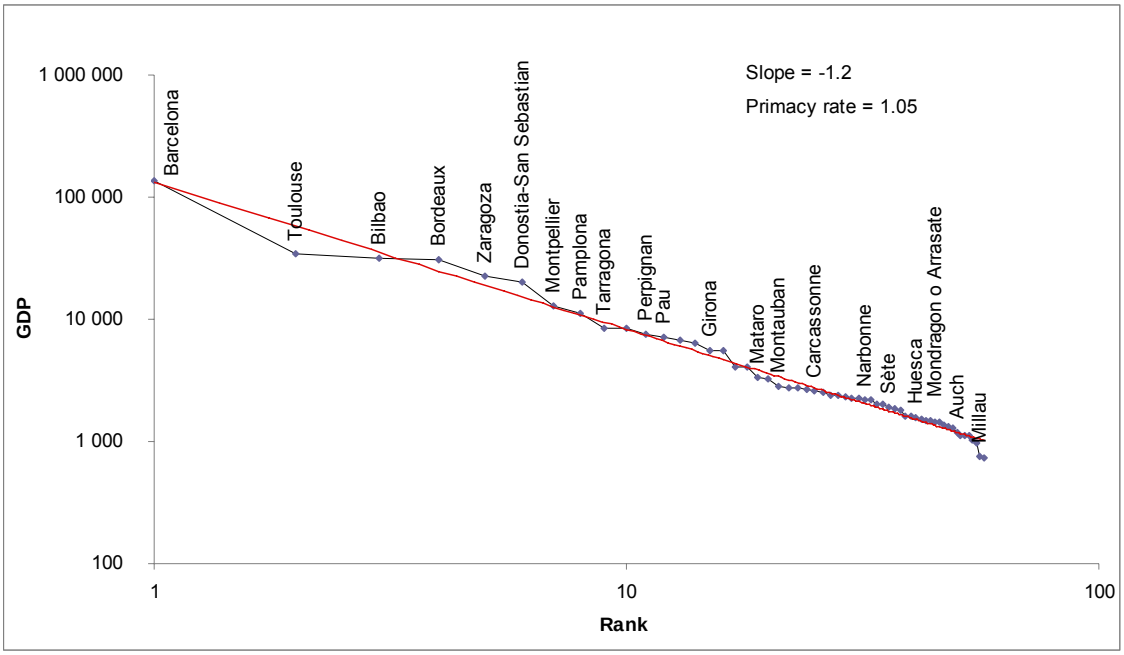
Figure 3.7 shows a rank-size distribution pattern quite similar to the population one. The slope for the GDP rank-size regression line is slightly bigger than the one obtained from the rank-size distribution of the population, suggesting a more concentrated distribution of the economic production and wealth in comparison to the population. The primacy rate, for instance, is slightly bigger than 1, meaning that Barcelona, as the biggest economic centre, has a GDP slightly bigger than expected according to the regression line.

To the upper end of the regression line another subject that deserves attention is the ranking alteration observed between positions 3 and 4. While for the population distribution Bordeaux holds position 3 and Bilbao stands on rank 4, both FUAs exchange their ranks. This means that Bilbao FUA holds more importance in economic than in population terms, in comparison with Bordeaux. The same can be said about Montpelier and San Sebastian on ranks 6 and 7. Also in this case the Spanish city seems to be dominant over the French one from the productive perspective, in contrast to the population ranking. The most outstanding example of this behaviour is Vitoria-Gasteiz, also in Spain, which hops from position 14 in terms of population to rank 10 in terms of GDP, indicating a much stronger role as economic centre than as urban agglomeration.

Generally speaking, to the upper end of the regression line it can be observed a comparatively more dominant role of the Spanish FUAs in comparison to the French ones, as also Tarragona, Mataro, Vic and Blanes rank higher in the GDP distribution than in the population graph. It goes without saying that the French FUAs follow an opposite trend. Cities like Montpellier, Perpignan, Nîmes, Tarbes, Albi, Périgueux and Agen rank lower in terms of GDP than of population. This fact can be interpreted in different ways and requires more specific analysis of the area before advancing a closed interpretation.

[11] The NUTS-3 GDP values were collected for year 2006 from Eurostat Regional Database, except for Switzerland and Norway GDP, whose data were missing for that year at NUTS-3 level and consequently 2005 values were picked in substitution.

Figure 3.7. Rank-size distribution of the FUA GDP within the Pyrenees CBA (year 2006)

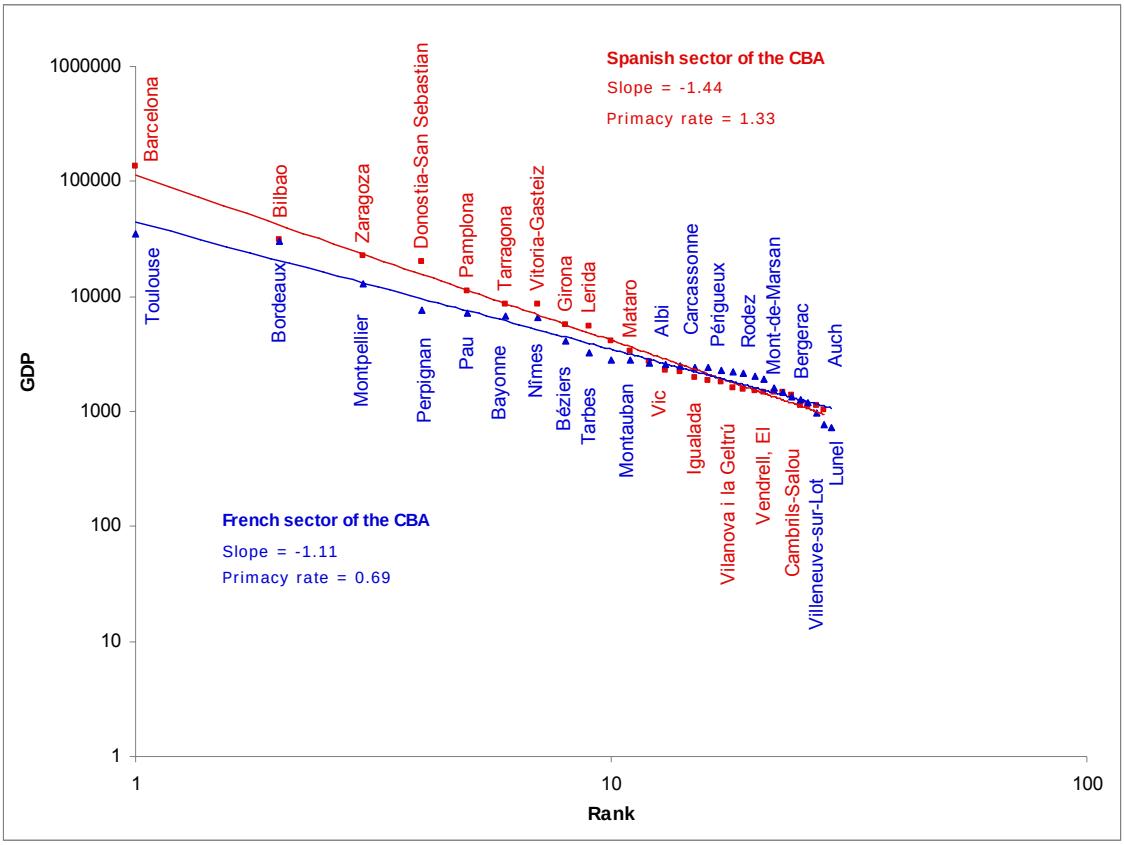


Source: Own elaboration based on ESPON FUA database.

Allegedly, the explanations for this asymmetric behaviour might be (i) a higher weight of the Spanish FUAs in absolute terms (ii) a more spatially dispersed pattern of production on the French sector of the CBA, considering also rural areas, or that (iii) the assumption that productivity is equal everywhere inside NUTS-3 areas made by the research team responsible for completing the ESPON FUA Database does not hold, especially in the French sector (note that the percentage of population residing in FUAs in year 2006 is 87.8% in the Spanish sector and only 77.0% in the French area). In this is the case, the GDP of French FUAs in this area would have been underestimated.

Similarly to the distribution of the population, the slope of the rank-size regression line of the GDP is smaller in the French sector than in the Spanish one. This suggests a more balanced distribution of economic activities and consequently a more polycentric structure of the economic centres over the area. What's more important and could partially explain the trend that has been described above, the smaller centres tend to be positioned to the upper side of the regression line on the French sector, in contrast to the medium and bigger ones that are frequently positioned under the line. This could be interpreted as a sign of a territorially more distributed production scheme that might support the assertion that the French sector of the CBA holds a more polycentric urban system also from the economic perspective.

Figure 3.8. Rank-size distribution of the FUA GDP on both versants of the Pyrenees (year 2006)

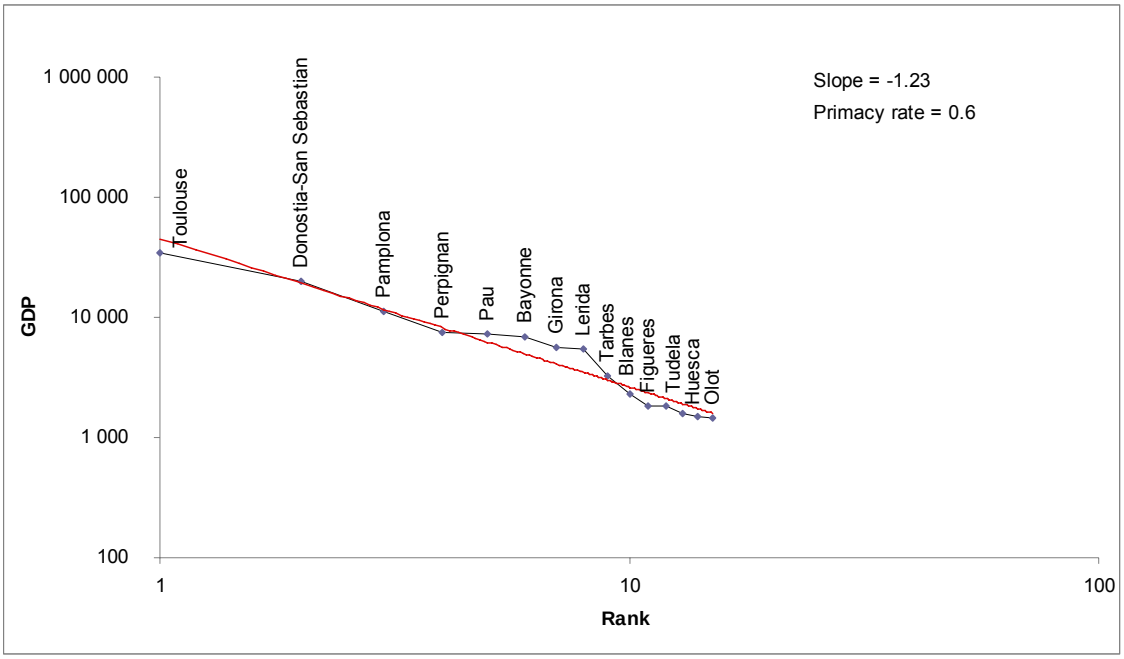


Source: Own elaboration based on ESPON FUA database.

Focusing only on the confining NUTS-3 regions, the analysis of the rank-size distribution shows an intermediate slope in comparison to the French and Spanish subsectors taken in isolation (Figure 3.9). Remarkably, all cities align quite well over the regression line, with the exception of some medium-sized FUAs found to both sides of the boundary, such as Pau, Bayonne, Lerida, or Tarbes. In contrast, the smallest cities are usually located under the regression line, like Blanes, Figueres, Tudela, Huesca, Mondragon, Olot, or Eibar. What's more important, all of them are Spanish cities, as in the general population plot, given that no FUA under 100 000 inhabitants is found on the French subsector of the confining NUTS-3 regions.

Also from the economic perspective the former figures seem to point towards a denser and more structured network of medium and small -sized towns in Spanish Pyrenean subsector in comparison to the French one. This might be interpreted as an enhanced opportunity to support the development of the most remote areas to the Southern side of the Pyrenees, allowing them to develop a higher level of interaction with urban nodes. As far as the French confining NUTS-3 regions are concerned, these features pose a challenge on those areas in regard to rural development, particularly within mountainous areas, as there seem to be a lack of enough medium and small -sized centres serving the most remote areas, thus increasing isolation and maximising the weakness of rural economies on remote rural areas.

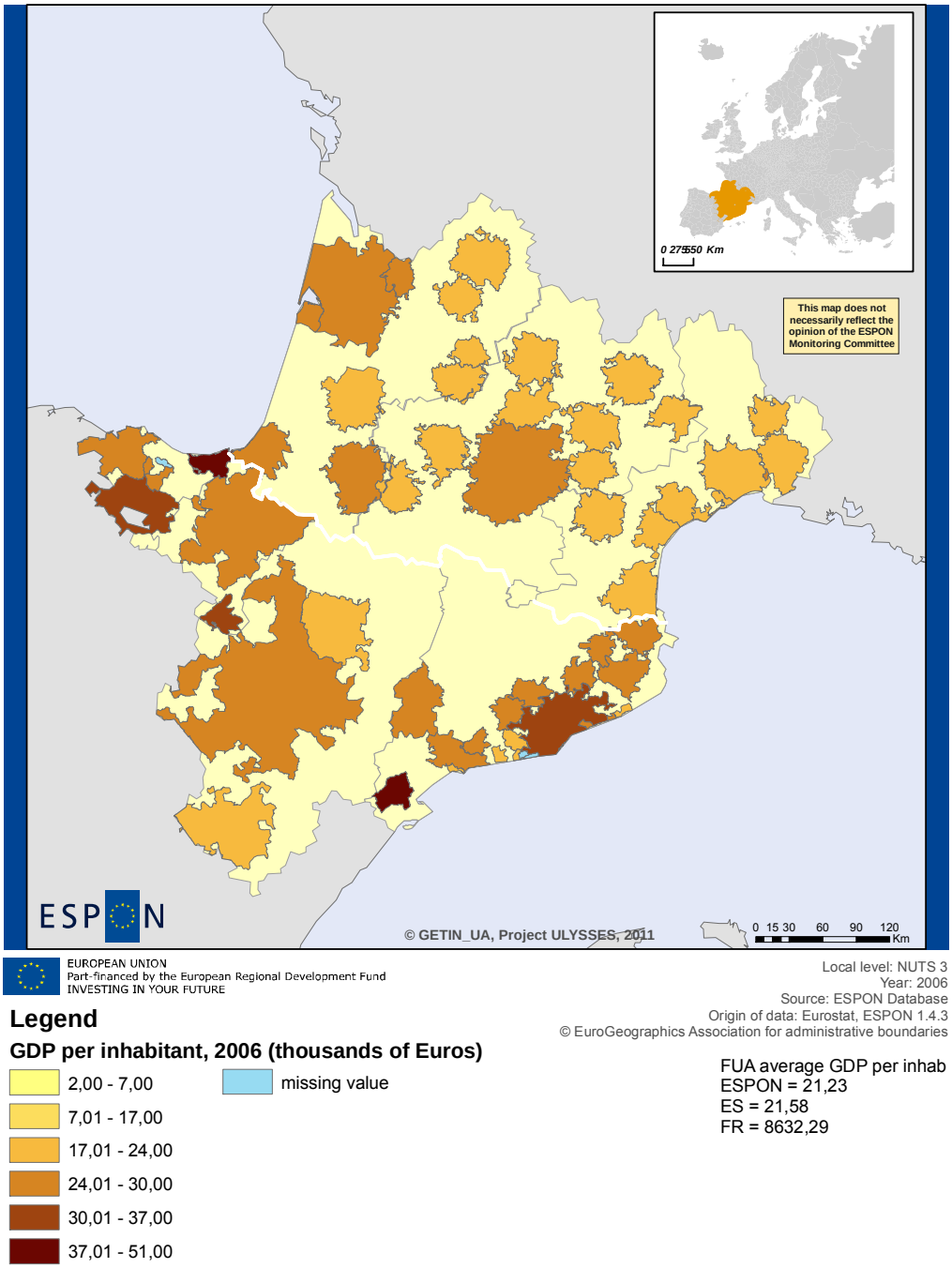
Figure 3.9. Zoom-up on the confining NUTS-3 regions: distribution of the FUAs' GDP (year 2006)



Source: Own elaboration based on ESPON FUA database.

In contrast to the dynamics observed within the CBA taken as a whole, in the Pyrenean domain the ranking position of main FUAs do not change between population and GDP plots in most cases. Only smaller FUAs in Spain such as Huesca, Figueres and Tudela are ranked differently on both distributions. While Huesca holds position 11 in terms of population, it falls to position 13 in terms of GDP. Figueres outstrips both Huesca and Tudela, while the latter does also better than Huesca in terms of GDP. This can be entirely linked to the higher productivity of the NUTS-3 regions where those FUAs belong (Navarre in the case of Tudela and Girona in Figueres' case), what it is easily perceived observing the distribution of the GDP per capita shown in Map 3.4.

Map 3.4. FUA GDP per inhabitant

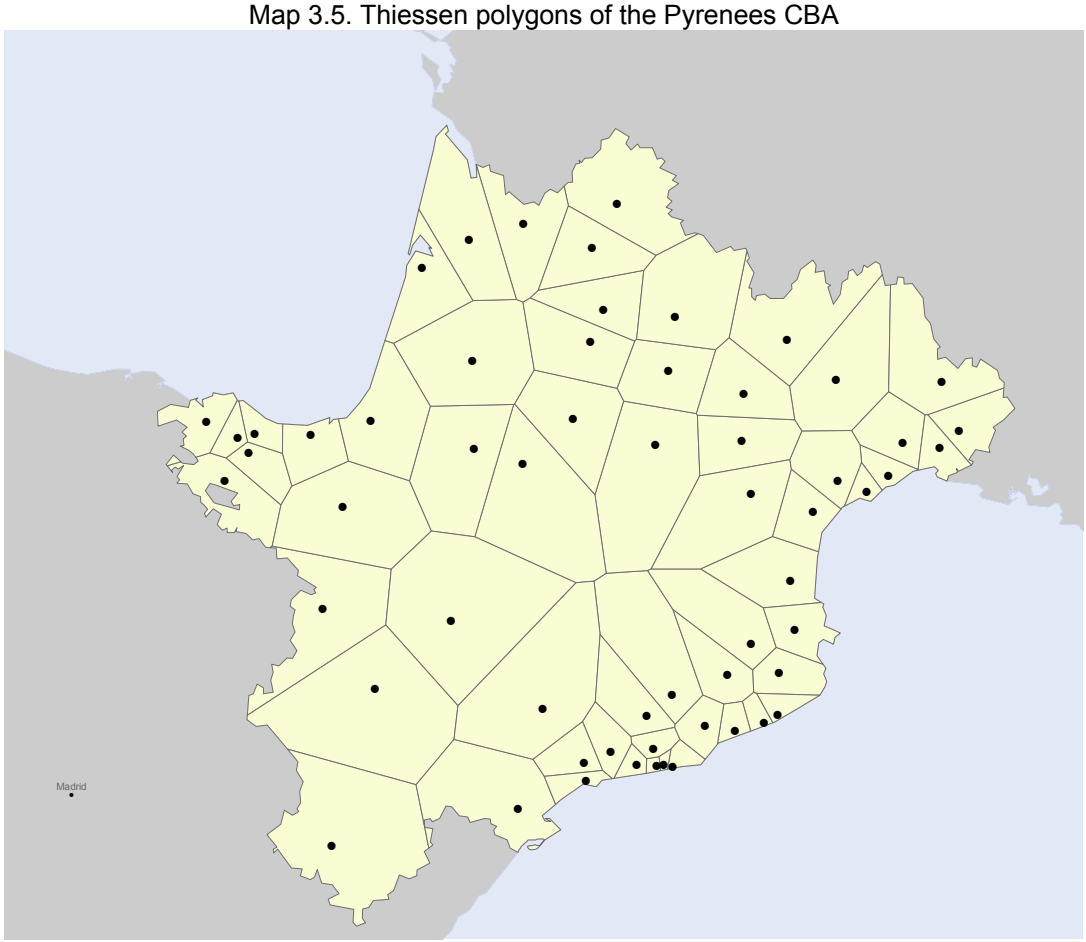


Location index

The Gini coefficient of the FUA Thiessen polygons is a measure of how the FUA are spaced throughout the region: number closer to 100% mean greater inequalities in the FUA distribution while lower percentages means the FUA are more evenly spaced. For this indicator, the polygons where produced so that the limits of the polygons are established exactly midways between two FUA.

As stated by the ESPON's 1.4.3 Final Report (ESPON 2007, p 230) this measure implicitly evaluates the overall distribution of the population, and it assigns the same weight to all the different FUA and does not reflect the actual influence of a city. It should therefore be essentially understood as a way to evaluate whether the minimum amount of services that an urban agglomeration can provide is accessible throughout the region.

Map 3.5. Thiessen polygons of the Pyrenees CBA



Map 3.5 shows the Thiessen polygons generated for the Pyrenees CBA. The map clearly illustrates how the Mediterranean corridor and the Basque region have a denser network of FUAs than the remaining areas, and that accordingly their average service areas are smaller than those on the remaining CBA. The map also suggests a more skewed distribution of the service areas among Spanish FUAs, in contrast to the French sector, where the differences in size between service areas are smaller. The above implies a more balanced distribution of urban centres over the French territory in comparison with Spain.

All these impressions may be corroborated by Table 3.3, showing a comparison between the Gini coefficients of the Thiessen polygons associated with all FUAs within the CBA and the involved countries.

Table 3.3. Gini coefficients of the Thiessen polygons associated with the FUAs

	CBA	ES	FR
Gini coefficient thiessen polygons (%)	34.1	53.91	29.40

Source: Own elaboration based on ESPON FUA database.

3.3.2. Functional polycentricity

As it has been said before, functional polycentricity refers to the relational links established between cities, i.e. the networks of flows and cooperation. Consequently, this type of analysis requires some sort of multi-dimensional indicators that are largely absent from official databases by suppliers such as Eurostat and the national agencies of the member states. Essentially, the kind of data needed to perform an in-depth analysis of this kind are expected to cover at least the flows of population, goods, services and information between the different FUAs. Unfortunately, in the best possible scenario some extrapolation techniques have to be put in place, as usually the raw data needed for compiling the expected indicators do not cover the area at the required detail (LAU2 in most cases). In the worst case, however, some of the relevant dimensions of functional polycentricity are not included at all in the official databases, forcing to use the alternative or indirect indicators.

For instance, ESPON 1.4.3 manage to analyse 5 key functions for which the research team managed to obtain sufficient data. These were (i) the administrative functions, consisting of the national functions (capital city, chief towns, etc) and the international functions (cities hosting headquarters of important European and international institutions); (ii) the decision functions, consisting of the localisation of the headquarters and their subsidiaries of national and international important companies; (iii) the transport functions that measure the connectivity of a city with the others, consisting of the road and rail connectivity as well as the air traffic and the sea transport; (iv) the knowledge functions, consisting of the localisation of the most important universities, research centres and high-technology production, and; (iii) the tourism functions.

ESPON Functional Areas Database project (ESPON 2011) adopted a more straightforward approach. This project developed a proxy of the actual functional specialisation of the FUA by extrapolating the values of the NUTS-3 regions to the FUA located totally or partially within them. These indicators, which were produced in collaboration with Metroborder, another ESPON project, are (i) the unemployment rates, which traces the nature of the labour market and indirectly the degree of dynamism of local economies within each FUA; (ii) the GDP per capita, which informs about the level of wealth enjoyed within FUAs, and; (iii) the value added by NACE[12], which allowed for a functional analysis of the urban network relaying on actual classifications of economic activities.

[12] NACE, in French *Nomenclature statistique des activités économiques dans la Communauté européenne* is a Classification of Economic Activities in the European Community. Allegedly, this ESPON project has used the NACE 1.1 revision.

As far as the Working Community of the Pyrenees is concerned, the results of the analysis can be seen on Table 3.4.

Table 3.4. Selected indicators on functional polycentricity (year 2006)

FUA	Gross Value Added						GDP by Inhabinant	Unemployment rate 2006
	Agriculture, forestry and fishing (AB)	Mining, manufacturing and energy (CDE)	Construction (F)	Trade, tansport and accomodation (GHI)	Finance and business services (J-K)	Other services (L-P)		
Barcelona	0.6	24.6	9.1	24.8	23.8	17	31	6.7
Toulouse	0.8	15.6	7	17.8	34.1	24.8	29	8.8
Bordeaux	4.2	11.7	6.6	18.7	31.8	27.1	28	8.4
Bilbao	0.8	25.2	11.3	23.4	20.2	19.2	30	7.9
Zaragoza	2.8	24.8	10.9	22.5	18.8	20.2	27	5.8
Montpellier	2.2	6.4	5.5	17.3	35.9	32.7	23	11.9
Donostia-San Sebastian	1.2	33	8.7	21.8	16.3	18.9	44	5.5
Pamplona	2.8	29	11.4	20.2	16.3	20.4	28	5.3
Perpignan	3.5	8.2	7.1	19.1	33.4	28.7	21	11
Tarragona	2.3	20	15	25.5	21.1	16.1	26	6.3
Nîmes	2.9	13.3	9.4	22.1	29	23.3	20	11.9
Pau	2.5	15.4	7.4	19.2	29.8	25.7	26	6.8
Bayonne	3.1	15.3	7.4	19.1	29.2	25.9	26	6.9
Vitoria-Gasteiz	2	36.3	8.2	15.6	17	20.9	32	6.7
Girona	2.8	15.1	15.3	30.9	19.5	16.5	27	6.6
Lerida	8.9	14.5	11.7	31.4	15.4	18.1	27	6.3
Béziers	2.2	6.4	5.5	17.3	35.9	32.7	24	11.9
Manresa	0.6	24.6	9.1	24.8	23.8	17	29	6.7
Tarbes	2.2	11.9	6.9	20.4	25.7	33	23	8.7
Albi	3.5	14.5	8.1	16.6	27.7	29.6	21	9.5
Montauban	5.4	12.9	8.3	19.3	24.8	29.3	21	9.4
Mataro	0.6	24.6	9.1	24.8	23.8	17	26	6.7
Périgueux	4.9	13.3	9.6	18.5	23.9	29.9	19	7.8
Alès	2.9	13.3	9.4	22.1	29	23.3	21	11.9
Carcassonne	5	9.3	7.8	21.9	25.7	30.3	22	10.3
Agen	4.9	13	7.6	21.9	24.6	27.9	20	8.3
Narbonne	5	9.3	7.8	21.9	25.7	30.3	20	10.3
Vic	0.6	24.6	9.1	24.8	23.8	17	25	6.7
Rodez	5.4	16.1	9.3	19.2	25.7	24.4	23	5.3
Blanes	2.8	15.1	15.3	30.9	19.5	16.5	24	6.6
Castres	3.5	14.5	8.1	16.6	27.7	29.6	21	9.5
Mont-de-Marsan	7.5	14.5	8.1	18.4	24	27.5	24	7.3
Libourne	4.2	11.7	6.6	18.7	31.8	27.1	28	8.4
Sète	2.2	6.4	5.5	17.3	35.9	32.7	23	11.9
Igualada	0.6	24.6	9.1	24.8	23.8	17	25	6.7
Bergerac	4.9	13.3	9.6	18.5	23.9	29.9	20	7.8
Huesca	12	17.2	13.3	20.4	15.7	21.5	22	5.5
Figueres	2.8	15.1	15.3	30.9	19.5	16.5	28	6.6
Vilanova i la Geltrú	0.6	24.6	9.1	24.8	23.8	17	24	6.7
Vendrell, El	2.3	20	15	25.5	21.1	16.1	23	6.3
Arcachon	4.2	11.7	6.6	18.7	31.8	27.1	26	8.4

Vilafranca del Penedès	0.6	24.6	9.1	24.8	23.8	17	24	6.7
Cahors	5.3	15	8.3	18.2	25.5	27.7	22	7.5
Auch	12.1	9.4	8.9	19.7	21.1	28.8	21	5.8
Villeneuve-sur-Lot	4.9	13	7.6	21.9	24.6	27.9	22	8.3
Tudela	2.8	29	11.4	20.2	16.3	20.4	32	5.3
Cambrils-Salou	2.3	20	15	25.5	21.1	16.1	22	6.3
Tortosa	2.3	20	15	25.5	21.1	16.1	44	6.3
Mondragon o Arrasate	1.2	33	8.7	21.8	16.3	18.9	30	5.5
Olot	2.8	15.1	15.3	30.9	19.5	16.5	29	6.6
Eibar	n/d	n/d	n/d	n/d	n/d	n/d	0	n/d
Teruel	4.5	25.9	16.3	20.1	12.1	21.1	23	3.6
Pineda de Mar	0.6	24.6	9.1	24.8	23.8	17	30	6.7
Agde	2.2	6.4	5.5	17.3	35.9	32.7	24	11.9
Durango	0.8	25.2	11.3	23.4	20.2	19.2	26	7.9
Valls	2.3	20	15	25.5	21.1	16.1	29	6.3
Millau	5.4	16.1	9.3	19.2	25.7	24.4	22	5.3
Sant Pere de Ribes	n/d	n/d	n/d	n/d	n/d	n/d	0	n/d
Sitges	n/d	n/d	n/d	n/d	n/d	n/d	0	n/d
Lunel	2.2	6.4	5.5	17.3	35.9	32.7	29	11.9

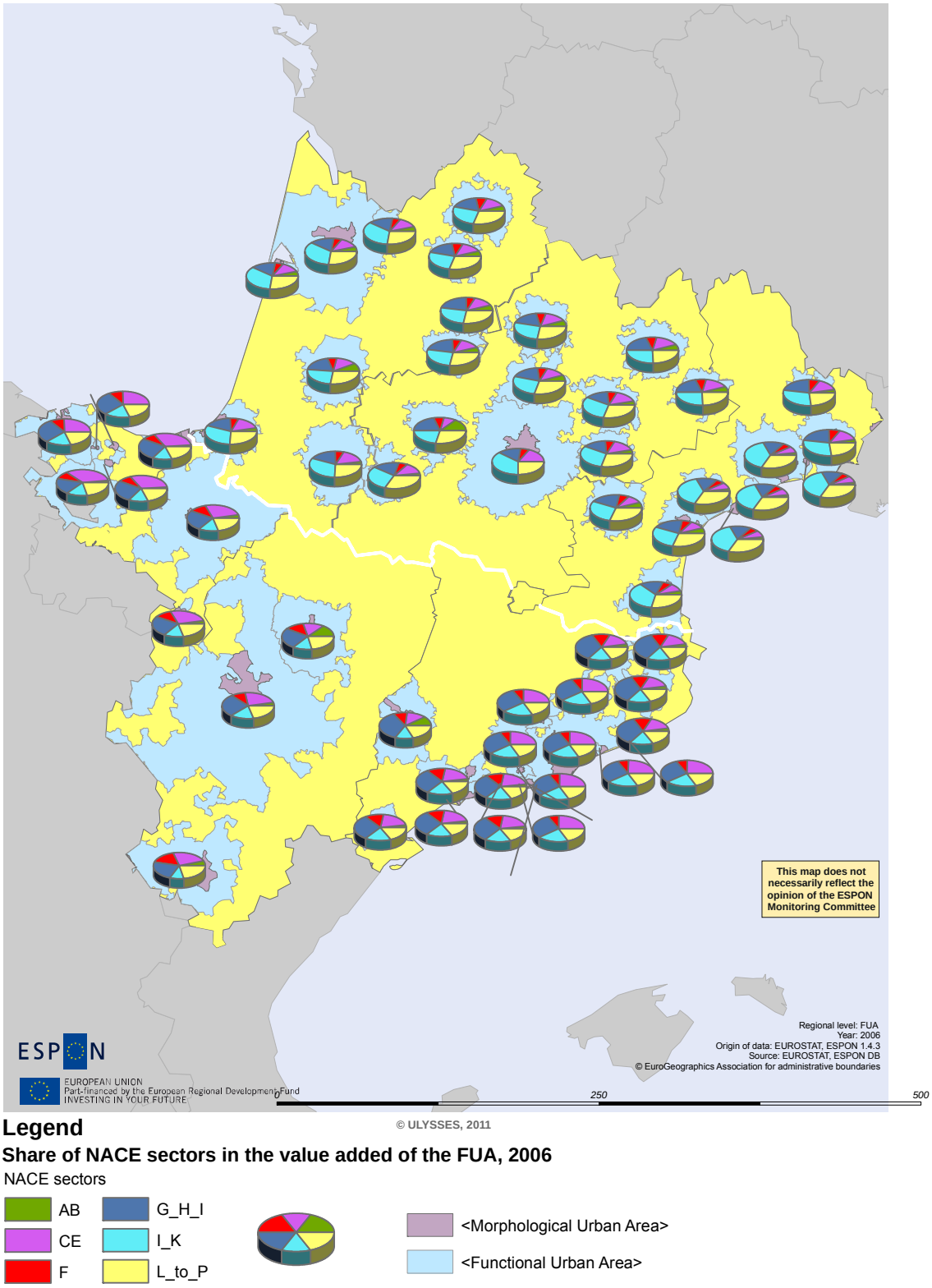
Source: Own elaboration based on ESPON FUA database.

Distribution of gross value added by NACE activities

Taking the agriculture, forestry and fishing sectors as a starting point for the analysis, it can be concluded that French FUAs tend to be more specialised in this type of activities, as only three Spanish centres (Huesca and Lerida, ranked 2nd and 3rd, and Teruel, ranked 15th) are included among the first 28th FUA listed by share of gross value added (GVA) from that sector. While the French FUA of Auch leads the classification with more than 12% of the GDP shared by primary activities, no Spanish FUA, apart from the ones mentioned above, have more than 3% of their respective GDP derived from agriculture, forestry and fishing activities. The biggest FUA found by its ranking in this list would be Bordeaux, a big FUA including a very productive farming system, which has more than a 4.2% of its GVA generated by these activities.

With regard to the mining, manufacturing and energy sectors, a first analysis of the data unveils and opposite trend. In this case, the Spanish centres are characterised by higher weights of these sectors in comparison with French FUAs, as a result of the first 23 cities by share of GVA belonging to the Southern sector of the CBA. Values range from over 30% of the GVA in some Basque FUAs, such as Vitoria-Gasteiz, Donostia-San Sebastian and Mondragon, to Huesca's 17.2%. The first French city ranked by share of GVA is Rodez, with 16.1% of its GVA generated by these activities. The biggest FUA ranked in this classification is Bilbao, whose GVA derived from manufacturing sector accounts for 25.2%.

Map 3.6. Share of NACE in the value added of FUA



Indeed, the construction sector prevails among Spanish cities. The first 17 FUAs ranked by their contribution to this sector belong to the Spanish subset of the CBA. Again, Bilbao is the biggest city listed in the first positions of this classification, computing more than 11% of its GVA generated by the building and construction sector. The first French FUA ranked here is Périgueux, shared by a 9.6% of its GVA. Together

with Périgueux, another group of French centres distributed along the axis Rhone-Lot-Dordogne generate more than 9% of their respective GVA from the building and construction sectors. These FUAs are Bergerac, Nîmes, Alès, Rodez and Millau. Following, on some Spanish cities over the Catalonian coastline (Barcelona and some confining FUAs) this sector plays a major role, with more than 9% of the GVA. All the FUAs with less than 8% of the GVA derived from this sector belong to the French side of the CBA.

Trade and transport seem to be a group of activities on which Spanish FUAs within the CBA are also more specialised than French ones. The first 21 centres ranked in this category fall to the Spanish side of the CBA. Particularly small and medium Catalonian FUAs are highly specialised on these two activities. Tarragona, El Vendrell, Cambrils-Salou, Tortosa and Valls have more than 25% of their respective GVA participated by trade and transport, while Lerida, Girona, Blanes, Figueres, Olot obtain more than 30% of the GVA from to these activities. French FUAs generally occupy lower positions in this ranking, while among the biggest centres is Barcelona the one holding the highest position, with 24.8% of its GVA derived from trade and transport. The French FUAs ranked higher in this category are those located close to the Mediterranean coastline (Nîmes, Alès, Carcassonne, Narbonne). The interpretation of these figures is very difficult in absence of further information. However, it seems obvious that the more touristic is the economic orientation of the FUA, as it occurs for example along Catalonian coastline, the more weight these activities have on their GVA. Other factors linked to logistic factors such as maritime ports and nodal communication services seem to have minor impact.

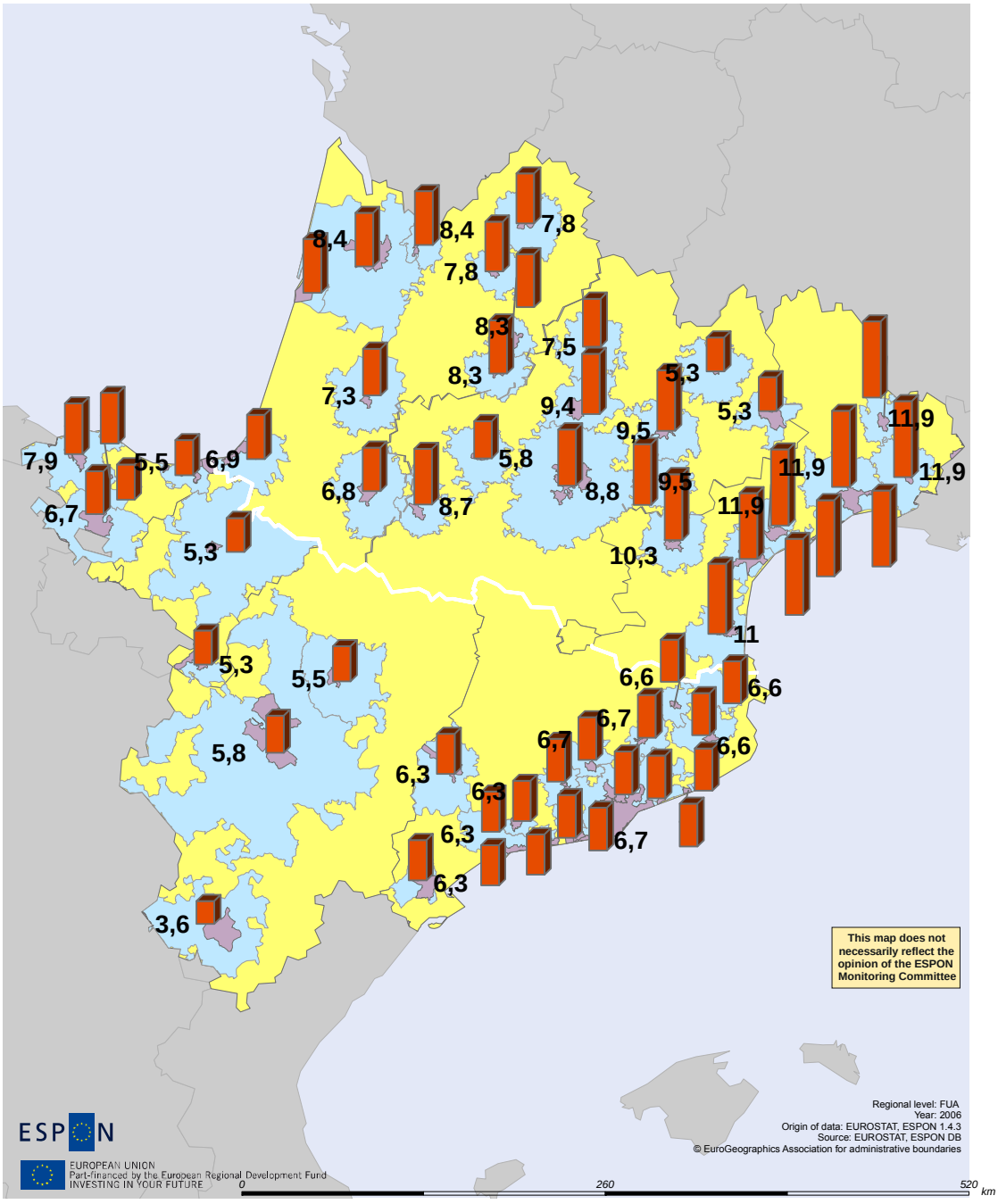
As far as information, communication, finance and business services are concerned, French FUAs occupy the leading positions in the ranking. In fact, with the exception of Auch, all the French centres are ranked higher than the Spanish FUAs. Many French centres more than double that of Spanish in terms of GVA related to those sectors. The same can be said about other services (NACE classes L to P), for which all French FUAs within the CBA are ranked higher than Spanish centres.

From the polycentric perspective, the analysis of these figures must be done with care, given that, as it has been said before, the data used to build the indicators has been extrapolated from NUTS-3 level to FUA2 level, thus assuming that economic activities distribute homogenously over the territory, which is far from being a bold assumption. However, in general terms it can be said that the figures commented above suggest a more service-oriented economy in the French FUAs of the CBA, in contrast to the Spanish centres, whose economies seem to be more oriented towards secondary activities, particularly to building and construction sectors. In any case, spatial outliers can also be found in certain FUAs showing values not aligned with the regional specialisation.

The same care must be put while handing the unemployment data for all FUAs. This indicator has also been developed downscaling Eurostat data from NUTS-3 level to LAU2 units and back upwards to the FUA level following unspecific methods. The results of this exercise show an unemployment rate ranging from 11.9% in Montpellier to 3.6% in Teruel. As for the rest of the economic indicators, the effects of the financial blow of

2008 and the economic crisis that followed could not be captured by this indicator, given that the data refer to year 2006, well before those events took place.

Map 3.7. Unemployment in the FUA (year 2006)



Legend

Share of the active population unemployed by FUA, 2006 (obtained from the intersecting NUTS)

<Morphological Urban Area>

<Functional Urban Area>

FUA average unemployment
ESPON = 8,47
FR = 8,89
ES = 9,59

In any case, as it can be easily perceived looking at Map 3.7, the higher unemployment rates recorded at that stage concentrated on French FUAs, particularly along the Mediterranean coastline: together with Montpellier, also Béziers, Sète, Agde, Lunel, Nîmes, Alès and Perpignan suffered unemployment rates over 11% of the economically active population. Generally speaking, the Spanish cities within the CBA showed smaller unemployment rates, given that 28 out of the 29 FUAs ranked better in terms of employment belonged to the Spanish sector. Two exceptions were found among Spanish FUAs, namely Bilbao and Durango that at that time held higher unemployment rates than the average Spanish sector (both cities had a 7.9% of unemployment rate, while the average rate on the Spanish sector of the CBA was 6.3%). The centres of Rodez and Millau can be considered as being two significant outliers on the French sector, as both cities showed a comparatively small unemployment rate of 5.3%, in contrast with the 9% held in average by the French sector.

3.4. Chapter conclusions

As general conclusion for this chapter, it can be said that:

1. As it can be seen on Table 3.5, the distribution of the main indicators among the different areas under analysis shows meaningful differences, indicating a clear variance of the territorial patterns at the different scales.
2. The distribution of the urban population in the area is centrifugal in respect to the Pyrenees mountain range. Three corridors may be individuated: The Garonne-Adour corridor, the Ebro corridor and the Mediterranean corridor.
3. The lack of urban nodes in the inner parts of the Pyrenean domain poses additional challenges to rural development on this sector, which will allegedly have to face additional problems derived from its isolation and lack of connectivity to global networks.
4. The urban network of the CBA seems altogether hierarchical due to the weight of Barcelona metropolitan area. If this city is excluded from the analysis, a more polycentric picture emerges.
5. Taken as a whole, the urban system on the French side of the CBA is more polycentric than the Spanish one, as a more balanced distribution of the urban population can be observed in this area, essentially due to the absence of a clearly dominant FUA such as Barcelona, which is 4 times bigger than the second ranked city.
6. Focusing only on the confining NUTS3 regions, the Spanish sector seems to rely on a denser network of medium and small -sized towns and cities that makes this area more polycentric than the French sector, which is characterised by a much more ruralised territory, given that it almost entirely lacks of FUAs between 20 000 and 50 000 inhabitants.
7. These same patterns can be found also on the distribution of the GDP per capita over the FUAs that reinforces the primacy of Barcelona and the general hierarchic nature of the urban system.

8. Comparing the population and the GDP distribution of the FUAs, it emerges that some big Spanish FUA outstrip French centres in the GDP rank-size distribution.

9. The Thiessen polygons generated for the CBA suggest a more balanced distribution of the service areas among French FUAs, where they have comparable sizes. The Mediterranean corridor has a denser network of FUAs than the remaining areas, and thus its average service areas are smaller.

10. Due to data shortages, not much can be said about functional polycentrism. According to the structural economic indicators available, it can be said that in general terms French FUAs have a more service-oriented economy, while the Spanish FUAs seem to rely more on manufacturing and construction sectors. It would be interesting to deepen this analysis under the new economic situation.

Table 3.5. Summary table of some of the features of the FUAs found on the CBA

	CBA	ES	CBA (ES)	FR	CBA (FR)	Zoom-up Pyrenees	ESPON
Number FUA (2006)	60	186	31	168	29	16	1552
% population in FUA (2006)	81.1	83.7	87.8	77.0	72.4	76.1	74.8
% effective FUA pop change 01-06	9.5	10.2	9.3	5.2	9.8	10.7	3.0
Population of biggest FUA (2006)	4 435 116	178 500	4 435 116	520 533	1 188 281	1 188 281	12 972 492
Population of smallest FUA (2006)	25 201	310	25 642	565	25 201	49 094	3 216
Average FUA population (2006)	261 262.8	193 848.1	308 705.0	288 096.5	210 548.7	246 069.5	244 014.9
Median FUA pupulation (2006)	95 240.5	63 509.0	67 244.0	128 911.0	118 500.0	171 599.0	94 903.5
Compactness 2001 (MUApop/FUA pop)	68.0	80.0	76.4	61.0	54.7	60.3	64.9
Slope rank size distribution population (2006)	-1.16	-1.11	-1.38	-0.96	-1.06	-1.19	0.00
Primacy rate population (2006)	0.96	0.63	1.40	1.64	0.57	0.65	0.14
Slope rank size distribution GDP (2006)	-1.20	-1.20	-1.44	-1.03	-1.11	-1.23	-1.36
Primacy rate GDP (2006)	1.05	0.60	1.40	2.34	0.69	0.60	0.05
Gini coefficient thiessen polygons (%)	34.1	53.91	-	29.40	-	-	-

Source: Own elaboration based on ESPON FUA database.

Chapter 4 – Urban-rural relationships

4.1. Concept and definition

In the framework of ESPON project 1.1.2 - Urban-rural relations in Europe, urban-rural relationships are understood in terms of the comparative evolution of the both, thus as urban opposed to rural in the sense that the former compromises the very existence of the latter, or at least severely modifies its nature.

As ESPON 1.1.2 mentions in its final report, “the easily comprehensible traditional picture of town and countryside was blurred already by the emerging industrialisation and it was further reinforced by de-regulated property markets, improved communications and lately by the advanced information technology. A clear-cut visual divide is simply gone, being replaced by rurbanisation, a process where the physical environment loses qualities that were traditionally associated with urban or rural settings.” From this perspective, urbanisation “can be comprehended as demographic change, as structural changes in the economy and as ideas, images and behaviour of people” (ESPON, 2003 p 12).

Hence, urban-rural relations are mostly looked at from a dialectical and conceptual dimension, rather than from a systemic point of view. Given its applied nature, Ulysses project fully uptakes this approach and will try to apply the main finding and methods of ESPON 1.1.2 to achieve a complete characterisation of the rural areas (as opposed to the urban ones) found within the CBA.

4.2. Data and methods

The indicators used in this chapter are listed on the following table.

Table 4.1. List of indicators

Variable name	Geographical scale	Source	Time frame
Change urban fabric	NUTS 3	Corine Land Cover	2000-2006
Agricultural areas	NUTS 3	ESPON DB	1990; 2000; 2006
Urban-rural typology	NUTS 3	ESPON DB/ Eurostat	
Urbanization of natural areas	NUTS 3	Corine Land Cover	2000-2006
Gross value added in forestry and fishing	NUTS 3	Eurostat	1997-2008
Employment in forestry and fishing	NUTS 3	Eurostat, Russian Federal State Statistics Service	1997-2008

As evidenced by Table 4.1, which includes all the information related to this topic that the TPG of this project succeeded to found, there is no data available on Eurostat or ESPON to actually evaluate the interaction (meaning flows of people and goods as well as other types of interactions) between rural and urban areas.

Regarding the structural indicators, and although it is possible to obtain land cover data on a very large geographical scale from the CORINE Land Cover (CLC)[13], indicators such as employment and economical patterns are only available at a NUTS 3 level. Also the typologies established by the ESPON and Eurostat are only available at a broad scale, limiting the ability to link the indicators with rural or urban areas at any significant dimension. A valuable insight into the nature of this problem will be provided by the on-going ESPON's EU-LUPA project, which aims to supply regionalised information integrating the physical dimension (land cover) with socio-economic (land use) and environmental dimensions, in order to understand land use dynamics, land use changes and current land use patterns in the European territory.

Besides the ESPON typology of urban and rural regions, data for land types have been included as well. Some of these data are available from the ESPON DB, although there are some inconsistencies between this database and the data derived from the CLC country files. In this regard, as data related to agricultural areas vary only with an acceptable margin of error, we have focused on the land use changes recorded by the CLC survey from 2000 to 2006, which has been processed for all the relevant NUTS 3 and ESPON countries

4.3. Urban-rural Typology

Regional typologies basing on a set of indicators have been one of the most used tools across ESPON projects. In ESPON 1.1.2, the urban-rural typology was built basing on three indicators, namely land cover, population density and status of the leading urban centre of each NUTS3 area (i.e. the presence of a MEGA). Depending on how those indicators combine in any given area, NUTS3 were classified into the groups shown in table 4.2.

Being useful for illustrative purposes, this typology could not be used for overlapping with other variables in Ulysses project, as this classification has not been updated for more recent NUTS changes. On the contrary, the Eurostat urban rural typology has addressed this issue on a new typology based on a variation of the OECD methodology, established in three steps:

"It creates clusters of urban grid cells with a minimum population density of 300 inhabitants per km2 and a minimum population of 5 000. All the cells outside these urban clusters are considered as rural.

It groups NUTS 3 regions of less than 500 km2 with one or more of its neighbors solely for classification purposes, i.e. all the NUTS 3 regions in a grouping are classified in the same way.

It classifies NUTS 3 regions based on the share of population in rural grid cells. More than 50 % of the total population in rural grid cells = predominantly rural, between 20 % and 50 % in rural grid cells = intermediate (6) and less than 20 % = predominantly urban" (Eurostat 2010, p 249).

[13] CORINE Land Cover (CLC) is a geographic land cover/land use database encompassing most of the countries of the European Union and the majority of the Central and East European countries and parts of the Maghreb.

Further, some regions that are predominantly rural are considered intermediate in the presence of a city with more than 200 000 inhabitants and intermediate regions with cities of over 500 000 inhabitants are considered as urban.

Table 4.2. ESPON 1.1.2 urban-rural typologies

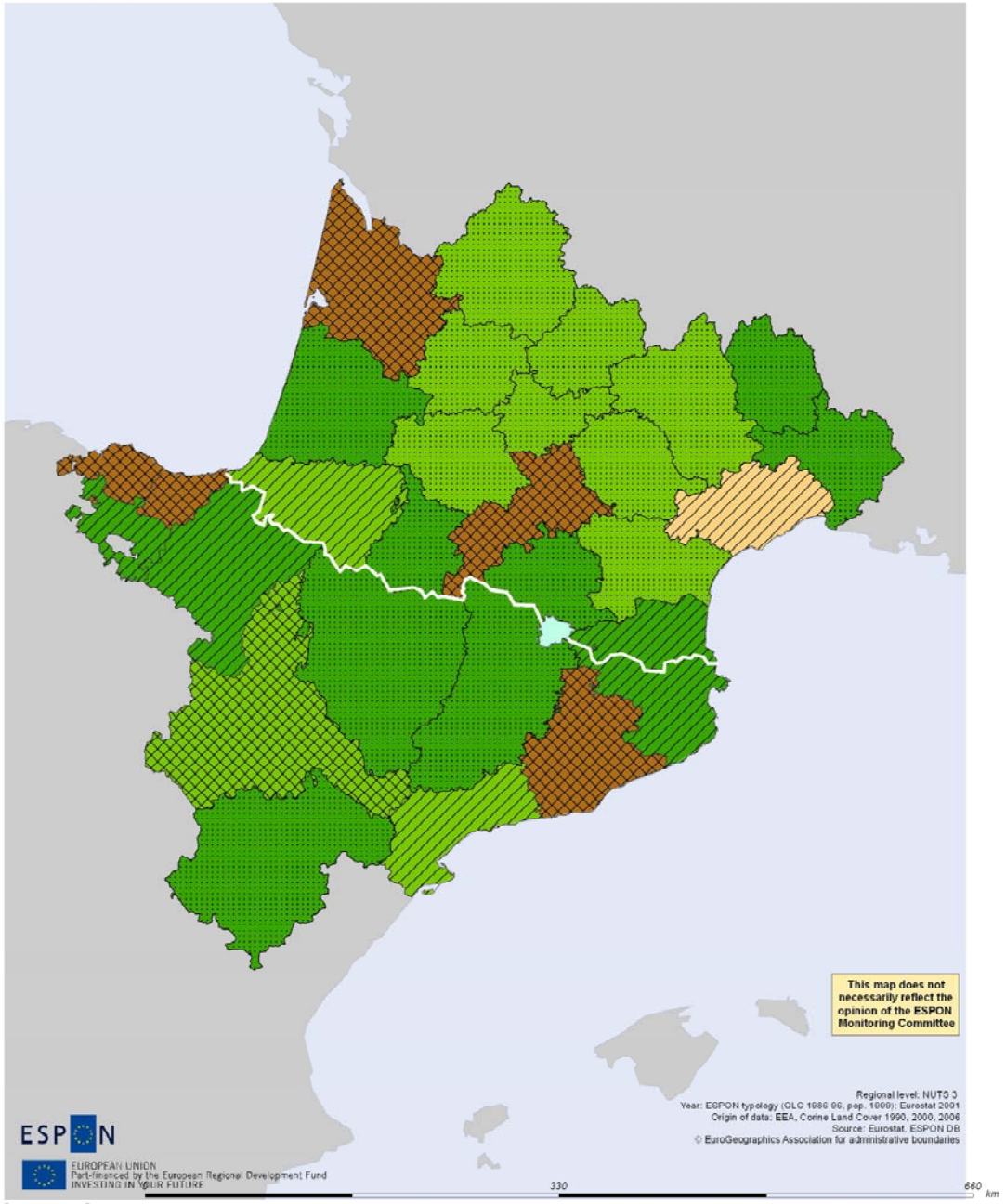
Dimensions	Variables	Thresholds	Typologies
Degree of urban influence	Population density and status of the leading city	Population density > 107 persons / sqkm (European average) and/or the areas where the leading urban centre of the NUTS3 area has been labelled "Metropolitan European Growth Area (MEGA)".	High urban influence
		All remaining NUTS3 areas	Low urban influence
Degree of human intervention	Main land cover classes of the CORINE data set: artificial surfaces, agricultural areas, and residual land cover	The share of artificial surfaces is above 3.48% (European average)	High human intervention
		The share of agricultural land is above European average (50.36%)	Medium human intervention
		Only the share of residual land cover is above European average (46.16%), while the other two are below average	Low human intervention

Source: ESPON 1.1.2 - Urban-rural relations in Europe

Map 4.1 shows a combination of ESPON and Eurostat typologies within the CBA. This map illustrates how both typologies are almost coincident as far as Eurostat's predominantly urban regions are concerned. In this case, all NUTS3 regions represented with the exception of Zaragoza, namely Vizcaya, Guipuzcoa and Barcelona, in Spain, and Gironde and Haute-Garonne in France, are classified by ESPON 1.1.2 as having high urban influence and high human intervention. This urban nature is derived from either having a dense network of urban nodes, like in Guipuzcoa and Vizcaya, or from having a big city included in it, like Haute-Garonne, or from a combination of the two, like Barcelona and Gironde. However, in some regions internal differences are relevant, especially in the Haute-Garonne, where strong contrasts between the more rural Pyrenean domain and the Toulouse agglomeration are in force. Also the province of Zaragoza, which has been classified as predominantly urban by Eurostat and as showing low urban influence and medium human intervention by ESPON 1.1.2 is a good example of an area where strong internal contrasts between a dominating agglomeration and a predominantly rural hinterland do exist.

Even more complex and difficult to interpret situations can be verified when looking at those regions classified by Eurostat either as intermediate or predominantly rural. Among the former, some fall under ESPON's 1.1.2 low human intervention and low urban influence category (Lozère, Gard, Landes, Hautes-Pyrénées and Ariège, in France, and Huesca, Lérida and Teruel, in Spain), whilst others are classified by ESPON 1.1.2 as having low urban influence and medium human intervention (Dordogne, Lot, Aveyron, Lot-et-Garonne, Tarn-et-Garonne, Tarn, Gers and Aude, all of them in France).

Map 4.1. Urban-rural typologies according to ESPON 1.1.2 and Eurostat



Eurostat intermediate regions present an even wider range of alternatives in terms of ESPON 1.1.2 typologies: one region is classified as having high urban influence and low human intervention (Hérault), two as having low urban influence and medium human intervention (Pyrénées-Atlantiques, in France, and Tarragona, in Spain), and the remaining two as having low urban influence and low human intervention (Pyrénées-Orientales, in France, and Gerona, in Spain).

Remarkably, if one looks exclusively at the confining NUTS3 regions of the CBA, only Guipúzcoa, located at the most western end of the tri-national boundary, and Haute-Garonne, on its centre, are classified as predominantly urban by Eurostat. Also ESPON considers both regions as zones under high human influence and high human intervention. Within all the remaining cases, four of them are classified as intermediate regions by Eurostat, of which three (Pyrénées-Orientales, Navarra and Gerona) under low urban influence and low human intervention, and only one under low urban influence and medium human intervention (Pyrénées-Atlantiques). The four remaining regions (Hautes-Pyrénées and Ariège in France, and Huesca and Lerida in Spain) are rural regions under low urban influence and low human intervention.

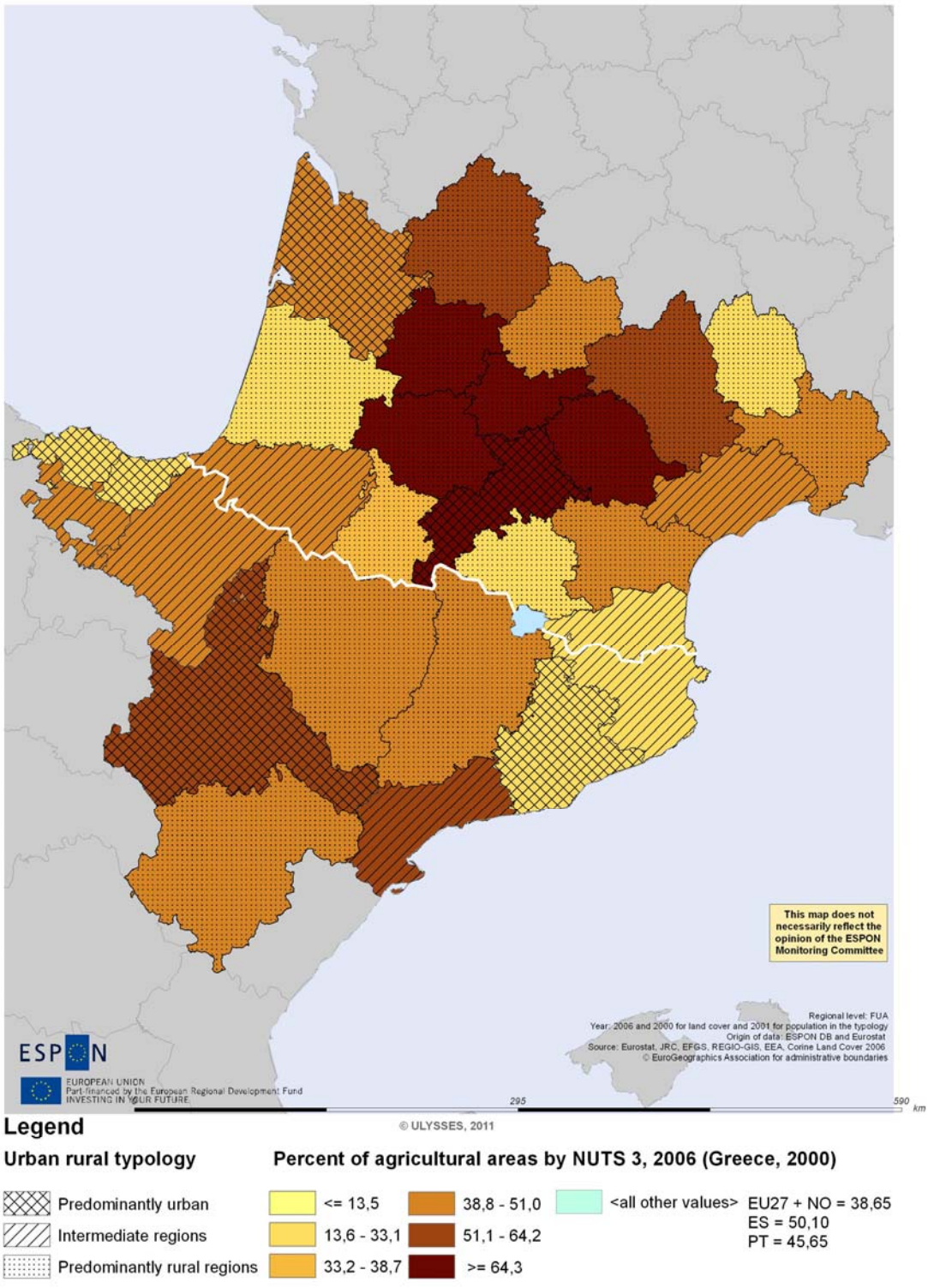
This pattern confirms the symmetrical distribution of the urban phenomena to both ends of the mountain range that was referred on the previous chapter. Taking the axis Toulouse-Zaragoza as a reference line, while the inner regions of the Pyrenees remain quite unaltered and offer important potentials in terms of natural and unaltered rural landscape assets, the areas falling to the two extremes of the axis and thus closer to the sea are much more urbanised. The exception to this general rule is the French Department of Haute-Garonne, where the weight of the city of Toulouse conditions the classification of the entire NUTS3 to which this city belongs, hiding important internal differences between the lower Garonne valley where Toulouse stands and the mountainous area found to its southern sector.

4.4. Land use data

Land cover and land use data offer some indirect insights on the comparative evolution on the urban and rural phenomena over the space. In combination to other demographic and economic data, these indicators inform for example about the degree of sprawl of the urbanization model in a given territory and thus the degree to which any area is loosing agricultural fields and potentially valuable rural landscapes. As far as the agricultural dimension is concerned, land cover data may also inform about the productivity of any agricultural model and it can also provide important clues about how the different types of agricultural systems perform in the different regions.

According to Map 4.2, the most agriculture oriented NUTS3 regions within the CBA from the land cover perspective are the French Departments of Tarn-et-Garonne, Lot-et-Garonne and Haute-Garonne, with more than 70% of their total area occupied by this type of land cover, and especially the Department of Gers, with almost 90% of its entire extension devoted to agricultural production. All these areas share the common feature of being crossed by the Garonne river, and thus of having rich soils and good general conditions for different types of agricultural productions. Among these, only the Haute-Garonne Department belongs to the Pyrenean domain, and is also the only one classified by Eurostat differently to predominantly rural, due to the impact that Toulouse metropolitan area has on its territorial setting.

Map 4.2. Share of agricultural areas by NUTS3 (year 2006)14



Following, some other French and Spanish "riverside" NUTS3 regions hold more than 50% of their territories occupied by agricultural fields. These are Tarn (Tarn), Zaragoza (Ebro), Aveyron (Aveyron), Dordogne

[14] This map refers to following CLC classes: Arable land, permanent crops, pastures and heterogeneous agricultural areas (CLC classes 211 to 244).

(Dordogne), Tarragona (Ebro) and Pyrénées-Atlantiques (Adour). Of those, only the latter belong to the Pyrenean domain, concretely to its most western end, where the mean altitude and the average slope are more moderate than in the central regions.

Those regions characterised by a mixed land cover composition (from 20 to 40 per cent of the total area occupied by agricultural fields) tend to be classified by Eurostat as predominantly rural regions (Lot, Aude, Lleida, Huesca and Teruel on the one hand, with more than 30% of the total surface covered by agricultural areas, and Gard, Hautes-Pyrénées, Ariège and Landes, on the other hand, with less than 30% of the total area occupied by this type of land cover). Among the remaining regions with 20 to 40 per cent of the area occupied by agricultural fields, two share a clear influence of a big metropolitan area, like the Department of Gironde and the Province of Barcelona, both with less than 30% of their overall extension occupied by agricultural land cover, and the remaining three regions, with more than 30% of the surface devoted to agriculture, namely Navarra, Hérault and Álava are zones with an medium –sized city structuring a weaker urban network of medium and small sized towns.

Those areas under 10% of the surface occupied by agricultural land cover are located to the most western and eastern extremes of the mountainous range, but while on the Catalonian area both French (Pyrénées-Orientales) and Spanish (Girona) versants share the same characteristics, to the west end of the Pyrenees the Spanish provinces of Vizcaya and Guipúzcoa are much less adequate for agricultural production than the Pyrénées-Atlantiques.

From the urban-rural perspective, the dynamic dimension of the changes that are being registered is even more important than the static distribution of land cover classes between the different uses. In this regard, Table 4.3 shows the evolution of the agricultural areas classified under category 2 of the CLC over 16 years, from 1990 to 2006. The table shows how, despite the net loss of this type of land cover experienced at the national level in both Spain and France, those countries still have a much bigger proportion of their total areas occupied by agricultural fields (more than 50% in both cases) in relation to the European average (38.65%). Oddly, at the European level the trend has been the opposite during those years, with an annual growth rate of this type of land cover of more than 6.44 per 10 000.

Table 4.3. Agricultural areas (class 2 of Corine Land Cover)

NUTS name	Agricultural areas (ha)						
	Total 1990	Total 2000	Total 2006	Share of total area 06 (%)	Net formation of land cover 90-06	Net formation of land cover by total area 90-06 (per 10000)	Annual growth rate 90-06 (per 10000)
EU27 + CH + NO	182685050	205227723	184577384	38.65	1892334	39.621	6.44
Spain	25396779	25428657	25349184	50.10	-47595	-9.41	-1.17
France	33006580	32903514	32826621	51.42	-179959	-28.19	-3.42
Andorra	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Álava	124258	123593	122022	40.21	-2236	-73.68	-11.34
Guipúzcoa	48541	47973	47378	23.94	-1163	-58.76	-15.15
Vizcaya	56926	56091	55439	251	-1487	-67.10	-16.53
Navarra	490825	484067	481097	46.30	-9728	-93.63	-12.50
Huesca	662640	661824	661136	42.29	-1504	-9.62	-1.42
Teruel	598729	598420	595408	40.19	-3321	-22.42	-3.48
Zaragoza	1082070	1079490	1073600	62.14	-8470	-492	-4.91
Barcelona	249705	244263	239590	30.99	-10115	-130.82	-25.81
Girona	173105	172180	170400	28.83	-2705	-45.76	-9.84
Lleida	527119	525752	524597	43.12	-2522	-20.73	-30
Tarragona	336072	333194	330803	52.46	-5269	-83.55	-9.87
Dordogne	487056	486663	486702	52.75	-354	-3.84	-0.45
Gironde	399448	398407	395065	38.90	-4383	-43.16	-6.89
Landes	271941	275567	281152	306	9211	98.47	20.84
Lot-et-Garonne	405222	403811	401975	74.64	-3247	-60.29	-53
Pyrénées-Atlantiques	391069	390003	390083	50.74	-986	-12.83	-1.58
Ariège	154080	153553	154117	31.39	37	0.75	0.15
Aveyron	512991	512628	523616	59.67	10625	1218	12.82
Haute-Garonne	455147	450773	446530	70.21	-8617	-135.49	-11.94
Gers	566133	565506	565237	89.75	-896	-14.23	-0.99
Lot	252552	251513	254900	48.78	2348	44.94	5.79
Hautes-Pyrénées	163766	163179	162976	365	-790	-17.47	-32
Tarn	387267	386477	387212	66.98	-55	-0.95	-09
Tarn-et-Garonne	298539	297814	295538	79.16	-3001	-80.38	-6.31
Aude	306373	305733	302374	47.68	-3999	-636	-8.21
Gard	233689	233188	229722	39.13	-3967	-67.57	-10.70
Hérault	254316	251489	251471	40.31	-2845	-45.61	-73
Lozère	121218	124453	129784	258	8566	165.52	42.77
Pyrénées-Orientales	118526	116962	113493	27.39	-5033	-121.46	-278

Source: ESPON DB

The trend described above for the national level is confirmed also at the regional scale. At this level only some French Departments, namely Lozère (42.77 per 10 000), Landes (20.84 per 10 000) and Aveyron (5.79 per 10 000) show annual increase rates of the agricultural surfaces meaningfully above zero. All the remaining regions either show almost null change rates, like Ariège (0.15 per 10 000), or held a declining trend in agricultural land cover. The most negative rates are shown by the most urbanised regions in Spanish and French sectors of the Working Community of the Pyrenees, especially in Gard, Álava, Haute-Garonne, Navarra, Guipúzcoa, Vizcaya, Barcelona and Pyrénées-Orientales. From 1996 to 2006, all these regions have shifted agricultural fields to other uses at annual rates higher than 10 per 10 000. Not only, but also Lot-et-Garonne, Tarn-et-Garonne, Gironde, Hérault, Aude, Girona and Tarragona lost agricultural lands at an annual rate higher than 5%, while the remaining regions, namely Tarn, Dordogne, Gers, Huesca, Pyrénées-Atlantiques, Lleida, Hautes-Pyrénées, Teruel and Zaragoza, lost agricultural area at smaller rates.

Table 4.4 and Map 4.3 offer more insights on the actual transfers between urban and agricultural land cover classes occurred from 2000 to 2006. All in all, the regions that transferred more agricultural areas to urban fabric are some French departments found along the French Mediterranean coast like Gard, Hérault and Pyrénées-Orientales, and the urbanised Haute-Garonne, where the net formation of land cover by total area exceeded 15 per 10000. The reasons for this behaviour are complex enough and require further analyses for a better understanding of the main drivers that determine those changes. Allegedly, a combination of a

decreased competitiveness of agrarian activities in relation to urban economies, especially of those regions less productive like the Mediterranean and the mountainous areas, and the proliferation of holyday homes in vast areas along the Mediterranean and Atlantic coastline are to blame for these land cover changes.

Table 4.4. Urban fabric (classes 111 and 112 of Corine Land Cover[15])

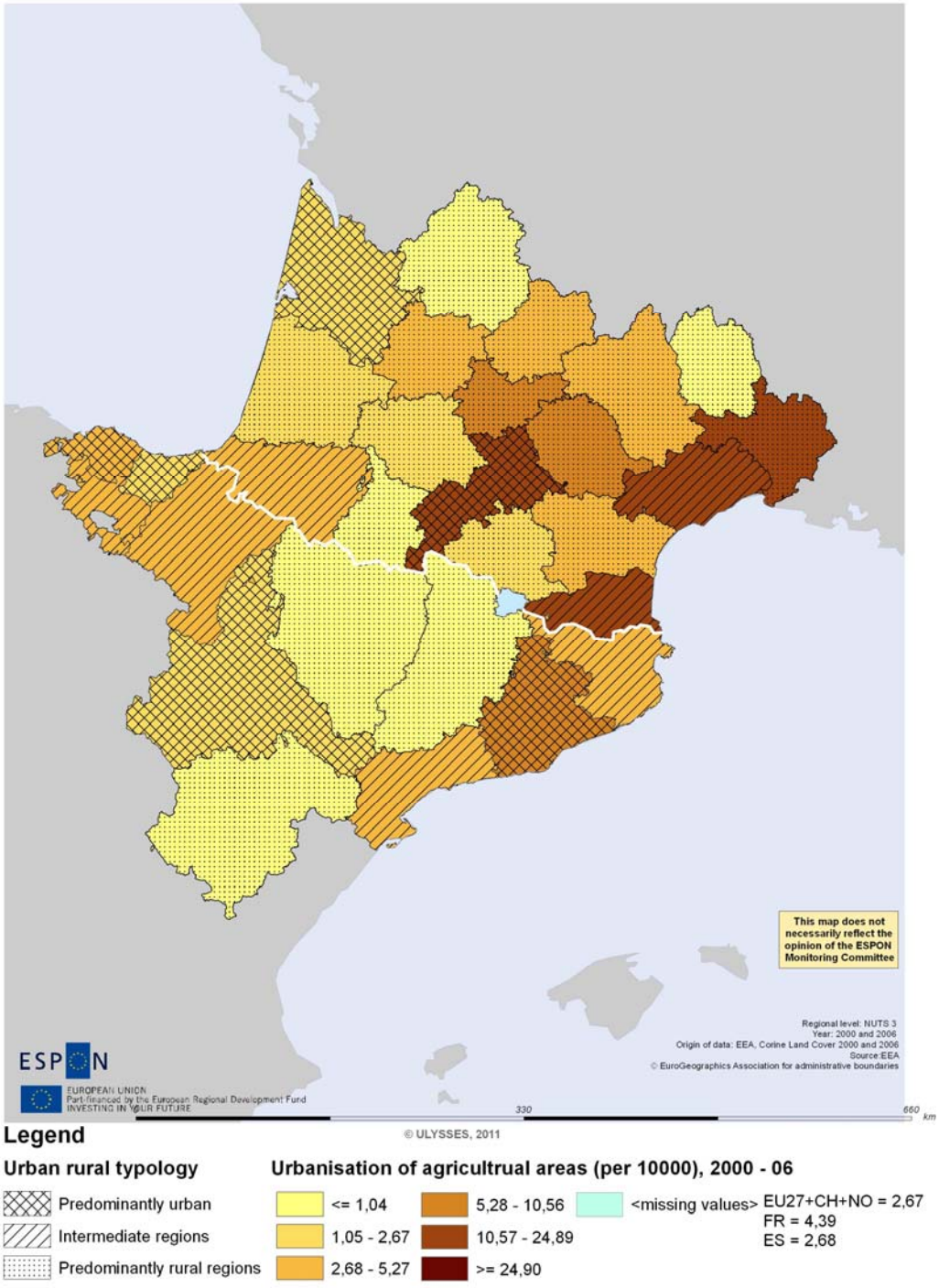
	Urban fabric (ha) (2000-2006)							
	Formation new land cover	**Consumption of land cover**	**Net formation of land cover**	**Net formation of land cover by total area (per 10000)**	**Urbanisation of agricultural areas (00-06)**	**Urbanisation of agricultural areas by total area (per 10000)**	**Urbanisation of natural and semi-natural areas**	**Urbanisation of natural and semi-natural areas by total area(per 10000)**
EU27 + CH + NO	191290.05	1447.96	189842.09	3.97	127745.51	2.67	16003.73	0.34
Spain	31541.51	263.21	31278.30	6.18	13556.91	2.68	3429.76	0.68
France	33364.83	83.54	33281.29	5.21	28045.26	4.39	2308.05	0.36
Andorra	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Álava	228.77	0.00	228.77	7.54	112.63	3.71	0.00	0.00
Guipúzcoa	32.27	4.36	27.91	1.41	32.27	1.63	0.00	0.00
Vizcaya	163.43	0.00	163.43	7.37	67.84	3.06	11.52	0.52
Navarra	948.62	0.00	948.62	9.13	410.48	3.95	28.33	0.27
Huesca	222.16	0.00	222.16	1.42	133.94	0.86	23.79	0.15
Teruel	78.04	0.00	78.04	0.53	71.91	0.49	6.13	0.04
Zaragoza	505.75	0.00	505.75	2.93	301.26	1.74	60.41	0.35
Barcelona	763.22	17.89	745.33	9.64	493.64	6.38	63.21	0.82
Girona	304.93	0.00	304.93	5.16	226.58	3.83	33.69	0.57
Lleida	95.91	20.11	75.79	0.62	55.24	0.45	0.00	0.00
Tarragona	451.59	0.00	451.59	7.16	308.91	4.90	39.68	0.63
Dordogne	87.11	0.00	87.11	0.94	87.11	0.94	0.00	0.00
Gironde	649.27	0.00	649.27	6.39	176.77	1.74	244.21	2.40
Landes	646.10	9.19	636.92	6.81	196.37	2.10	370.48	3.96
Lot-et-Garonne	245.07	0.00	245.07	4.55	229.83	4.27	6.44	0.12
Pyrénées-Atlantiques	369.26	0.00	369.26	4.80	308.07	4.01	50.29	0.65
Ariège	87.73	0.00	87.73	1.79	87.73	1.79	0.00	0.00
Aveyron	359.69	0.00	359.69	4.10	317.45	3.62	24.82	0.28
Haute-Garonne	1579.00	0.00	1579.00	24.83	1252.82	19.70	14.88	0.23
Gers	117.32	0.00	117.32	1.86	102.51	1.63	14.81	0.24
Lot	187.34	0.00	187.34	3.59	168.54	3.23	18.80	0.36
Hautes-Pyrénées	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tarn	383.75	0.00	383.75	6.64	378.36	6.55	5.39	0.09
Tarn-et-Garonne	293.66	0.00	293.66	7.87	242.28	6.49	13.47	0.36
Aude	644.13	0.00	644.13	10.16	334.01	5.27	104.49	1.65
Gard	1241.13	0.00	1241.13	21.14	908.73	15.48	195.35	3.33
Hérault	1295.29	0.00	1295.29	20.77	819.05	13.13	90.44	1.45
Lozère	36.48	0.00	36.48	0.70	13.72	0.27	22.76	0.44
Pyrénées-Orientales	666.43	0.00	666.43	16.08	533.81	12.88	6.20	0.15

Source: ESPON DB

Following, some landlocked French Departments with high proportions of agricultural lands, like Tarn, Tarn-et-Garonne and Lot-et-Garonne have gained more than 4 per 10000 of the total area of urban fabric to the detriment of the agricultural lands.

[15] These classes include continuous urban fabric and discontinuous urban fabric, respectively.

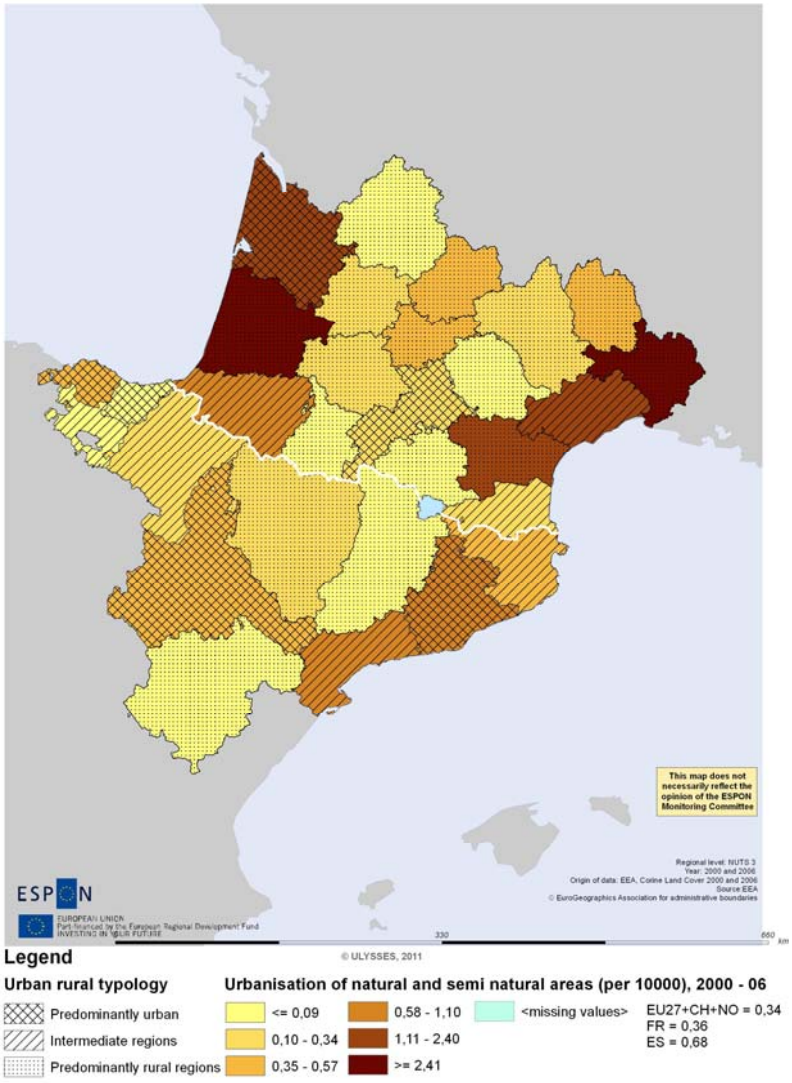
Map 4.3. Urbanisation of agricultural areas



This category should include as well some other Mediterranean regions like Barcelona, Aude or Tarragona and, more importantly, also the French Department of the Pyrénées-Atlantiques, where similar dynamics as the ones found on the Mediterranean coastline related to the proliferation of holyday homes, which is one of the possible drivers of this phenomenon, are found as well. Following, some Spanish regions characterised as intermediate or predominantly urban, like Navarra, Girona, Álava and Vizcaya, plus Aveyron and Lot, have transferred more than 3 per 10000 of their respective areas from agricultural to urban classes. Finally, those areas where the transfer from agricultural to urban classes has been more moderate are of various Types:

- In the first place can be included here those areas with a clearest agricultural vocation on both the Spanish sector of the CBA, like Teruel, and the French one, like Gers, Dordogne and Lozère.
- Also two areas with small surfaces covered by agicultural fields, like Landes and Guipúzcoa may be listed here.
- Two big regions dominated by important cities, such as Zaragoza and Gironde.
- Last but not least, the two French Departments (Ariège and Hautes-Pyrénées) and the two Spanish Provinces (Huesca and Lleida) that occupy the central Pyrenees should also be mentioned, as they have not lost agricultural area to the benefit of urban classes on a relevant proportion.

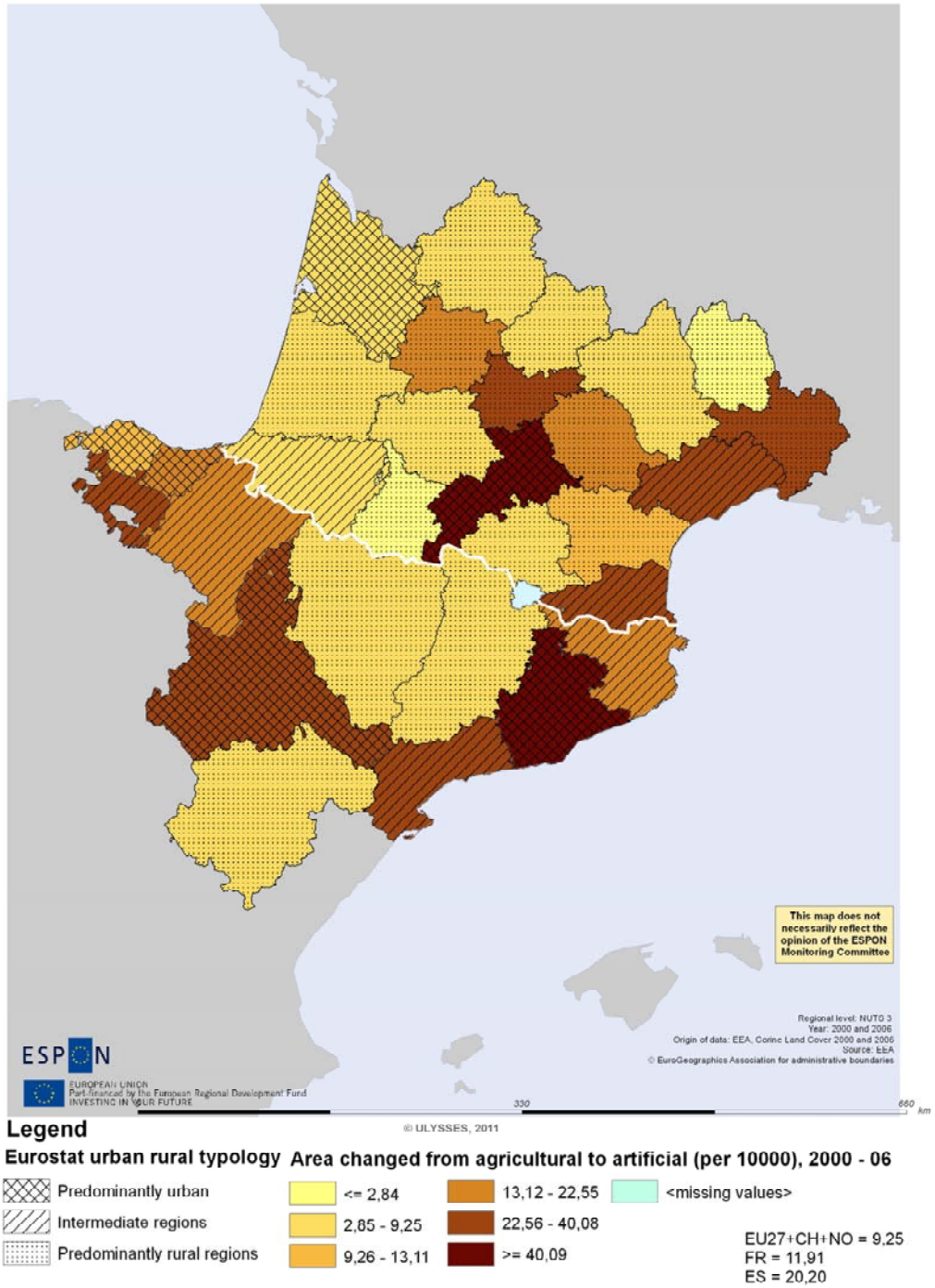
Map 4.4. Urbanisation of natural and semi-natural areas



If analysed in combination with Map 4.4, this last point seems to suggest that those areas at the heart of the Pyrenean domain seem to have resisted better to the urbanising inertia observed elsewhere within the CBA. If this has been the case, those regions, which are gifted with the most valuable natural, cultural and artistic heritages within the CBA, should have succeeded better than other areas in protecting those assets from the impact caused by the urbanisation of agricultural and natural areas, which might have major consequences

on the landscape and the intrinsic value of rural contexts. Allegedly, this would make those regions even more attractive from a touristic point of view in relation to other areas under higher urban pressure, offering some important development potentials for the future.

Map 4.5. Land use change from agricultural to artificial



Map 4.5 and Table 4.5 offer additional insights on the land use changes registered from 2000 to 2006 in the CBA. The changes included refer to the land cover migrations observed between agricultural fields and unspecific artificial land cover. This CLC class includes (i) industrial, commercial and transport units; (ii) mine, dump and construction sites; (iii) artificial, non-agricultural vegetated areas, and; (iv) urban fabric. Thus, the changes showed in both the Map and the Table reflect not only the alterations produced on the

agricultural system by the urbanisation forces active during that period of time, but those generated by human interventions in general, either if the alterations are caused by residential forces or by other drivers.

Generally speaking, both figures seem to confirm the trends detected in the previous section. Those areas that are more urbanised and under sustained structural transformations linked to specific economic dynamics (Álava, Tarragona, Hérault, Pyrénées-Orientales, Gard, Zaragoza, Tarn-et-Garonne) have shifted more than a 20 per 10000 of their total extension from agricultural lands to artificial surfaces, with peaks over 50 per 10000 in Haute-Garonne and Barcelona, where the urban influence of Toulouse and Barcelona seem to be the most relevant driver behind this tendency. The opposite can be said about those regions where the agricultural specialization has a bigger importance, particularly in those landlocked NUTS3 found nearby the mountain range, like Lleida, Huesca, Hautes-Pyrénées and Ariège, where net transfers of agricultural land to artificial surfaces remained under 8 per 10000 in all cases.

The most urbanised regions have also been those where net loss of agricultural areas has been mostly related to non urban drivers, especially in Barcelona, Álava and Haute-Garonne, where it was registered a net transfer of agricultural lands to artificial (non-urban) land cover of more than 30 per 10000. The opposite holds true for some core Pyrenean regions like Huesca, Ariège and Hautes-Pyrénées, where transfers of agricultural lands towards artificial surfaces have been more moderate (under 7 per 10000 in all cases) and mainly related to urban expansion.

Table 4.5. Artificial surfaces (class 1 of Corine Land Cover)

NUTS name	Artificial Surfaces (ha) (2000-2006)							
	Formation new land cover	Consumption of land cover	Net formation of land cover	Share net formation of land cover (per 10000)	Agricultural to artificial areas (00-06)	Agricultural to artificial areas by total area (per 10000)	Natural and semi-natural to artificial areas	Natural and semi-natural to artificial areas by total area (per 10000)
EU27 + CH + NO	667087.81	159607.44	507480.37	10.63	441994.68	9.25	118710.43	2.49
Spain	166984.70	35594.70	131389.99	25.97	102237.08	20.20	35413.39	7.00
France	96121.60	14174.37	81947.23	12.84	76025.58	11.91	10387.77	1.63
Andorra	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Álava	1423.08	165.62	1257.46	41.43	1127.54	37.15	129.93	4.28
Guipúzcoa	722.80	70.55	652.25	32.95	305.10	15.41	347.15	17.54
Vizcaya	579.48	148.96	430.52	19.43	251.56	11.35	178.95	8.07
Navarra	3038.72	1168.04	1870.68	18.00	1918.57	18.47	296.47	2.85
Huesca	1368.89	121.66	1247.23	7.98	846.94	5.42	413.04	2.64
Teruel	1726.16	574.11	1152.05	7.78	984.01	6.64	676.69	4.57
Zaragoza	6749.54	1216.75	5532.80	32.02	4254.65	24.63	1617.61	9.36
Barcelona	5405.16	759.83	4645.33	60.08	3879.46	50.17	804.67	10.41
Girona	1338.50	44.67	1293.83	21.89	1086.61	18.38	207.23	3.51
Lleida	1044.53	182.57	861.95	7.08	880.49	7.24	19.62	0.16
Tarragona	2556.74	293.31	2263.44	35.89	1895.48	30.06	367.96	5.84
Dordogne	984.21	384.88	599.32	6.50	544.97	5.91	280.60	3.04
Gironde	1570.65	433.31	1137.34	11.20	495.77	4.88	685.65	6.75
Landes	1455.33	100.78	1354.55	14.48	561.08	6.00	793.47	8.48
Lot-et-Garonne	836.57	156.80	679.77	12.62	759.85	14.11	39.43	0.73
Pyrénées-Atlantiques	621.43	49.74	571.69	7.44	475.30	6.18	122.91	1.60
Ariège	378.13	172.26	205.87	4.19	241.97	4.93	41.00	0.84
Aveyron	993.77	246.35	747.42	8.52	664.99	7.58	123.23	1.40
Haute-Garonne	3964.36	602.83	3361.53	52.85	3325.26	52.28	68.25	1.07
Gers	371.35	105.69	265.66	4.22	335.14	5.32	19.90	0.32
Lot	1071.13	813.21	257.92	4.94	258.23	4.94	129.82	2.48
Hautes-Pyrénées	165.80	55.72	110.08	2.43	96.90	2.14	13.18	0.29
Tarn	860.21	177.67	682.53	11.81	831.06	14.38	29.14	0.50
Tarn-et-Garonne	990.43	55.48	934.95	25.04	905.17	24.25	47.35	1.27
Aude	978.86	327.96	650.90	10.26	618.19	9.75	126.92	2.00
Gard	2191.79	356.19	1835.60	31.26	1497.44	25.50	338.16	5.76
Hérault	2764.99	1174.44	1590.55	25.50	1841.86	29.53	279.84	4.49
Lozère	149.75	0.00	149.75	2.89	87.77	1.70	61.98	1.20
Pyrénées-Orientales	1365.39	179.32	1186.07	28.62	1105.49	26.68	103.94	2.51

Source: ESPON DB
Methodology: Tabulate area between CLC 2000 level 3 and NUTS 2006 (levels 1,2,3) and aggregation at CLC 2000 level1.

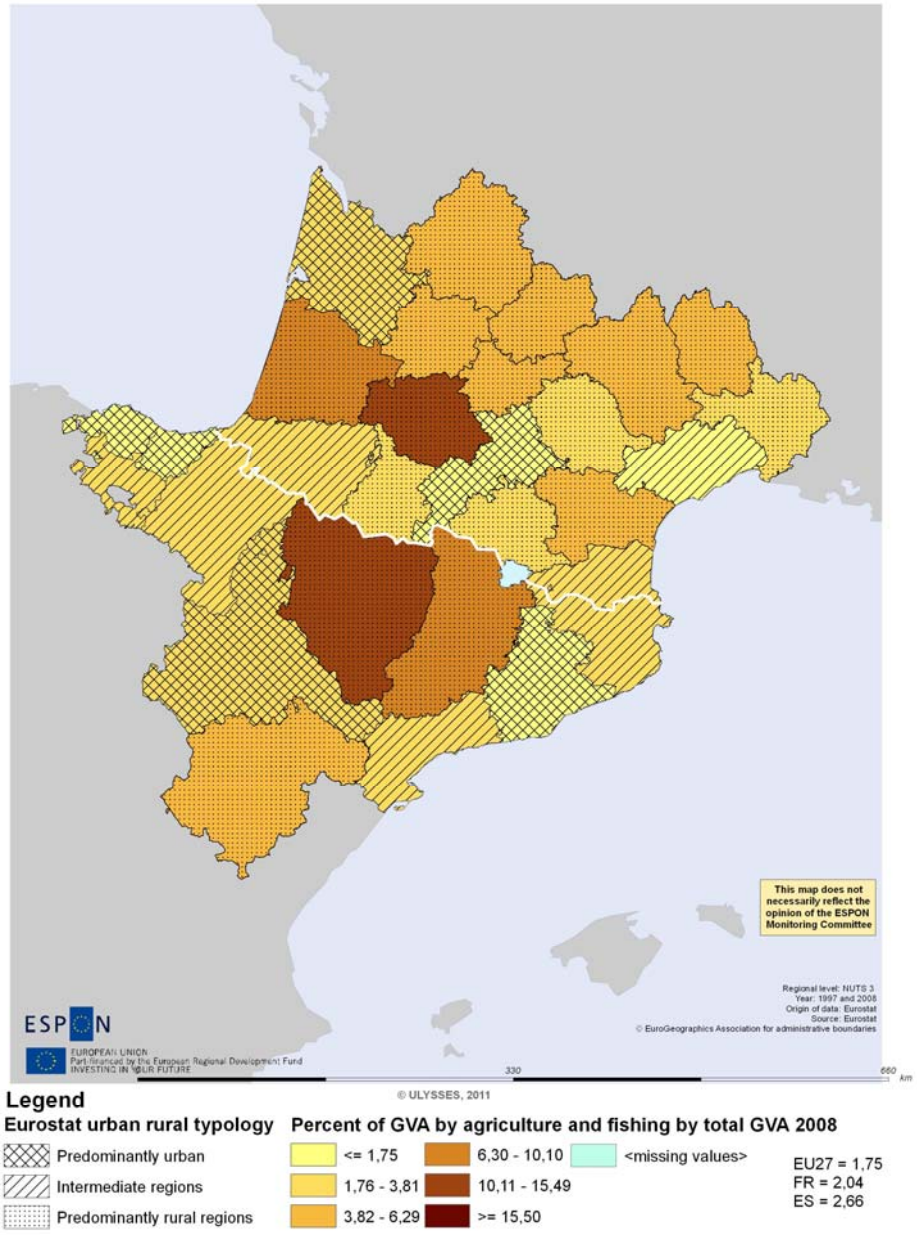
4.5. Economic profile of the agricultural sector

Gross value added

By far, the CB region where the agricultural sector has a bigger relevance in absolute terms is the French department of Gironde, with more than 1300 million Euro in 2008, mainly derived from wine production. Following, four Spanish provinces (Barcelona, Lleida, Huesca and Zaragoza), and one additional French department (Landes) show a gross value added (GVA) generated by agricultural and fishing activities over 500 million Euro. In the opposite end of the distribution can be mentioned areas such as Guipúzcoa, Vizcaya, Lot, Teruel and Hautes-Pyrénées, with less than 200 million Euro, and especially two French departments Lozère and Ariège, where the annual output of the agricultural sector was under 100 million Euro in 2008.

However, these figures do say nothing about the relative weight of the agricultural sector in relation to the economy taken as a whole. In this respect, the figures on relative GVA by agriculture and fishing clearly allow identifying two NUTS3 regions where primary activities have higher economic weight in comparison to the remaining areas. As shown by Map 4.6, these areas are the Spanish province of Huesca, which is also very productive in terms of absolute GVA, and the French department of Gers, both sharing more than 11% of the GVA generated by agriculture in 2008. Following, Lleida and Landes, with more than 6%, and some predominantly landlocked French departments, like Lozère, Aude, Tarn-et-Garonne, Aveyron and Lot, with more than 5% of the respective GVA linked to agriculture and fishing. Dordogne, Lot-et-Garonne, Teruel, Gironde, Pyrénées-Orientales, Tarn and Gard all obtain more than 3% of their respective GVA from the agricultural and fishing sectors, while Álava, Navarra, Zaragoza, Ariège, Tarragona, Girona, Pyrénées-Atlantiques and Hautes-Pyrénées all have more than 2% of the overall GVA shared by these activities. Finally, the most urbanised regions, namely Hérault (1.7%), and particularly Guipúzcoa, Barcelona, Haute-Garonne and Vizcaya (<1%) are characterised by smaller weights of their agricultural sectors.

Map 4.6. Percent of GVA by agriculture and fishing



In dynamic terms, the economic trends observed in relation to the agricultural sector of the CBA suggest a net loss of economic weight of this sector in relation to the economy as a whole. In this respect, the relative growth weights of the share of GVA by agriculture and fishing 1997-2008 show as only the Spanish province of Alava experienced a slightly positive annual growth (1.2%) over the period 1997-2008, with an overall expansion of the agricultural sector of more than 8%, mainly thanks to wine production. In all the remaining cases, the agricultural sector lost relative weight in relation to the economy taken as a whole. As shown by map 4.7, those regions where the annual decreasing rate of share of GVA by agriculture and fishing showed a higher value were the Spanish regions of Guipúzcoa, Navarra, Tarragona, Lleida, Zaragoza, Teruel and Vizcaya, all showing decreasing rates inferior smaller than -5%. This may be linked to a relatively small (Guipúzcoa, Navarra, Tarragona, Lleida and Zaragoza) or even negative (Teruel, Vizcaya) increase of GVA by agriculture and fishing, in a general context of strong economic growth of other sectors.

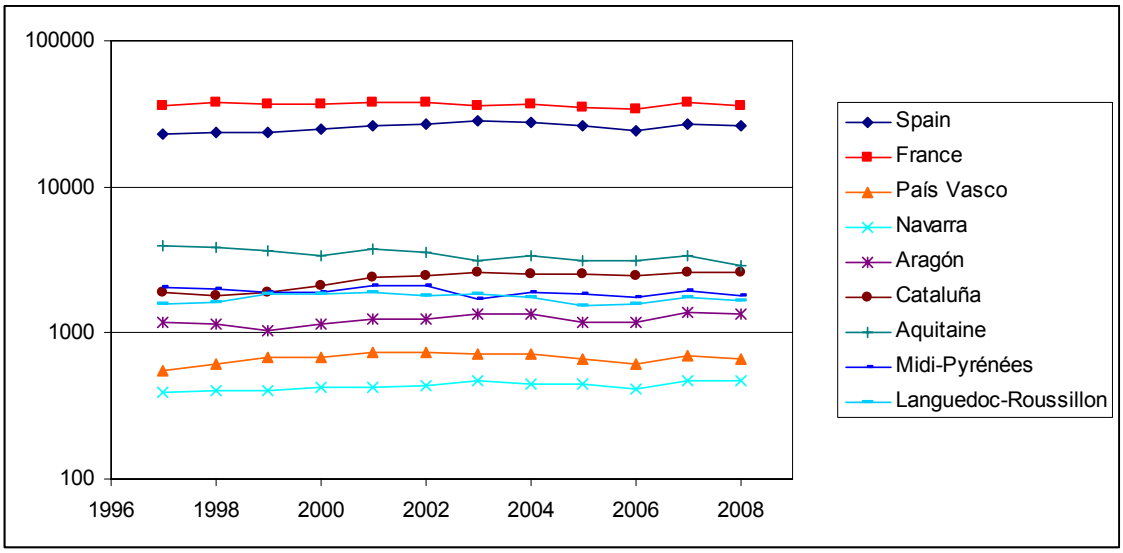
Table 4.6. Gross Value Added by agriculture and fishing (total values)

NUTS Name	GVA by Agriculture; fishing (millions of Euro/ECU)		GVA by Agriculture; fishing by total GVA (%)		Annual growth rate GVA by agriculture and fishing 1997-2008	Annual growth rate of share of GVA by agriculture and fishing 1997-2008
	1997	2008	1997	2008		
EU27	196578.6	171307.5	2.82	1.75	1.26	-4.23
Spain	23222.7	26494	5.01	2.66	1.21	-5.60
France	36038.2	35738	3.21	2.04	-0.08	-4.04
Andorra	N/A	N/A	N/A	N/A	N/A	N/A
Álava	110.7	276.4	2.44	2.79	8.67	1.23
Guipúzcoa	166.8	198.4	1.72	0.98	1.59	-5.02
Vizcaya	280.9	187.5	1.91	0.59	-3.61	-10.18
Navarra	393.9	469.9	4.89	2.78	1.62	-5.02
Huesca	454.6	605.2	18.53	11.95	2.64	-3.91
Teruel	170.4	135.1	9.81	3.96	-2.09	-7.92
Zaragoza	542.8	589.3	4.95	2.59	0.75	-5.70
Barcelona	541	871.1	0.81	0.63	4.43	-2.27
Girona	264.3	402.4	3.38	2.25	3.90	-3.62
Lleida	747.4	860.1	14.33	7.92	1.28	-5.25
Tarragona	350	437.8	4.04	2.29	2.06	-5.03
Dordogne	381	327	6.60	4.23	-0.19	-2.69
Gironde	1652	1388	9.05	3.56	-4.27	-3.14
Landes	552	550	8.96	6.66	1.46	-1.58
Lot-et-Garonne	324	271	10.24	4.08	-4.80	-2.76
Pyrénées-Atlantiques	437	348	4.14	2.10	-1.47	-3.71
Ariège	76	73	4.04	2.58	-0.35	-1.50
Aveyron	333	311	8.35	5.21	-0.49	-1.90
Haute-Garonne	236	221	1.22	0.60	-1.24	-2.61
Gers	439	406	20.26	11.66	-1.96	-1.64
Lot	197	182	7.84	5.11	0.35	-2.07
Hautes-Pyrénées	114	108	3.65	2.08	-1.10	-2.03
Tarn	258	249	5.73	3.42	-0.75	-1.59
Tarn-et-Garonne	260	241	10.34	5.24	-2.18	-2.02
Aude	386	370	8.92	5.29	-0.01	-1.65
Gard	501	474	5.50	3.36	-0.53	-1.81
Hérault	429	412	2.58	1.73	1.46	-2.21
Lozère	90	91	7.24	5.68	2.49	-1.16
Pyrénées-Orientales	327	312	5.55	3.46	0.49	-1.94

Source: Eurostat

In this regard, the most negative behaviour was shown by Vizcaya region, where it was experienced an annual loss rate of share of GVA by agriculture and fishing of more than 10% of the GVA. Following, some other Spanish regions like Teruel, Zaragoza, Lleida, Tarragona, Navarra, Guipúzcoa, Huesca and Girona, plus the French deparments of Pyrénées-Atlantiques and Gironde, lost relative share of GVA by agriculture and fishing over the period 1997-2008 at an annual rate of more than 3%. In some cases, like Vizcaya, Teruel, Pyrénées-Atlantiques and Gironde this was related to a net loss of the GVA by agriculture and fishing in absolute terms, while in the remaining areas the observed trend had to do more with a comparative smaller growth rate of agriculture in comparison with other activities. The most diverging behaviours between absolute and relative annual growth rates of agriculture and fishing activities were detected on the Spanish sector of the CBA, particularly in Álava, Vizcaya, Teruel, Zaragoza, Lleida, Guipúzcoa, Navarra and Tarragona. The only areas within the CBA whose GVA by agriculture and fishing decreased annually more in absolute than in relative terms were the French departments of Lot-et-Garonne, Gironde, Gers and Tarn-et-Garonne, where in any case the relative weight of agricultural and fishing activities by total GVA was reduced by a half. This seems to suggest a general loss of agricultural productivity within an economic context unable to counterbalance that deficit with other sectors in those regions.

Figure 4.1. GVA by agriculture and fishing (millions of Euro/ECU)

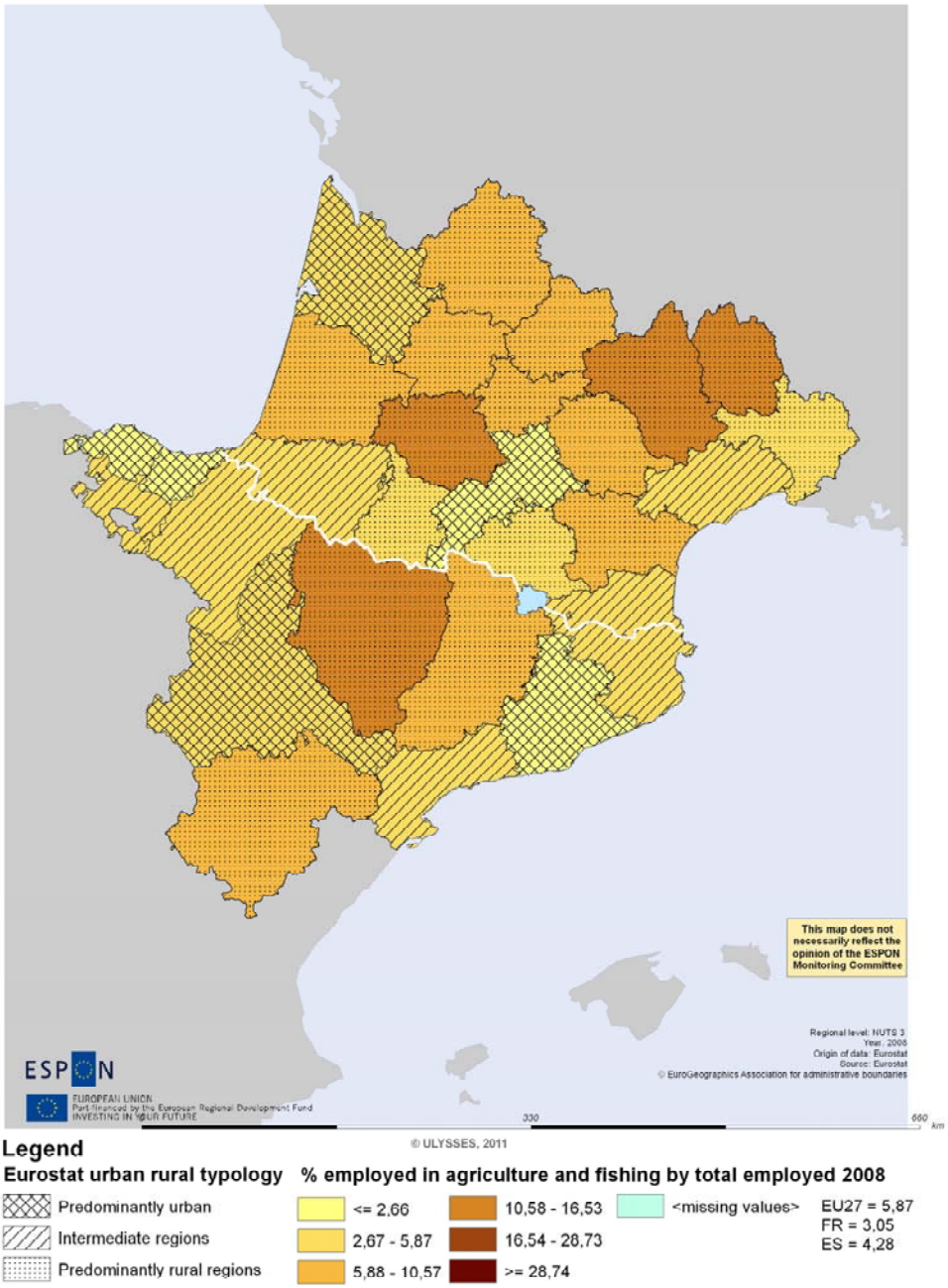


Source: Eurostat

Employment

The analysis of employment in primary sectors within the CBA shows significant divergences among NUTS3 regions. While some areas have around 15% of their populations employed in the agricultural sector, like Huesca and Gers, some others have less than 2% of it engaged in those activities (Guipúzcoa, Vizcaya and Haute-Garonne) or even less than 1% Barcelona. Most remarkably, Barcelona is also the region where more people are occupied on primary activities, as more than 25 000 people are still employed in such activities. As shown by Map 4.8, together with Huesca and Gers, the most agricultural areas in the CBA are Aveyron, Lozère, Lleida and Lot, with more than 9% of their overall employed population working in primary activities.

Map 4.7 Share of employment in agriculture and fishing sectors (2008)



In dynamic terms, the only region that showed a net increase on the total population employed in the agricultural sector over the period 1997-2008 was Lozère (0.35% annually). Teruel and Haute-Garonne, on their hand, showed null values, while all the remaining regions decreased the overall population engaged in those activities, with maximum annual growth rates under -4% in Vizcaya and Gironde.

Table 4.7. Employment in agriculture and fishing

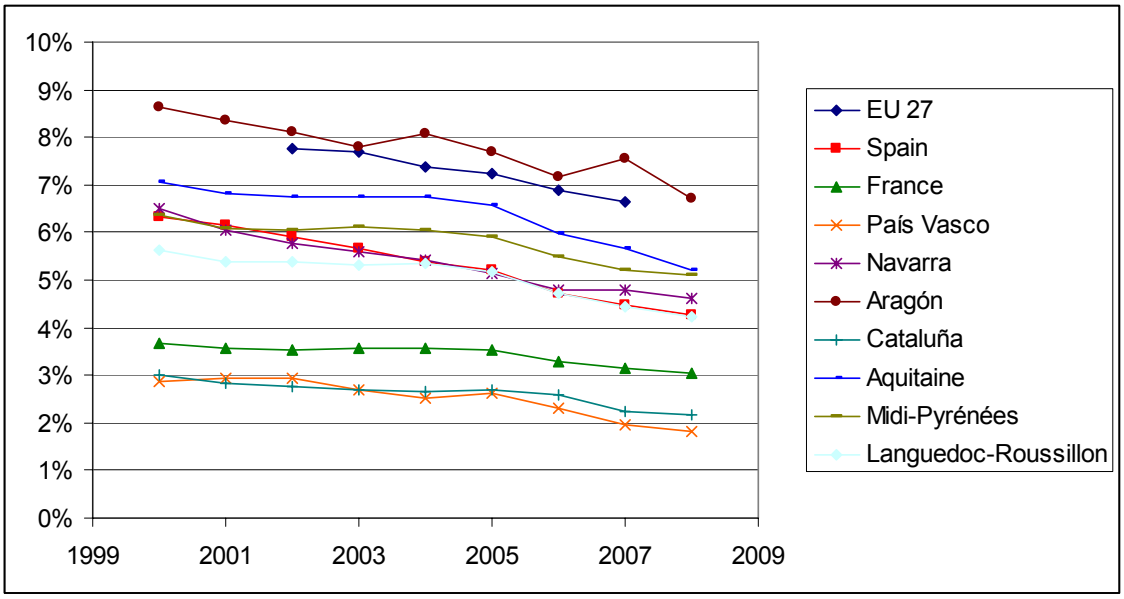
NUTS Name	Employment in agriculture and fishing (thousands of persons)		Share of employment in agriculture and fishing by total employed (%)		Annual growth rate of employment in agriculture and fishing 2000-2008	Annual growth rate of share of employment in agriculture and fishing 2000-2008
	2000	2008	2000	2008		
EU27*	17701.10	11706.90	8.41	5.87	-5.04	-4.39
Spain	1037.4	879.6	6.32	4.28	-2.04	-4.75
France	910.6	791.8	3.68	3.05	-1.73	-2.35
Andorra	N/A	N/A	N/A	N/A	N/A	N/A
Álava	5.9	5	4.38	2.97	-2.05	-4.75
Guipúzcoa	8.4	6.5	2.74	1.76	-3.15	-5.36
Vizcaya	11.9	8.5	2.55	1.49	-4.12	-6.46
Navarra	17.9	15.7	6.52	4.63	-1.63	-4.18
Huesca	19.2	17.6	21.05	16.46	-1.08	-3.03
Teruel	5.3	5.3	10.23	7.88	0.00	-3.22
Zaragoza	21.5	20.5	5.53	4.34	-0.59	-2.99
Barcelona	26.3	25.7	1.19	0.95	-0.29	-2.77
Girona	15.2	13.9	5.24	3.75	-1.11	-4.10
Lleida	27.7	23	14.47	9.77	-2.30	-4.79
Tarragona	20.5	17.3	7.34	4.76	-2.10	-5.28
Dordogne	12.4	10.2	8.87	7.13	-2.41	-2.70
Gironde	33	22.2	6.16	3.86	-4.83	-5.67
Landes	10.3	8.5	8.11	6.27	-2.37	-3.17
Lot-et-Garonne	12.1	10	10.59	8.56	-2.35	-2.62
Pyrénées-Atlantiques	13.7	12.8	5.79	5.01	-0.85	-1.79
Ariège	3.3	3	6.78	5.80	-1.18	-1.92
Aveyron	14.7	13.2	13.84	11.91	-1.34	-1.86
Haute-Garonne	8	8	1.76	1.47	0.00	-2.23
Gers	11.1	10.1	16.95	14.55	-1.17	-1.89
Lot	7	5.8	11.48	9.28	-2.32	-2.62
Hautes-Pyrénées	4.4	4	5.17	4.47	-1.18	-1.79
Tarn	8.3	7.4	6.79	5.94	-1.42	-1.65
Tarn-et-Garonne	7.9	6.4	10.60	8.03	-2.60	-3.42
Aude	9.4	7.7	8.74	6.41	-2.46	-3.80
Gard	11.2	9	5.29	3.88	-2.70	-3.81
Hérault	12.7	11.6	4.02	3.11	-1.13	-3.18
Lozère	3.5	3.6	11.82	11.61	0.35	-0.23
Pyrénées-Orientales	7.9	6.3	6.08	4.31	-2.79	-4.21

Source: Eurostat

In relative terms, the CBA regions that lost more population in agriculture and fishing sectors from 1997 to 2008 were Vizcaya, Gironde, Guipúzcoa and Tarragona, with annual rates of share of employment on those sectors smaller than -5%. Other Spanish regions like Lleida, Álava, Pyrénées-Orientales, Navarra and Girona showed annual decrease rates smaller than -4%, while on the French side the decreasing rate has been comparatively smaller. Gard, Aude, Tarn-et-Garonne, Teruel, Hérault, Landes and Huesca lost share in agricultural sector at a rate of -3% or smaller, while those areas with more moderate shortfalls of the share of employment in agriculture and fishing are all located within the French sector of the CBA (Ariège, Gers,

Aveyron, Pyrénées-Atlantiques, Hautes-Pyrénées, Tarn and Lozère), with annual growth rates bigger than -2%. All these trends can also be observed at NUTS2 level, as shown by Figure 4.2.

Figure 4.2. Share of employment in agriculture and fishing by total employed (%)



Source: Eurostat

Agricultural productivity

Several dimensions of the agricultural productivity within the CBA can be investigated combining together some of the abovementioned indicators. In particular, the intensity of the different agricultural models can be easily perceived through the productivity index shown by Figure 4.3. This Figure clearly illustrates how certain agricultural models, namely dairy and beef farming systems to the most Western end of the Pyrenees (Guipúzcoa and Vizcaya), together with wine production areas (Gironde) and mixed Mediterranean farming based on wine, horticultural and fruit products (Barcelona, Girona, Pyrénées-Orientales), are the most spatially intense agricultural activities carried out within the CBA[16].

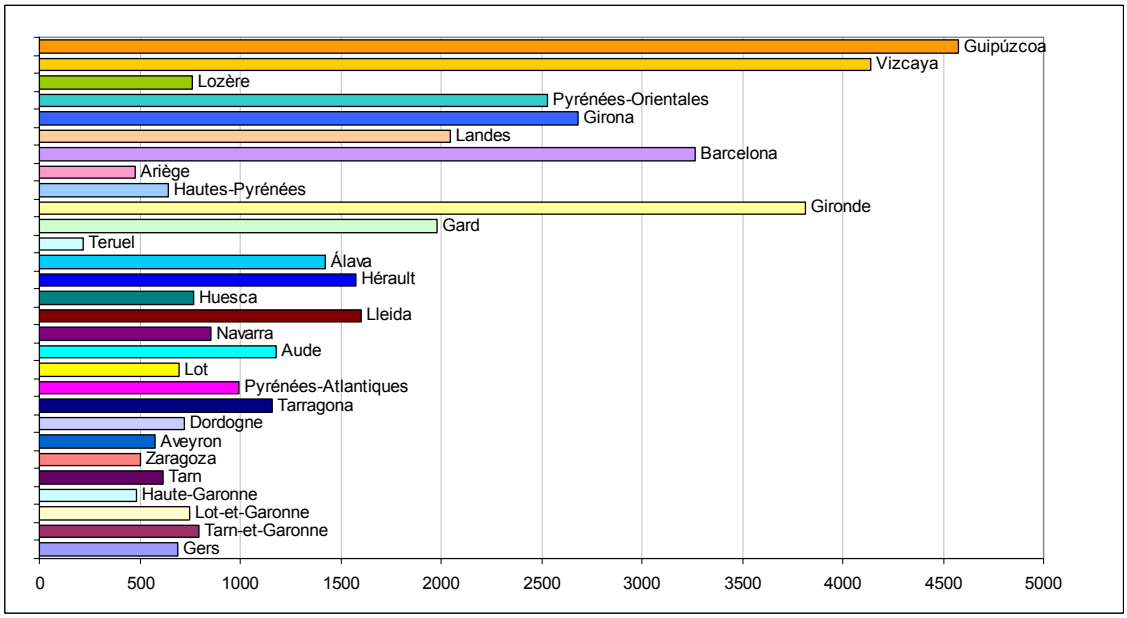
Following, some regions with diversified farming systems, namely Landes (corn, vegetables, foie-grass, and various species of fowls), Gard (wines, fruits, horticulture products, including flowers), Lleida (fruits and cereals), Hérault (wines, cereals and vegetables), and Alava (wine, cereals, beetroot and potato) all have productivity rates higher than 1400 Euro per hectare. Some other regions with similar characteristics and mixed farming systems, namely Aude, Tarragona, Pyrénées-Atlantiques and Navarra, but with more extensive farming models, show annual productivities over 800 Euro per hectare.

To the lower end of the distribution can be found those regions whose agricultures are based on a combination of extensive cerealist and livestock raising systems, like Tarn-et-Garonne, Huesca, Lozère, Lot-et-Garonne, Dordogne, Lot, Gers, Hautes-Pyrénées and Tarn, which in all cases have annual productivities

[16] It must be noted that part of the primary production within coastal regions comes from fishing activities and thus the productivity indexes calculated for those areas are overestimated. Fishing activities have an important impact in certain zones, particularly in the Spanish provinces of Vizcaya and Guipúzcoa, whose GVA by fishing activities accounted respectively for 32% and 18% of the total primary production in 2006, according to Basque official statistics office.

over 600 Euro per hectare. Finally, those regions penalised by adverse climatic and/or physiographic conditions, such as Aveyron, Zaragoza, Haute-Garonne, Ariège and Teruel show annual productivities below 600 Euro per hectare, with a minimum in the cold and semi-arid province of Teruel (220 Euro per hectare). This latter group of reduced productivity regions includes also those mountainous areas belonging to the core Pyrenean domain, which poses an extra challenge to those regions in terms of development perspectives within the rural setting. Here the agriculture can not be pointed out as a real option for socio-economic development, but only as a supportive activity for other alternatives.

Figure 4.3. Agricultural productivity measured in Euro per agricultural hectare, 2006



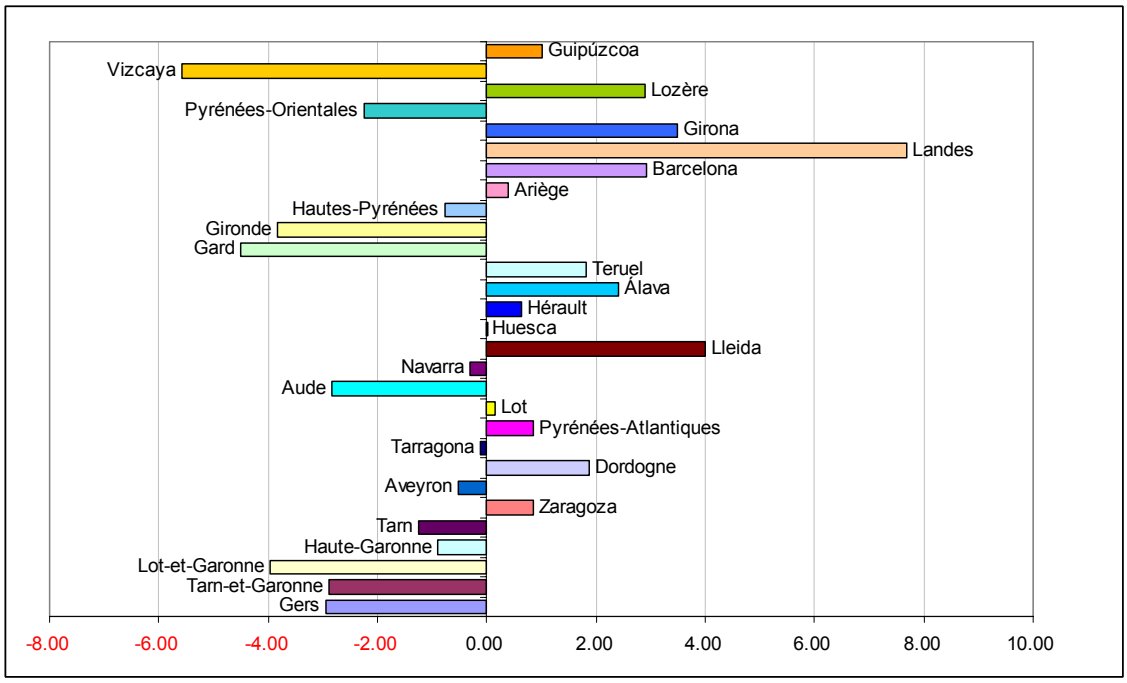
Source: own elaboration basing on Eurostat data and CLC

From a dynamic perspective, the behaviour shown by the different regions over the period 2000 to 2006 in terms of agricultural productivity measured in Euro per hectare results also very diverging. Although the overall area devoted to agriculture has remained essentially constant over the reference period in all regions, some small but meaningful annual change rates for this type of land cover have been detected during those years in some regions, either in positive (Lozere, 0.70%, Aveyron, 0,35%, Landes, 0.33%, Lot, 0.22%) or in negative (Pyrénées-Orientales, -0.50%, Barcelona, -0.32%, Gard, -0.25%, Álava and Guipúzcoa, -0.21%, and Vizcaya -0.19%) terms. These trends, combined with those regarding GVA by agriculture and fishing shown by Figure 4.1, produced a number of different combinations that ultimately crystallised in specific productivity changes for each NUTS3 region under examination.

By definition, those regions where the GVA by agriculture was reduced while the agricultural area increased over the period 2000 to 2006 (Aveyron and Tarn) showed declining annual productivity rates of -0.52% and -1.23% respectively. Remarkably, those are not the regions showing the biggest declines in productivity during the studied period, as all regions within the CBA with declining trends of both GVA by agriculture and total agricultural surface have also experienced decreased productivity measured in Euro per agricultural hectare (Tarragona, Navarra, Hautes-Pyrénées, Haute-Garonne, Pyrénées-Orientales, Aude, Tarn-et-Garonne, Gers, Gironde, Lot-et-Garonne, Gard and Vizcaya, listed from smaller to bigger reductions on productivity), some of them at very high rates.

The opposite holds true for those regions where agricultural production expanded while the agricultural area remained unaltered or even reduced (Lleida, Girona, Barcelona, Álava, Teruel, Guipúzcoa, Zaragoza, Hérault and Huesca, listed from bigger to smaller productivity increases). More importantly, some of the most significant increments on annual agricultural productivity rates were recorded in those regions where both GVA by agriculture and the agricultural surface expanded (Landes, Lozère, Dordogne, Pyrénées-Atlantiques, Ariège and Lot, listed from bigger to smaller increase in productivity) due to a number of factors that fall outside the scope of this report.

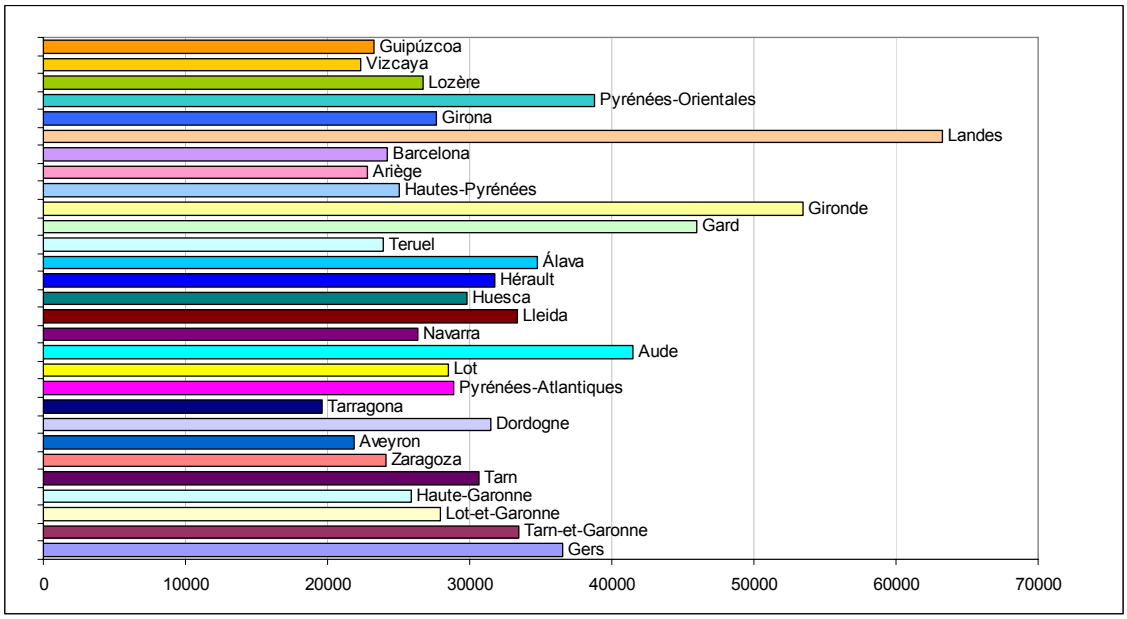
Figure 4.4. Annual growth rate of agricultural productivity measured in Euro per agricultural hectare 2000-2006



Source: own elaboration basing on Eurostat data and CLC

As shown by Figure 4.5, in contrast to what reported about the agricultural productivity measured in terms of Euro per hectare, labour productivity of agricultural activities measured in Euro per employed person does not reflect such big differences between regions. In 2006 the most productive areas from that perspective were the French departments of Landes, Gironde, Gard and Aude, with more than 40 000 Euro per each person occupied in that field. Eight additional regions, namely Pyrénées-Orientales, Gers, Álava, Tarn-et-Garonne, Lleida, Hérault and Dordogne performed over 2006 CBA average of 31 385.61 Euro per employed person. All the remaining areas had productivities over 20 000 Euro, with the only exception of the Spanish province of Tarragona, which recorded a productivity of 19 610 Euro per each person engaged in the primary sector. Among the confining NUTS3 areas, only Pyrénées-Orientales and Lleida recorded an average agricultural productivity bigger than 30 000 Euro per employed person, while all the remaining areas had a productivity under the CBA average, ranging from 33 321 Euro per capita in Lleida to 22 812 in Ariège. Among these regions, five were ranked above the statistical median of the CBA (28 548 Euro per person) and the remaining thirteen were classified under that value.

Figure 4.5. Agricultural productivity measured in Euro per employed person, 2006



Source: own elaboration basing on Eurostat data and CLC

As shown by figure 4.6, the most relevant increase in agricultural labour productivity over the period 2000-2006 can be found in Landes, linked to a dramatic enlargement in overall GVA production from 362 to 576 million Euro, while the agricultural labour force was reduced from 10.3 to 9.1 thousand people. This led to an overall annual increase rate in the productivity index of more than 10.3%. However, it must be clarified that according to Eurostat official data, the GVA by agriculture and fishing recorded in Landes in 2000 was abnormally small in comparison to 1999 (438 million Euro) and 2001 (445 million Euro), which might have lead to an overestimation of the average growth rate of the agricultural productivity within that region.

Apart from Landes, some other NUTS3 regions, namely Alava and Lleida have increased their labour productivity at annual rates bigger than 4%. All these regions, together with Dordogne, Pyrénées-Atlantiques, Lot, Huesca, Hérault and Ariège share an increase of the GVA by agriculture and fishing in association with smaller populations employed in those sectors.

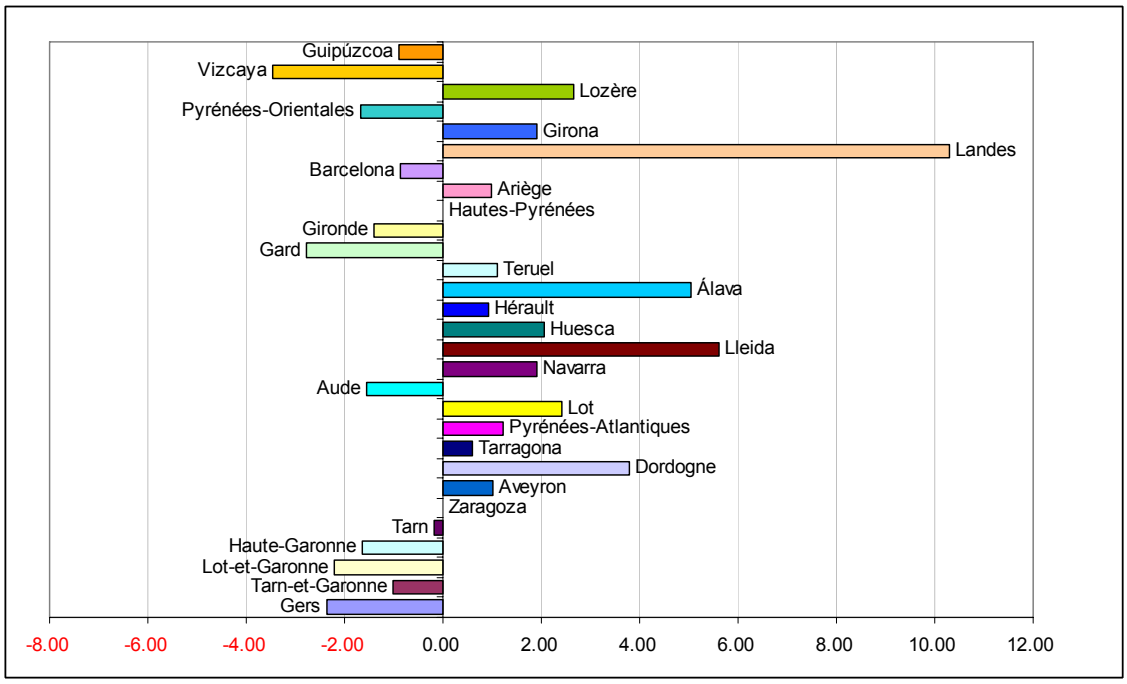
Some other regions, namely Teruel, Girona and Lozère show positive growth rates of the productivity index in the presence of net increase in the GVA and bigger populations employed in the agricultural and fishing sectors. Under a similar cojuncture, regions such as Barcelona and Guipúzcoa show a negative trend, while Zaragoza maintained a fairly constant productivity over the period under analysis.

However, most regions showing negative trends of GVA by agriculture and fishing and smaller labour forces in those sectors registered decreasing productivity measured in Euro per employed person over the period 2000 to 2006. This was the case in Gers, Tarn-et-Garonne, Lot-et-Garonne, Tarn, Aude, Gard, Gironde, Pyrénées-Orientales and Vizcaya.

The opposite situation, with positive annual growth rates of the productivity index in the presence of contracting GVA and labour, was verified in Aveyron, Tarragona, Navarra, Hautes-Pyrénées. The only region

that held a reduced GVA by agriculture and fishing in association with more people engaged in those sectors was Haute-Garonne. It goes without saying that here the annual growth rate was a negative one (-1.65%).

Figure 4.6. Annual growth rate of agricultural productivity measured in Euro per employed person 2000-2006



4.6. Chapter conclusions

The main conclusions of this chapter may be summarised as follows:

1. This chapter has introduced ESPON's and Eurostat's urban-rural typologies. Each of them follows different classification criteria, producing a number of possible combinations between the two. In general terms, both typologies are coincident as far as predominantly urban regions are concerned. A number of more complex and difficult to interpret situations have been presented for those regions classified by Eurostat as either intermediate or predominantly rural.

2. A land cover analysis within the CBA shows as the most agriculturally oriented regions according to the overall surface covered by agricultural fields are those regions to both side of the border were the main water channels are found, especially the landlocked regions to the French side of the CBA. French NUTS3 regions show the higher rates of agricultural coverage (Gers, 89.75%, Tarn-et-Garonne, 79.16%, Lot-et-Garonne, 74.64, Haute-Garonne, 70.21%, etc.)

3. From 1990 to 2006, most regions within the CBA lost agricultural surfaced at a sustained pace, particularly within the most urbanised regions to both sides of the border, especially in Gard, Álava, Haute-Garonne, Navarra, Guipúzcoa, Vizcaya, Barcelona and Pyrénées-Orientales. Only some French Departments, namely Lozère (42.77 per 10 000), Landes (20.84 per 10 000) and Aveyron (5.79 per 10 000) showed annual increase rates meaningfully above zero.

4. From 1990 to 2006, those regions that transferred more agricultural areas to urban fabric were some French departments found along the French Mediterranean coast like Gard, Hérault and Pyrénées-Orientales, and the heavily urbanised department of Haute-Garonne. This might be linked to a combination of a decreased competitiveness of agrarian activities and the proliferation of holyday homes in rural and coastal areas.

5. Central Pyrenean regions have transferred less agricultural and natural lands to artificial uses. This fact suggests that these areas might have behaved better than other regions in preserving traditional agriculture and landscape assets, and indirectly also artistic and cultural heritages found within the rural setting.

6. In general terms, those areas that are more urbanised and under more structural transformations have lost more agricultural areas to the benefit of artificial surfces.

7. Gironde is, by far, the most important region in terms of agricultural production, followed by Barcelona, Lleida, Huesca and Zaragoza. In relative terms Huesca and Gers, both with more than 11% of the GVA shared by agriculture in 2008, are the two regional economies that rely most on primary activities. Most mountainous regions within the Pyrenean domain obtain between 2% to 3% of their GVA from primary activities.

8. The economic trend observed in relation to the agricultural sector suggests a decreasing weight of primary activities in relation to the economy as a whole. From 1997 to 2008 all NUTS3 regions but one (Alava) showed a declining tendency on the contribution of primary sector to regional economies.

9. Employment in agricultural sector shows a similar distribution pattern and long run trend as the ones held by GVA by agriculture. Agriculture is loosing weight within the global economic context also from the labour perspective.

10. Dairy and beef farming systems to the most Western end of the Pyrenees (Guipúzcoa and Vizcaya), together with wine production areas (Gironde) and mixed Mediterranean farming based on wine, horticultural and fruit products (Barcelona, Girona, Pyrénées-Orientales), are the most spatially productive agricultural activities carried out within the CBA.

11. Those regions penalised by adverse climatic and/or physiographic conditions, such as Aveyron, Zaragoza, Haute-Garonne, Ariège and Teruel show the smallest productivities per hectare.

12. Labour productivity of agricultural activities measured in Euro per employed person show smaller differences between regions. In 2006 the most productive areas were the coastal French departments of Landes, Gironde, Gard and Aude. The less productive areas from the labour perspective were Ariège, Vizcaya, Aveyron and Tarragona.

13. From 2000 to 2006 agricultural productivity rates measured both in terms of Euro per hectare and Euro per employed person evolved in a very unpredictable way that should be interpreted in the light of each region's specificities.

Chapter 5 – Accessibility and connectivity

5.1. Concept and definition

Communication and exchange of resources, goods, individuals and information are transferred between cities and regions via infrastructure networks. Access to those networks is increasingly becoming a crucial factor for territorial development (ESPON, 2004). As some have argued, areas with better access to the locations of input materials and markets are more productive, more competitive and hence more successful than more remote and isolated areas (Linneker, 1997). This view implies that the quality of transport infrastructure in terms of capacity, connectivity, travel speeds, etc. largely determines the competitive advantage of locations relative to other locations, which is frequently measured in terms of potential accessibility.

There are numerous definitions of accessibility. An accepted designation is that accessibility refers to "the location of an area with respect to opportunities, activities or assets existing in other areas and in the area itself, where 'area' may be a region, a city or a corridor" (Wegener et al., 2002). Accessibility indicators can differ in complexity. More complex ones take account of the connectivity of transport networks by distinguishing between the networks themselves and the activities or opportunities that can be reached by them. These indicators always include in their formulation a spatial impedance term that describes the ease of reaching other such destinations of interest. The impedance can be measured in terms of travel time, cost or inconvenience.

Being one of those complex indicators, potential accessibility is based on the assumption that the attraction of a destination increases with size (e.g. of population or GDP) and declines with distance, travel time or cost. From that perspective, potential accessibility is a similar indicator to the demographic potential, in the sense that it relates the activities to be reached with the travel time it takes to reach them.

According to the ESPON 1.2.1 (ESPON, 2004), the potential accessibility is defined as follows:

$$A_i = \sum_j W_j^{\alpha} \exp(-\beta c_{ij})$$

"where Ai is the accessibility of area i, Wj is the activity W to be reached in area j, and cij is the generalised cost of reaching area j from area i. Ai is the total of the activities reachable at j weighted by the ease of getting from i to j. The interpretation is that the greater the number of attractive destinations in areas j is and the more accessible areas j are from area i, the greater is the accessibility of area i." (ESPON, 2004, p 276)

For each NUTS 3 of the ESPON space the potential accessibility was obtained by relating the travel time between the centroids of all regions with the population, through different modes of transportation (road, rail and air). The multimodal accessibility synthesizes all the other modes.

Initially, the potential accessibility was calculated basing on 2001 data within the context of ESPON 1.2.1 project, but potential accessibility index was with 2006 data following to an specific request by ESPON related to the 4th Cohesion Report. Thus, potential accessibility is available for two different years, making possible to analyse the evolution of the infrastructure during that period through an index change of accessibility. "For this, the accessibility values of 2001 are standardised to the ESPON average of that year and those of 2006 to the average of that year, each ESPON average is set to 100 and the regional values are transformed accordingly. (…) Positive values express an improvement of the relative locational quality, while negative values express a loss in relative locational quality." (S&W et al, 2007 p 9)

In parallel to physical accessibility, access to information and communication technologies (ICT) is critical to improve the competitiveness of European industry and to meet the demands of its society and economy. ICTs have a catalytic impact in three key areas:

- democracy and social mobility, by facilitating personal communication;
- productivity and innovation, by facilitating creativity and management;
- modernisation of public services, such as health, education and transport;
- science and technology, by supporting cooperation and access to information.

According to the European Commission (EC, 2010), wider deployment and more effective use of digital technologies will enable Europe to address its key challenges and will provide Europeans with a better quality of life through, for example, better health care, safer and more efficient transport solutions, cleaner environment, new media opportunities and easier access to public services and cultural content.

At the European level ICTs are supported through policy instruments such as the Digital Agenda for Europe, which is one of the seven flagship initiatives of the Europe 2020 Strategy, and will be analysed in this project through a simple indicator regarding households' broadband internet access.

5.2. Data and methods

Most of the data for accessibility available at the ESPON database is very outdated and available mostly for the 1999 NUTS version. The use of NUTS 1999 delimitations is specially limiting since changes in the coding systems and the actual boundaries of the regions have occurred in almost all of the countries in Europe. Nonetheless, as it has been said before the potential accessibility by different modes of transportation has been updated in 2006 and re-calculated for fitting the then ruling NUTS 3 delimitation retroactively for 2001 and is therefore available for two different and comparable years. This is particularly useful as this indicator does not limit itself to measuring the transport network, but synthesizes the overall accessibility of the

regions by relating the travel time (impendance function) with the population that can be reached (activity function).

As for connectivity data, the ESPON database has only very few indicators on a NUTS 2 level and for 2003. Given the advancements in this area, data from the 5th Cohesion Report and from the European Innovation Scoreboard regarding households' broadband internet access have been used.

Table 5.1. List of indicators used in the analysis

Variable name	Geographical scale	Source	Time frame
Potential accessibility road, rail, air and multimodal indexed to ESPON average	NUTS 3	ESPON DB	2001;2006
Potential accessibility road, rail, air and multimodal indexed to CBA average	NUTS 3	ESPON DB	2001;2006
Potential accessibility road, rail, air and multimodal index change 2001-2006	NUTS 3	ESPON DB	2001;2006
Households with broadband connection, 2009	NUTS 2	European Comission 5th Cohesion Report, Regional Innovation Scoreboard	2009 (2004 NO, PL)

5.3. Physical accessibility

Table 5.2 includes the complete list of potential accessibility values registered in the CBA standardised to ESPON and CBA average values. In this case, potential accessibility has been calculated basing on the demographic weight of all NUTS3 regions included in ESPON space (EU27+NO+CH), and thus, those areas that are closer to the denser pentagon area from a physical (for land transport) or time (for air transport) perspective. These values will be further discussed in the following sections.

Table 5.1. List of indicators used in the analysis

Nuts code	Nuts name	Standardised potential accessibility (ESPON=100)				Standardised potential accessibility (CBA=100)			
		Multimodal	Rail	Road	Air	Multimodal	Rail	Road	Air
ES211	Álava	77.1	66.4	54.7	81.6	102.7	97.4	79.6	104.6
ES212	Guipúzcoa	83.3	74.2	63.1	89.6	111.0	108.9	91.9	114.8
ES213	Vizcaya	102.8	47.8	56.9	114.8	136.9	70.1	82.8	147.1
ES220	Navarra	74.3	61	53.5	80.2	99.0	89.5	77.9	102.8
ES241	Huesca	38.2	46.3	39.5	34.2	50.9	67.9	57.5	43.8
ES242	Teruel	39.8	31.7	35.1	40.3	53.0	46.5	51.1	51.6
ES243	Zaragoza	56.3	62.5	57.7	50.4	75.0	91.7	84.0	64.6
ES511	Barcelona	125	68.2	73.3	141.1	166.5	100.1	106.7	180.8
ES512	Girona	79.5	66.9	70.5	83.3	105.9	98.2	102.6	106.7
ES513	Lleida	52.1	49.5	50.4	50.1	69.4	72.6	73.4	64.2

ES514	Tarragona	81.3	51.9	57.8	87.2	108.3	76.2	84.1	111.7
FR611	Dordogne	55	80.4	74.9	49.1	73.3	118.0	109.0	62.9
FR612	Gironde	104.5	100.5	80.7	112.6	139.2	147.5	117.5	144.3
FR613	Landes	59	72.8	53.8	58.3	78.6	106.8	78.3	74.7
FR614	Lot-et-Garonne	69.5	77.3	72.1	71.4	92.6	113.4	105.0	91.5
FR615	Pyrénées-Atlantiques	83.1	67.8	61.2	89.4	110.7	99.5	89.1	114.6
FR621	Ariège	65.5	54.1	67.5	67.8	87.3	79.4	98.3	86.9
FR622	Aveyron	82.2	43.5	70.4	90.8	109.5	63.8	102.5	116.4
FR623	Haute-Garonne	111.3	77.9	85.5	121.8	148.3	114.3	124.5	156.1
FR624	Gers	72.1	62.5	67	76.1	96.0	91.7	97.5	97.5
FR625	Lot	61.2	62.1	79.4	61.2	81.5	91.1	115.6	78.4
FR626	Hautes-Pyrénées	72	65.2	66.4	75.6	95.9	95.7	96.7	96.9
FR627	Tarn	71	61.5	70.4	74.7	94.6	90.2	102.5	95.7
FR628	Tarn-et-Garonne	91	71.9	80.1	97.6	121.2	105.5	116.6	125.1
FR811	Aude	75.1	83.3	83.4	75	100.0	122.2	121.4	96.1
FR812	Gard	81.9	117.9	104.8	76.4	109.1	173.0	152.6	97.9
FR813	Hérault	86.5	105	94.8	87.8	115.2	154.1	138.0	112.5
FR814	Lozère	55.1	61.9	84.2	53.8	73.4	90.8	122.6	68.9
FR815	Pyrénées-Orientales	71.2	84.4	83.1	70.9	94.9	123.8	121.0	90.9

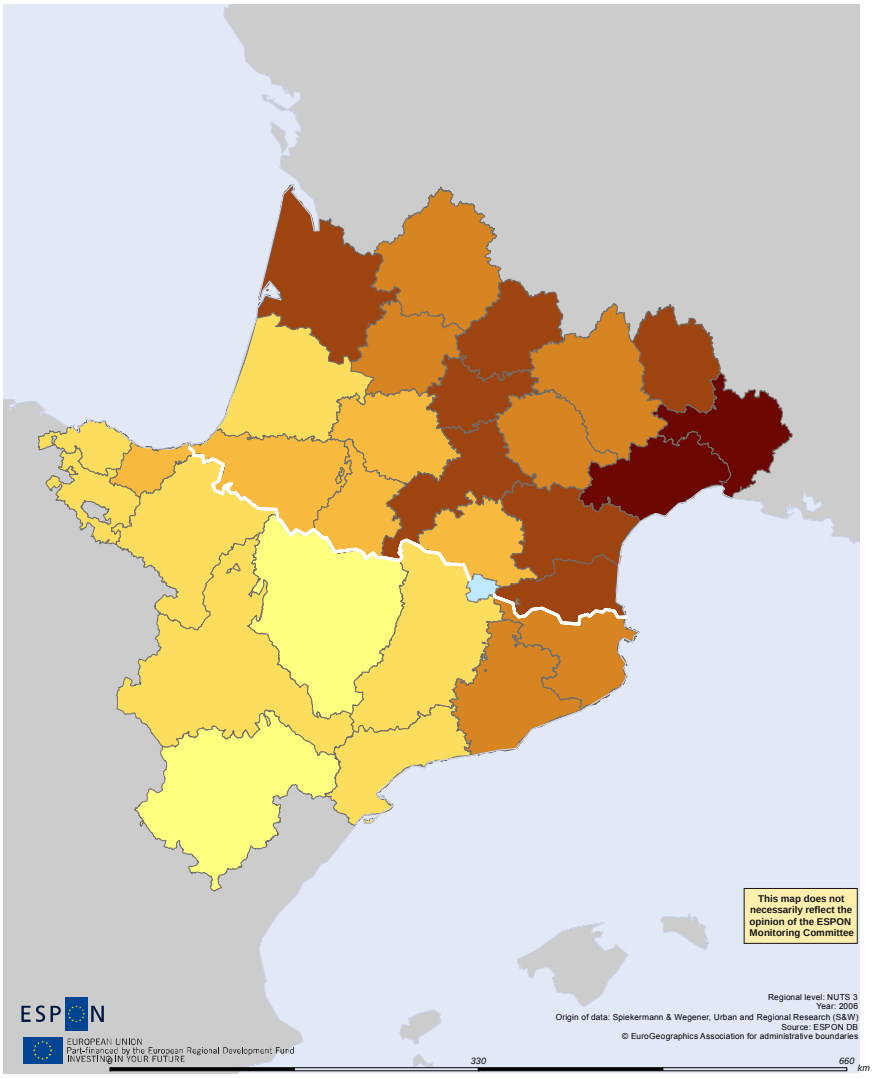
Source: Own elaboration based on S&W (2007) and ESPON 1.2.1 - Transport services and networks

Road accessibility

Map 5.1 shows the degree of accessibility by road of NUTS3 areas. The map shows that the most accessible regions within the CBA are those French areas distributed along the Mediterranean coast and the Garonne valley, especially Gard and Hérault, thus two of the French departments found at greater distances from the Pyrenees. As a matter of fact, Gard is the only region within the CBA that holds an accessibility index above the ESPON space average. Also the French departments of Haute-Garonne, Lozère, Aude, Pyrénées-Orientales, Gironde, Tarn-et-Garonne, Lot, Dordogne, Lot-et-Garonne, Girona, Aveyron and Tarn are more accessible than CBA average, while all Spanish provinces, excluding Barcelona and Girona, show potential accessibility by road below the CBA average. The only areas to the North of the border that have values below average are Ariège, Gers, Hautes-Pyrénées, Pyrénées-Atlantiques and Landes, most of them found within the Pyrenean domain.

The situation described above did not change much in most regions from 2001 to 2006. During that period, most areas increased their potential connectivity at comparable rates. This seems evident especially in some French regions such as Dordogne, Lot, Ariège and Tarn-et-Garonne, with net index changes of more than five points indexed to CBA average. Gironde, Haute-Garonne, Lot-et-Garonne, Zaragoza and Hautes-Pyrénées increased their respective accessibility values by less than 2 points, while the only areas to loss accessibility in relative terms were Hérault, Lozère, Aveyron and Gard.

Map 5.1. Potential accessibility by road in the CBA



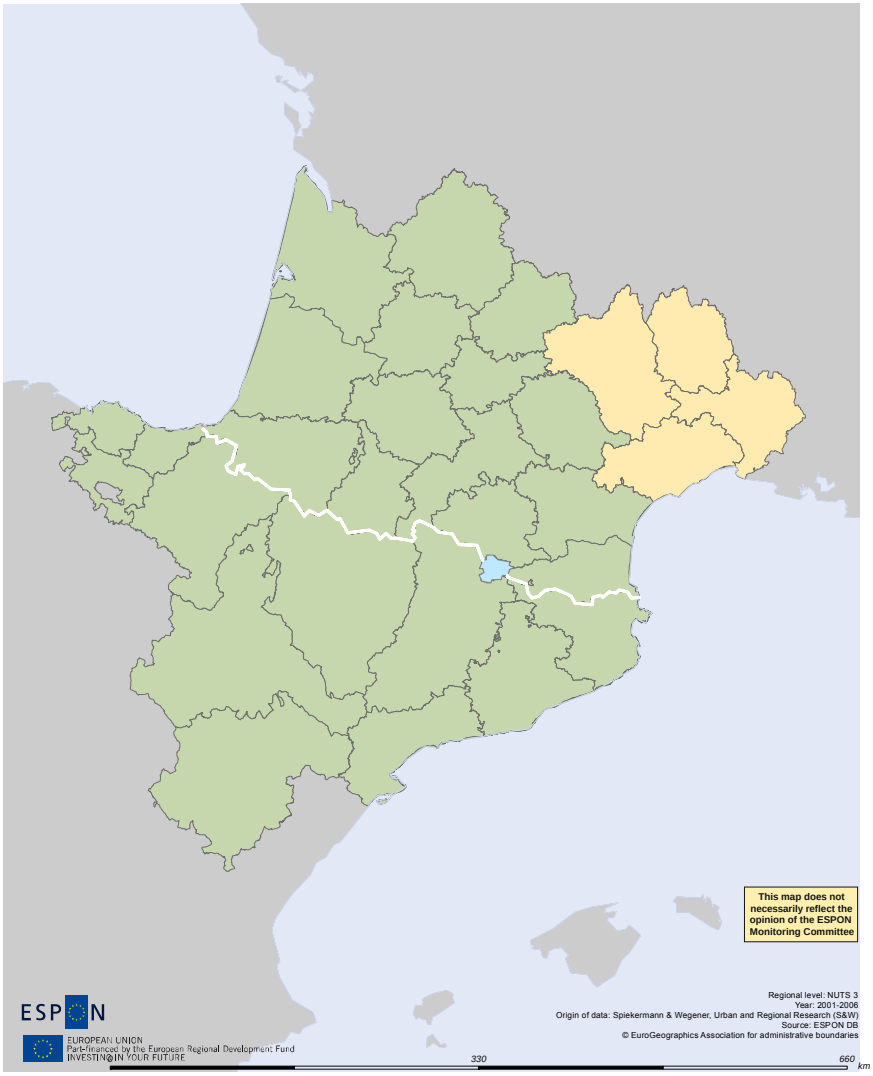
Legend

Potential accessibility by road indexed to Cross Border Region average (=100), 2006

<= 57,50	100,01 - 112,34	<missing value>
57,51 - 84,14	112,35 - 125,71	
84,15 - 100,00	>= 125,72	

The variations observed between the dissimilar variation rates determined minor changes in the relative rankings of several regions: Pyrénées-Orientales, Barcelona and Tarn lost two positions in terms of accessibility within the CBA regional ranking, while Aveyron lost three positions. In contrast, Dordogne jumped from position 15 to 10 and Haute-Garonne and Ariège outstripped two other regions in terms of road accessibility. In absolute terms, it appears that French departments improved more than Spanish regions in terms of road accessibility, making the gap between both sides of the border bigger than in 2001. Dordogne, Lot, Ariège and Tarn-et-Garonne were the regions that improved most, with an average increase than 5 points, indexed to CBA average. Remarkably, the only regions that lost accessibility by road were also French, although at a very smooth rate. These areas were Aveyron, Lozère, Hérault and Gard. Cross-border NUTS3 regions performed in positive terms, producing positive increases ranging from 0.3 points (Pyrénées-Orientales) to 2.8 points (Haute-Garonne).

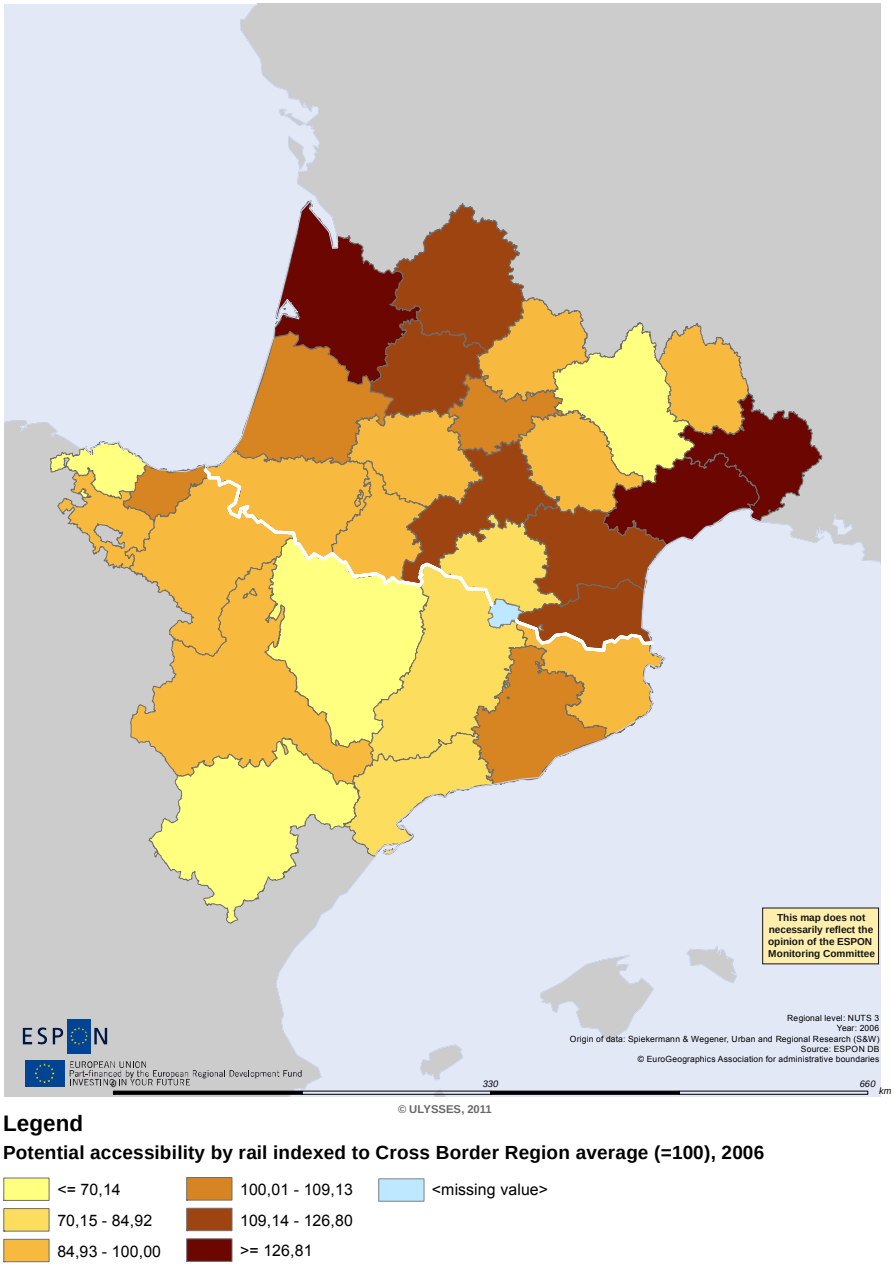
Map 5.2. Potential accessibility by road index change



Rail accessibility

In terms of rail accessibility the divide between French and Spanish regions is even more obvious. While the most accessible region by road performed less than three times better than the remotest one, in case of rail accessibility this value increased to 3.7 times. Again, those French regions closer to the Mediterranean and Atlantic coasts, and to a limited extent also along the Garonne valley, have bigger accessibilities in comparison to Spanish regions. The only Spanish regions with rail accessibilities slightly over the CBA average are Gipúzcoa and Barcelona, both closer to the French border and in the case of Barcelona also with a considerable demographic weight that might have impacted the final value.

Map 5.3. Potential accessibility by rail in the CBA



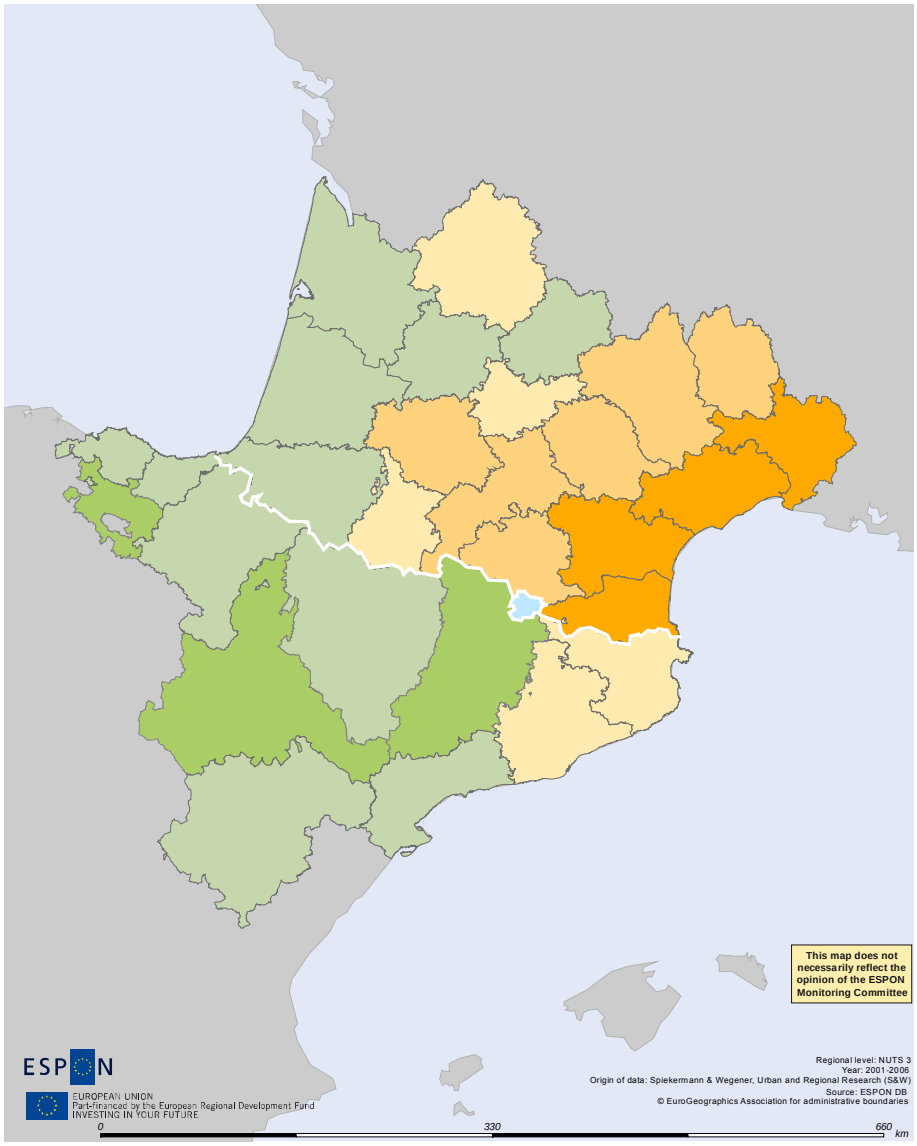
Legend

Potential accessibility by rail indexed to Cross Border Region average (=100), 2006

<= 70,14	100,01 - 109,13	<missing value>
70,15 - 84,92	109,14 - 126,80	
84,93 - 100,00	>= 126,81	

Contrary to road accessibility, where the border effect was not perceivable in dynamic terms, it appears that from years 2000 to 2006 Spanish provinces have behaved better than French departments in terms of rail accessibility. All regions with a net increase of the accessibility index of more than 3 points are from the Spanish sector (Álava, Zaragoza, Lleida, Guipúzcoa, Navarra, Vizcaya, Huesca and Teruel). Also contrary to road accessibility, all regions that lost accessibility by rail belonged to the French sector, with the only exceptions of Girona (-0.3) and Barcelona (-1.1). Those areas that lost most accessibility were Lozère, Pyrénées-Orientales, Aude, Hérault and Gard, with a net loss under -5 points. Note that two of them, Lozère and Pyrénées-Orientales, belonged to the core Pyrenean domain.

Map 5.4. Potential accessibility by rail index change



© ULYSSES, 2011

Legend

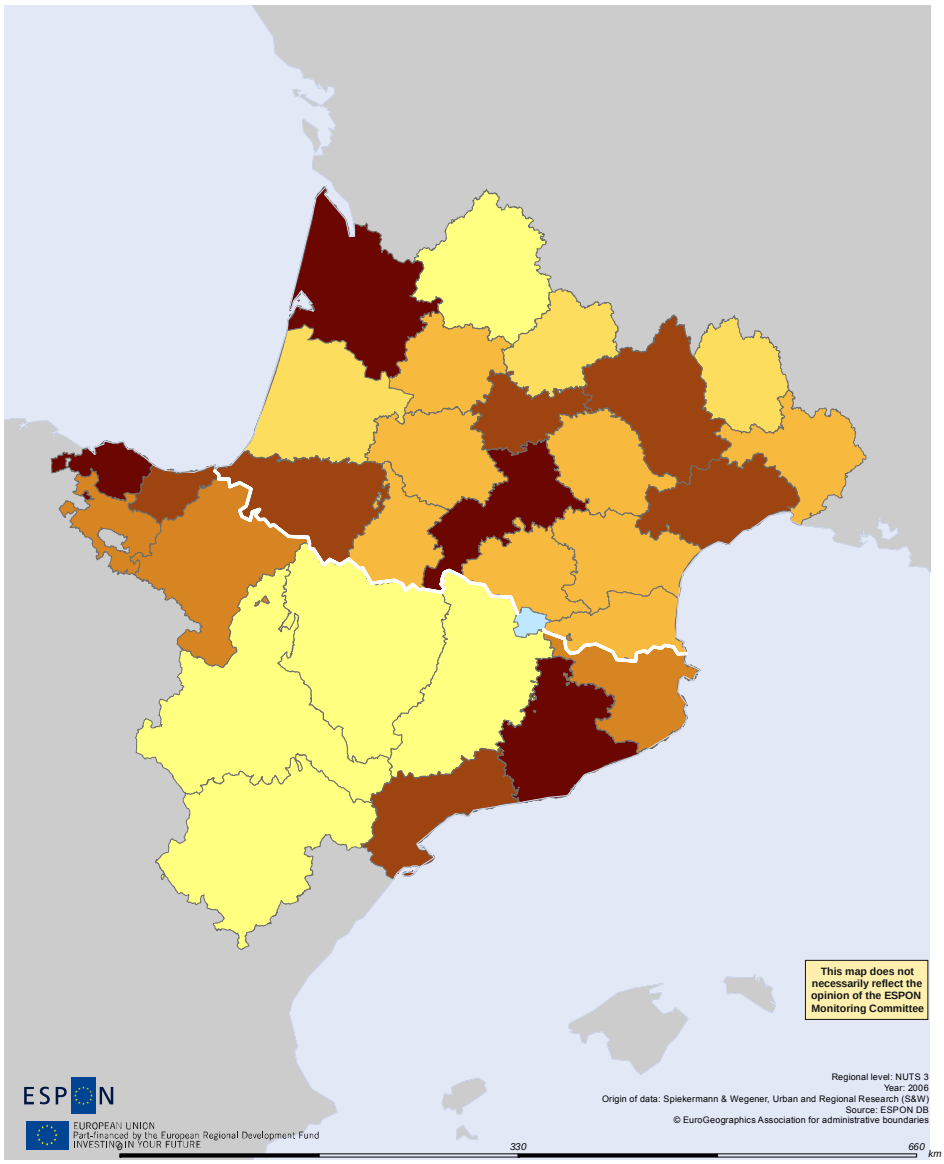
Potential accessibility by rail standardised index change, 2001-2006

- <= -6,10
- -6,09 - -2,10
- -2,09 - 0,00
- 0,01 - 6,30
- 6,31 - 13,80
- >= 13,81
- <missing value>

Air accessibility

Air accessibility offers a completely different picture compared to accessibility by land transport. Here, the presence of an international airport with a high number of international connections makes the difference. In this regard, the regions that shelter a big urban centre with an international airport are more accessible than other areas. Accordingly, in 2006 the most accessible NUTS3 regions by air were Barcelona, Haute-Garonne (though Toulouse airport), Vizcaya (through Bilbao airport) and Gironde (through Bordeaux airport). Oddly, Zaragoza, another important regional FUA within the CBA, ranked under the average (64.6). In general terms, the whole Aragon Autonomous Community appeared notably less accessible than other areas, as similarly to Zaragoza, Teruel and Huesca were the least accessible areas by air within the entire CBA.

Map 5.5. Potential accessibility by air in the CBA



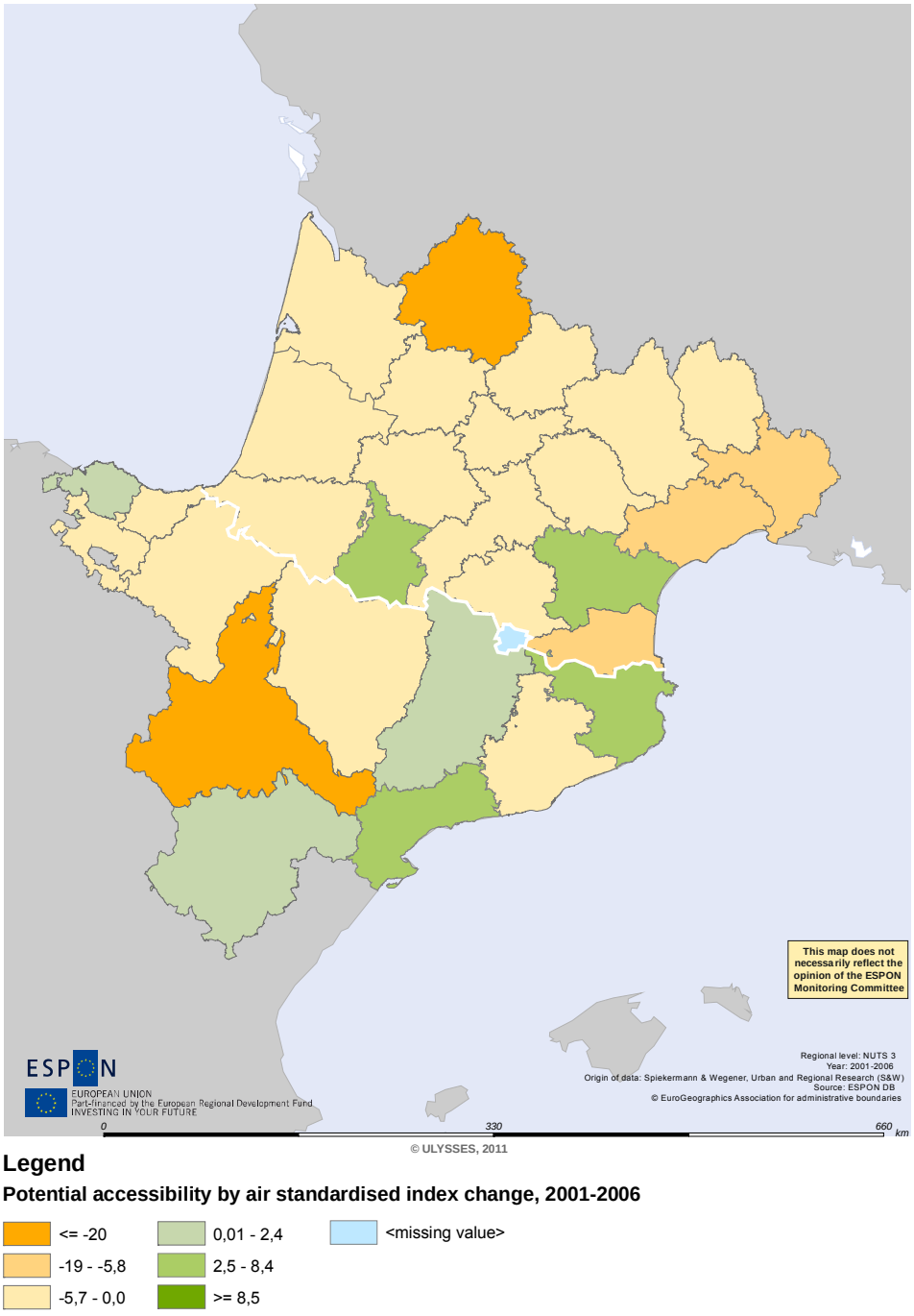
Legend

Potential accessibility by air indexed to Cross Border Region average (=100), 2006

<= 64,80	100,01 - 107,15	<missing value>
64,81 - 85,25	107,16 - 133,48	
85,26 - 100,00	>= 133,49	

The most accessible region within central Pyrenean domain was Haute-Garonne. Toulouse airport is an essential asset for the entire mountainous region and its potential to serve not only confining French regions but also some isolated Spanish areas from the central mountainous setting should be considered as well in any cross-border spatial planning initiative. Barcelona, Haute-Garonne, Vizcaya and Gironde resulted the only regions within the entire CBA to hold an accessibility by air above ESPON space average.

Map 5.6. Potential accessibility by air index change



Legend

Potential accessibility by air standardised index change, 2001-2006

<= -20	0,01 - 2,4	<missing value>
-19 - -5,8	2,5 - 8,4	
-5,7 - 0,0	>= 8,5	

In terms of dynamic behaviour, it appears that some Spanish provinces have increased their accessibilities drastically in recent years. From 2001 to 2006, Tarragona, Hautes-Pyrénées, Girona, Lleida and Teruel all increased their accessibility by air in absolute terms. The only French region that showed a comparable trend was the department of Aude, which increased its air accessibility by more than 6 points measured in percentage of ESPON average for 2006. Still, this former department remained under CBA average in absolute terms.

In opposition, some other areas lost track in recent years in terms of air accessibility. Particularly Pyrénées-Orientales, Dordogne and Zaragoza showed a very negative behaviour, with absolute losses on the accessibilty index of more than 10 points. Also Tarn-et-Garonne, Barcelona, Landes. Huesca, Haute-Garonne, Hérault and Gard performed very badly, with absolute deficits of more than 3 points measured in percentage of ESPON average for 2006.

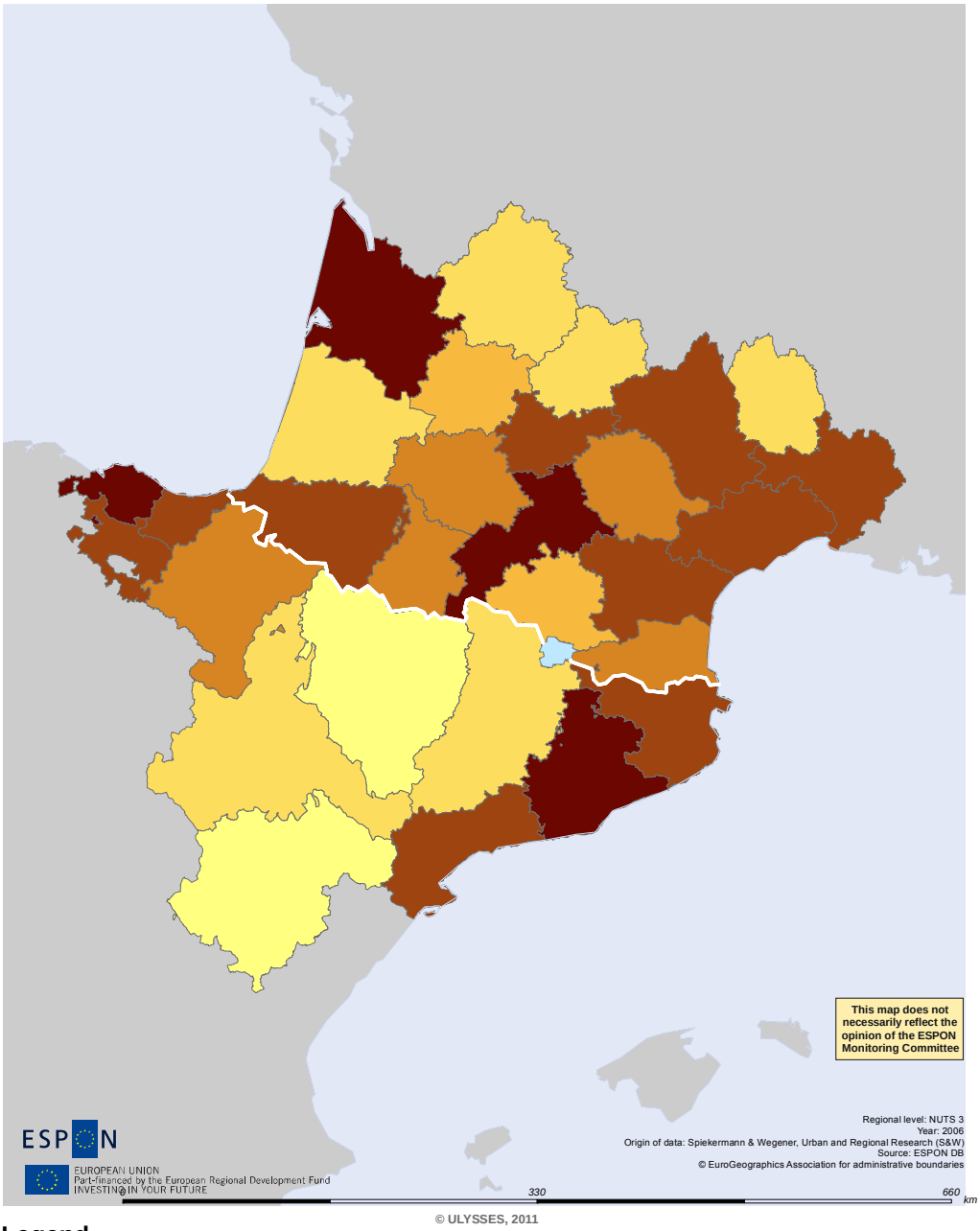
In conclusion, contrary to surface accessibility, air accessibility is very conditioned by proximity to local airport hubs. This, more than the overall population of the area, determines most the degree of accessibility of each NUTS3 region within CBA.

Multimodal accessibility

Multimodal accessibility combines the three types of transport accessibilities in one indicator. From the perspective, the most accessible regions within the CBA are Barcelona, Haute-Garonne, Gironde and Vizcaya, all of which show multimodal accessibility indexes above ESPON average. Some other regions, namely Tarn-et-Garonne, Hérault, Guipúzcoa, Pyrénées-Atlantiques, Aveyron, Gard, Tarragona, Girona, Álava and Aude are more accessible than CBA average, but less than ESPON average. However, all these areas hold indexes above 75% of ESPON average.

Those areas that remain under ESPON average in terms of multimodal accessibility are Landes, Zaragoza, Lozère, Dordogne, Lleida, Teruel and Huesca, the former two holding less than half of ESPON average. This confirms that central Pyrenean regions to the North of the international boundary are remarkably more accessible than those found to the South. In this respect, Hautes-Pyrénées and Pyrénées-Orientales are both above 70% of ESPON average, while Ariège is over 65% of that value. Outstandingly, Zaragoza, a main FUA within the entire CBA and the main city found in the south-central sector of the area, is one of the least accessible regions of the entire CBA, with a multimodal accessibility index slightly over ESPON average.

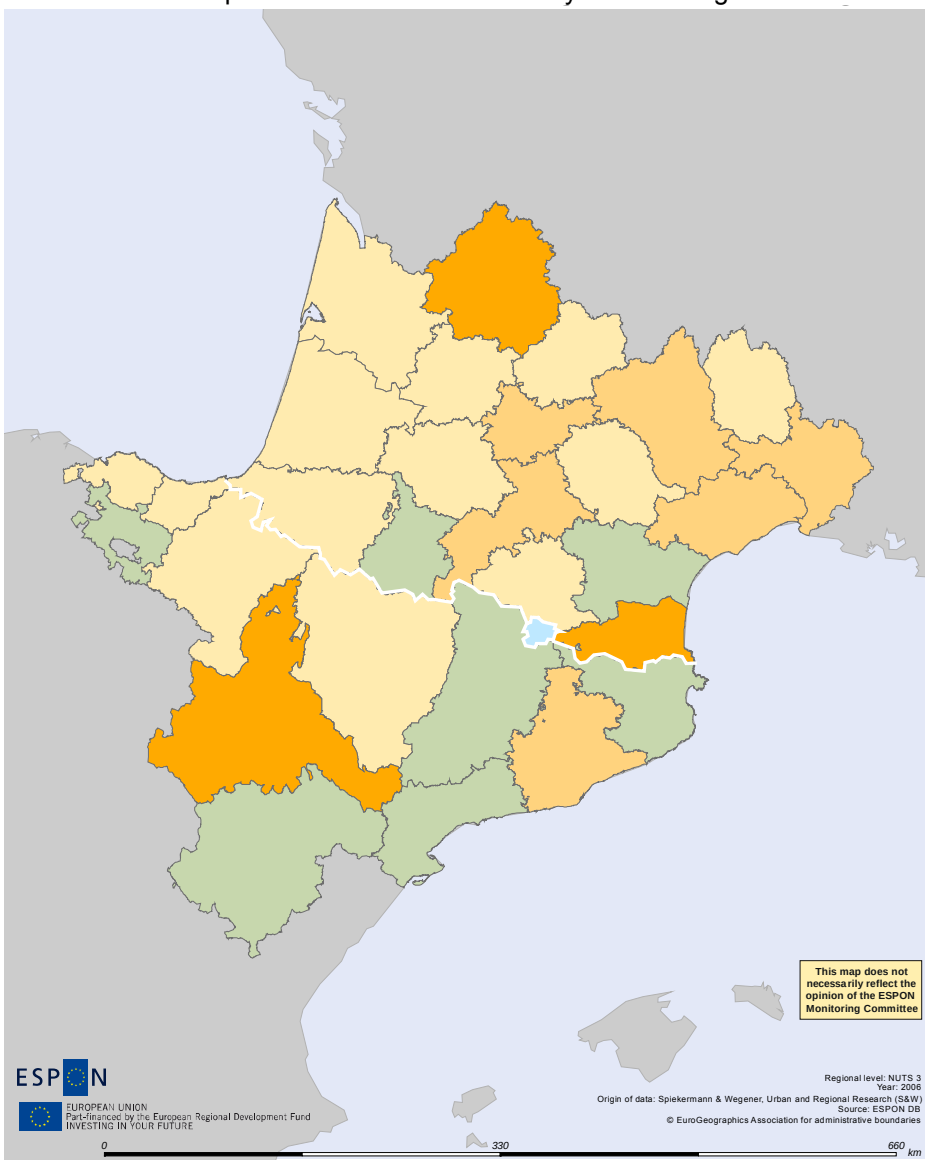
Map 5.7. Multimodal accessibility by road in the CBA



An important trend observed in terms of multimodal accessibility is that most regions located along the Mediterranean coast, namely Tarragona, Aude, Lleida and Girona, together with Hautes-Pyrénées, Teruel and, to a lesser extent, Alava, are the only areas that have gained multimodal accessibility during recent years. An important exception to this general rule has been Pyrénées-Orientales, which has lost more than 5 points measured in percentage of ESPON average for 2006 accessibility, together with regions such as Hérault, Gard, Dordogne and especially Zaragoza. Apart from the important exceptions of Lleida and Hautes-Pyrénées Pyrenean regions, namely Ariège, Huesca, Navarra, Pyrénées-Atlantiques and especially

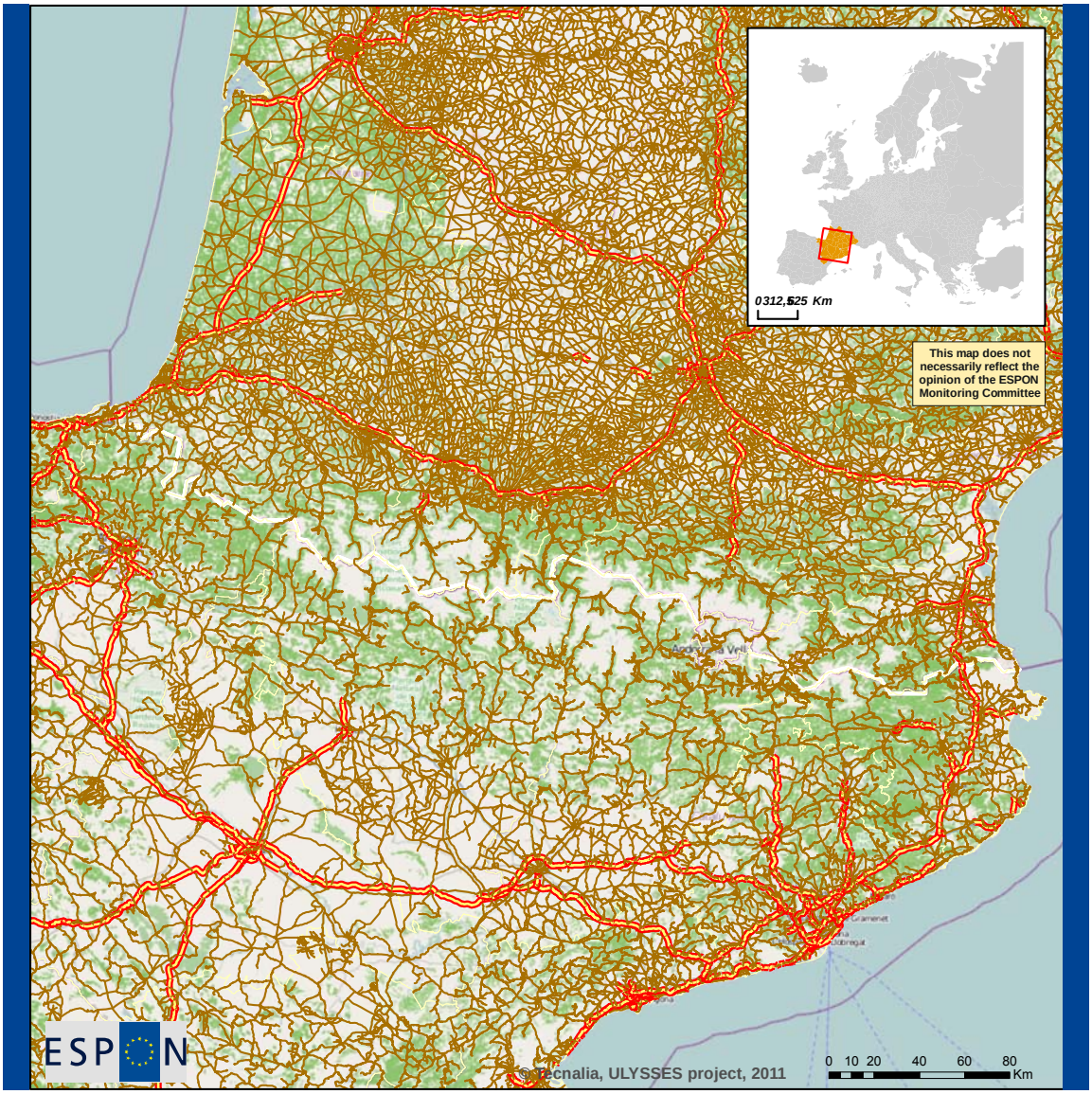
Haute-Garonne have become less accessible over the period 2001-2006 in comparison to ESPON general trends.

Map 5.8. Multimodal accessibility index change



Despite being relevant, all the datasets discussed above do not say much about internal connectivity, which in mountainous contexts such as the Pyrenees acts as an even more important driver boosting endogenous economic development as compared to outward connectivity and accessibility. The following maps seek to produce evidence on this internal dimension of connectivity by analysing the densities of road and railroad networks at the NUTS3 level within the CBA.

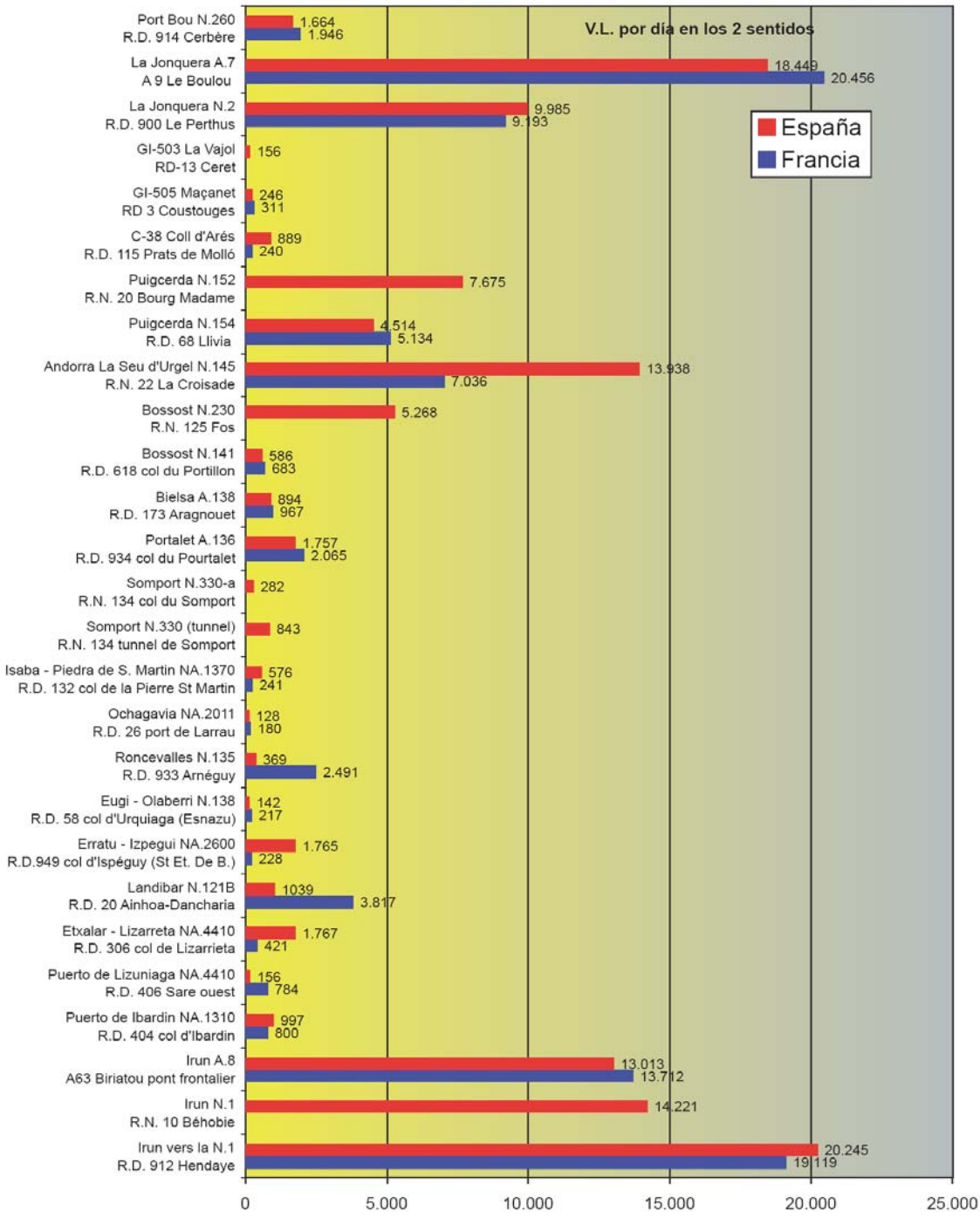
Map 5.9. Road network within the CBA



Road network within the CBA is characterised by very different structures on the three countries. France counts on a more developed motorway network articulated along the Mediterranean, Atlantic and Garonne main corridors. Spain holds a much weaker road network that is also organised along three corridors: Mediterranean, Atlantic and Ebro. Thus, the Pyrenees, Andorra included, are served by a secondary road network that connects the abovementioned corridors emulating a natural drainage system.

As showed by Map 5.9, in terms of international connectivity there are no less than 27 different alternative crossings enabling communication between the three countries. However, the only high capacity routes connecting Spain and France (Andorra do not have high capacity motorway at all) are traced close to the Mediterranean and Atlantic seas. Thus, most vehicles, both light and heavy, use those crossings in the detriment of the central alternatives.

Figure 5.1. Average annual daily traffic intensity of light vehicles (2008)[17]



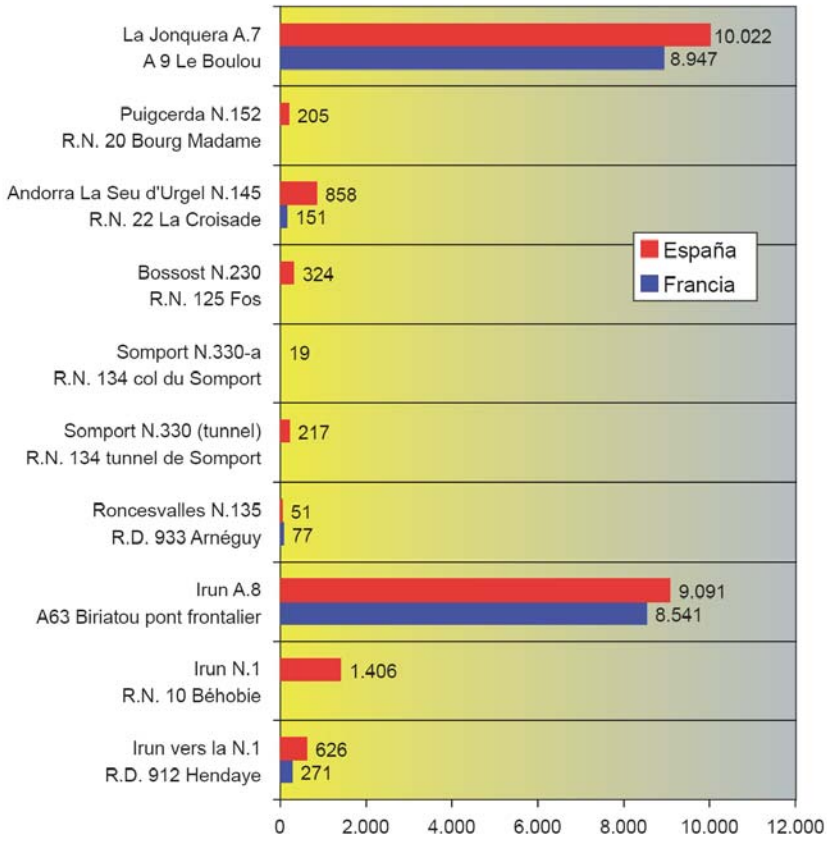
Source: Observatorio hispano-francés de Tráfico en los Pirineos, 2010

[17] Differences between Spanish and French data are given mainly by the different distance of the gauging stations of both countries.

According to Figure 5.1, a total of 119 700 light vehicles crossed the Spain-France border in 2008. A 29% of those vehicles used the coastal highways, plus a 38% that crossed through coastal ordinary motorways. The remaining 33% of them used any of the additional 20 mountain crossings distributed along the Pyrenees at quite regular intervals.

Among all the 27 road crossings mentioned above, only 10 of them register relevant traffic of heavy vehicles. Indeed, this type of vehicles shows an even more marked bias towards coastal crossings. Among the total amount of 20 400 vehicles that crossed daily the Spain-France border on average, 84% passed through a toll highway either over the Jonquera-Le Bolou or Irun-Biriatou routes. As for the remaining vehicles, 8% crossed through coastal motorways and only 8% through central mountain passes.

Figure 5.2. Average annual daily traffic intensity of heavy vehicles (2008)[18]



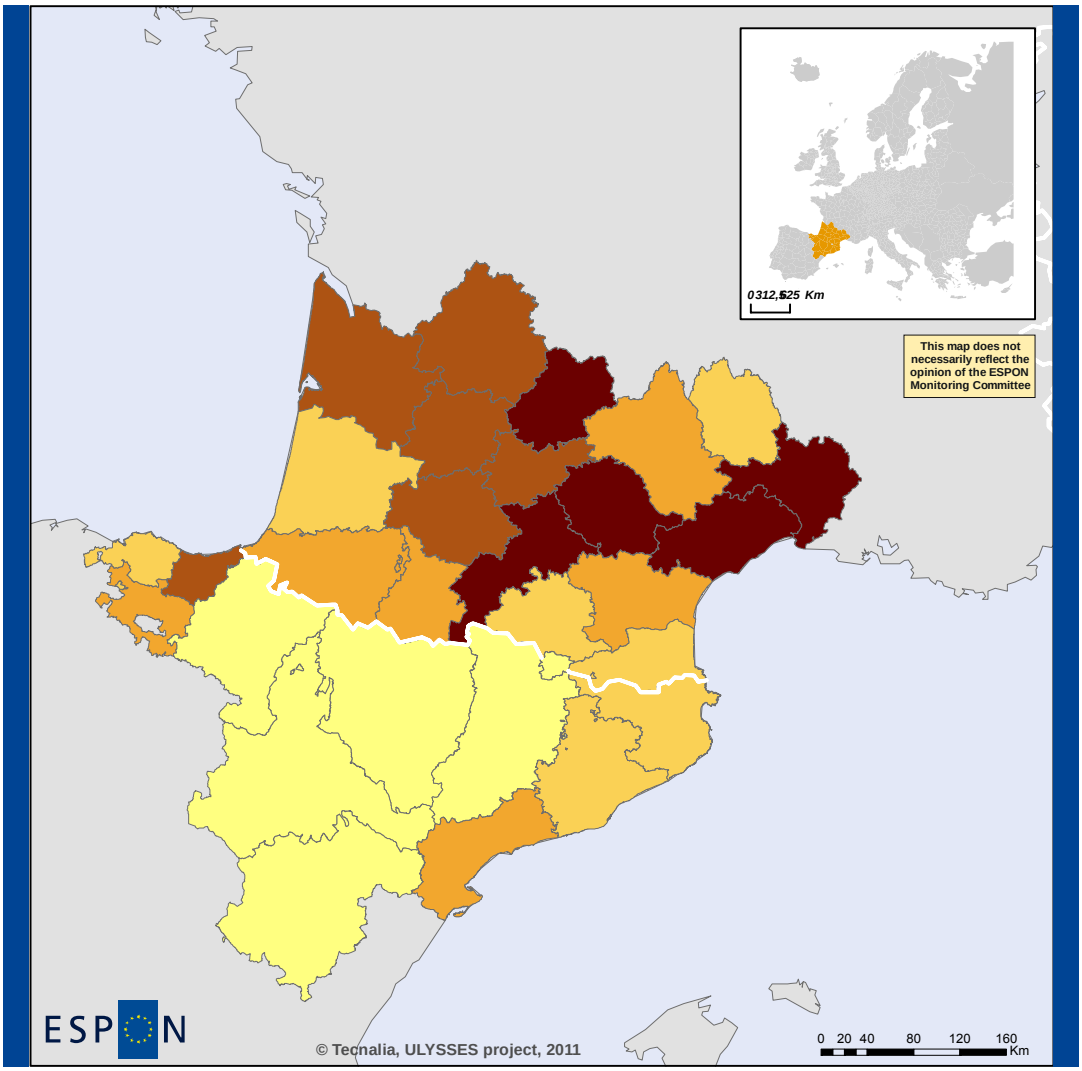
Source: Observatorio hispano-francés de Tráfico en los Pirineos, 2010

With regard to road density, the CBA clearly shows an evident North-South divide between the French and the Spanish sectors. To the North, many departments, namely Hérault, Lot, Gard and Tarn hold more than 800 metres of motorways per square kilometre of surface area, while Haute-Garonne has more than one kilometre of paved roads per square kilometre of surface. To the South, many Spanish provinces, particularly the Aragonese provinces of Teruel, Huesca and Zaragoza, plus Andorra, have less than 400 metres of motorways per square kilometre of superficial area. However, as evidenced by Map 5.9, the motorway

[18] Differences between Spanish and French data are given mainly by the different distance of the gauging stations of both countries.

network is not distributed homogenously over the territory, as the core mountainous area holds a much lower density of paved roads than the remaining regions.

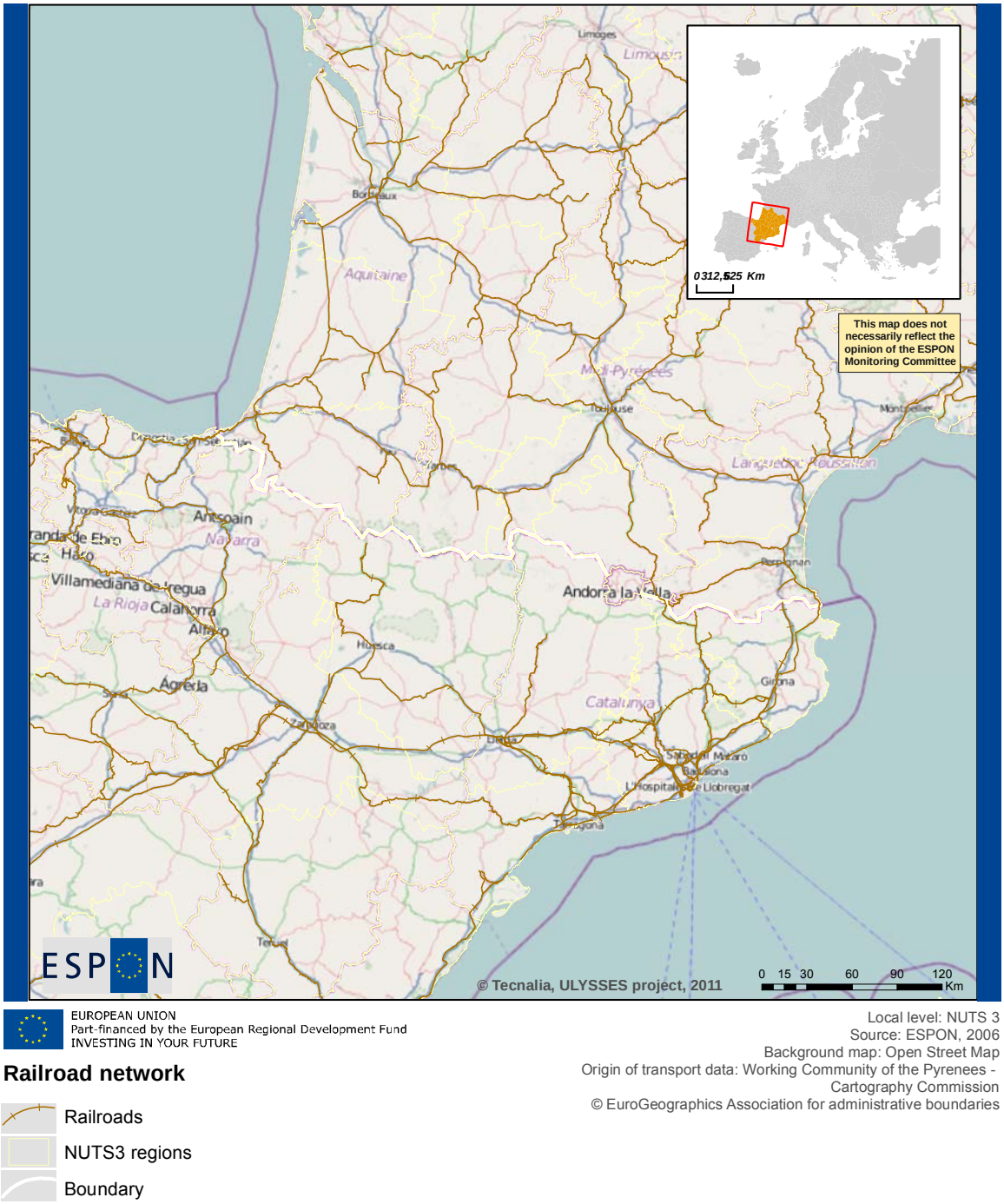
Map 5.10. Road density at NUTS3 level



The railroad network is ruled by a different spatial logic in comparison to the motorway system, which is a natural consequence of the latter being almost 15 times denser than the former. Railroads usually connect urban centres following the same routes employed by the main roads, but it goes without saying that the connectivity of the railroad network is enabled exclusively though a limited number of nodes (i.e. the train

stations) found along the line. Most railroads within the CBA have an urban origin and destination, while the presence of rail lines within the rural setting is quite an exceptional occurrence, if not as mere transit areas.

Map 5.11. Railroad network within the CBA



EUROPEAN UNION
Part-financed by the European Regional Development Fund
INVESTING IN YOUR FUTURE

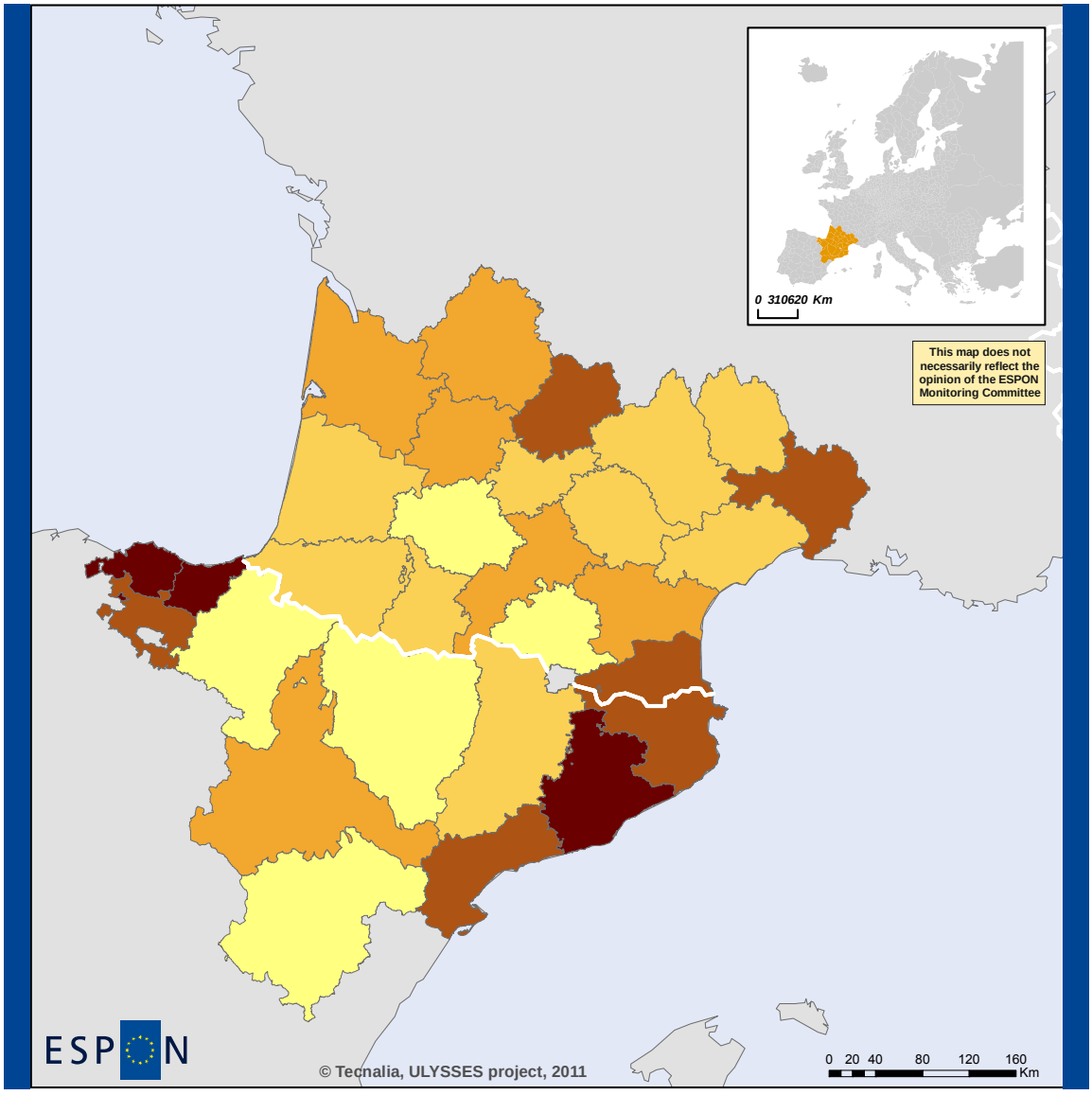
Local level: NUTS 3
Source: ESPON, 2006
Background map: Open Street Map
Origin of transport data: Working Community of the Pyrenees - Cartography Commission
© EuroGeographics Association for administrative boundaries

Railroad network

- Railroads
- NUTS3 regions
- Boundary

In this regard, those lines ending within the mountainous domain on both sides of the border (Huesca-Canfranc and Montréjeau-Gourdan-Polignan-Bagnères de Luchon) represent a picturesque exception to this general rule that might however offer relevant opportunities for the endogenous development of those areas. Oddly, these rail lines do not link both countries (Andorra does not have a single rail track in its territory), but end in the Pyrenees.

Map 5.12. Railroad density at NUTS3 level



EUROPEAN UNION
Part-financed by the European Regional Development Fund
INVESTING IN YOUR FUTURE

Local level: NUTS 3
Source: ESPON, 2006
Origin of transport data: Working Community of the Pyrenees - Cartography Commission
© EuroGeographics Association for administrative boundaries

Density of transport networks - Rail
km per sq km

- 0,016837 - 0,026523
- 0,026524 - 0,037712
- 0,037713 - 0,048009
- 0,048010 - 0,077071
- 0,077072 - 0,123835
- No data

Several studies have been conducted in relation to the possibility of linking some of those disconnected networks, particularly the Pau–Zaragoza line through the so-called “Central Pyrenees Crossing” (see for example Auphan, 2001, Ministère des Transports, 2006 and Logitrans, 2010), and broadly speaking a number of international cooperation initiatives have been launched for improving cooperation in the area. Of

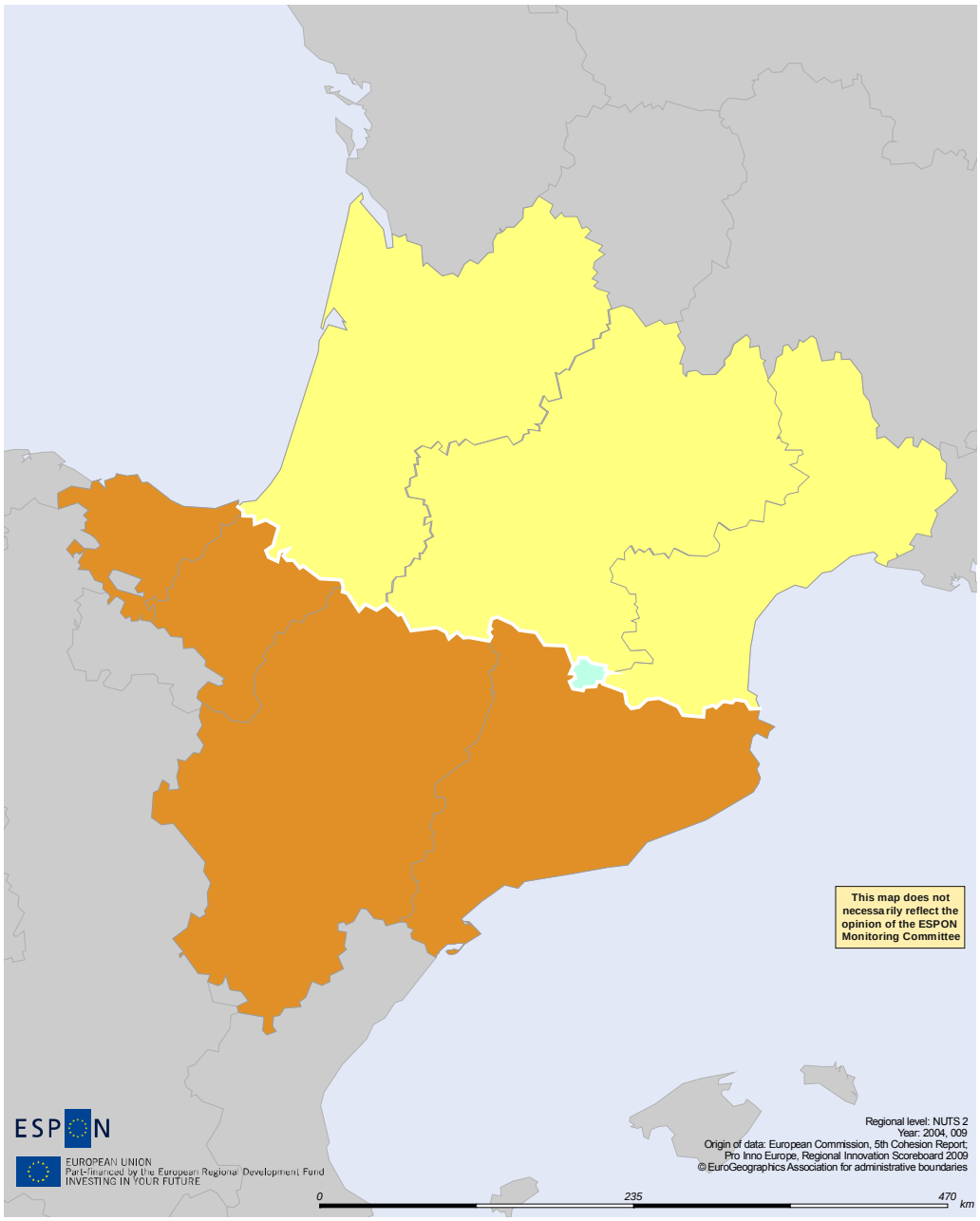
those, the most recent example is Espacio Portalet, a European Grouping for Territorial Cooperation (EGTC) formed by Aragón and the French department of Pyrénées-Atlantiques which has as one of its main objectives improving accessibility in the area.

All in all, in contrast to the motorway network the rail system seems to be comparatively denser in the Spanish sector of the CBA than in the French area. Particularly, the provinces of Barcelona, Vizcaya and Guipúzcoa have around 100 meters of railroads by square km of surface area, while Tarragona, Álava and Girona have more than 50. The only French departments to reach the latter proportion are Gard, Pyrénées-Orientales and Lot. To the lower end of the distribution one finds the same areas that performed equally bad in terms of motorway density, such as Navarra, Ariège, Huesca and Teruel. All these regions have a railroad density of around 20 meters of rail track per square kilometre.

5.4. ICT connectivity

Broadband accessibility data could not be obtained at the same spatial level on both sides of the border. While on the Spanish sector this indicator was available at NUTS2 level, to the French side the index was only available at NUTS1 level, a much broader scale. In any case, the available figures showed that in 2009 Cataluña was the only NUTS2 region with more than 60% of its households with broadband internet connection. All other areas, that is, the remaining NUTS2 regions in Spain and the two NUTS1 regions that take part in the Working Community of the Pyrenees on the French sector, showed a broadband penetration ranging from 50% to 60% in 2009: Méditerranée (57,58%), País Vasco (55,18%), Comunidad Foral de Navarra (52,36%), Sud-Ouest (52,17%) and Aragón (50,82%).

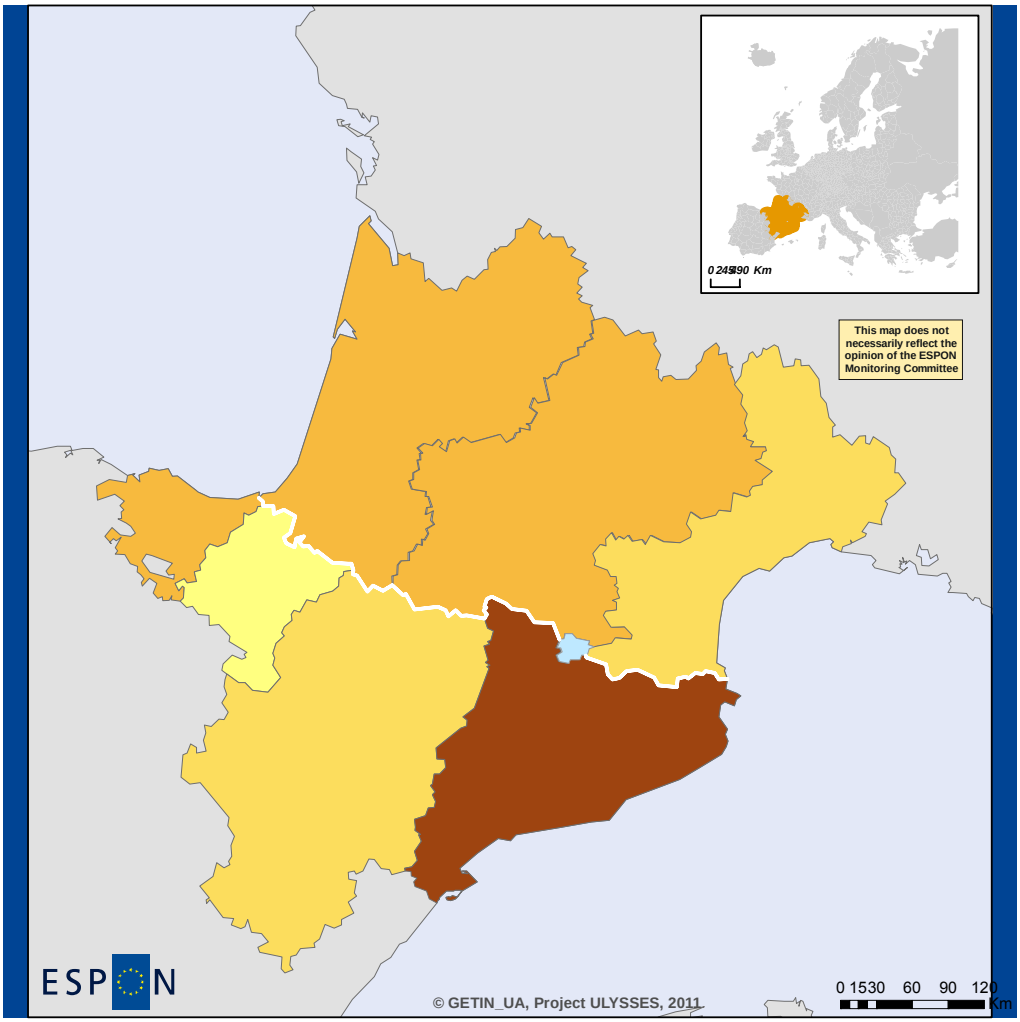
Map 5.13. Households with broadband internet access



More expressive than household broadband penetration results the composite indicator of internet infrastructure for 2008. This indicator has been constructed by DG REGIO at NUTS2 level as the average of the following indicators: (i) international internet backbone capacity; (ii) Internet exchange point (IXP) peak traffic, and; (iii) IP addresses. This indicator is thus a measure of the accumulated weight of a given region in terms of internet capacity. By far, the most connected region from this perspective is Cataluña, followed at the distance by Midi-Pyrénées, Aquitaine, and Pais Vasco. Aragón, Languedoc-Roussillon and ultimately Navarra are located in the lower end of the distribution. Without entering into details, it could be concluded

that the distribution of the composite indicator of internet infrastructure mirrors the overall distribution of the population of the different regions within the CBA.

Map 5.14. Composite indicator of Internet infrastructure



EUROPEAN UNION
Part-financed by the European Regional Development Fund
INVESTING IN YOUR FUTURE

Local level: NUTS 2
Year: 2008
Source: ESPON Database
Origin of data: DG REGIO
© EuroGeographics Association for administrative boundaries

Legend

Composite indicator of internet infrastructure, 2008 (max:100)

- <=0,13
- 0,14 - 0,33
- 0,34 - 0,71
- 0,72 - 1,82
- 1,83 - 5,26
- >= 5,27
- missing value

Composite indicator on the Internet infrastructure, calculated as the average of the following Internet infrastructure indicators: international Internet backbone capacity, peak traffic at IXPs and IP addresses all at regional level

5.5. Chapter conclusions

1. There is not much information available about regional accessibility, especially about internal accessibility, on which to draw a coherent and evidence based description on the issue. In alternative, this analysis relies on set of proxy indicators mainly related to physical accessibility and internet connectivity at the European level.
2. Accessibility by road clearly shows that the Spanish sector of the CBA is comparatively much more isolated from European core areas than French regions, even though Gard is the only NUTS3 region within the CBA to hold an accessibility level over ESPON average. Particularly, remote Pyrenean areas and the ill communicated province of Teruel can be considered the remotest areas within the CBA. However, most areas within the CBA have improved their accessibility by road from 2001 to 2006.
3. In terms of rail accessibility the overall situation is quite similar to the one described above, as Guipuzcoa and Barcelona are the only regions from the Spanish sector to perform above the CBA average. The particularity here is that not all regions performs equally well in terms of rail accessibility, as areas like Lozère, Ariège and especially Aveyron show accessibility rates neatly under ESPON and CBA averages. Another important difference with respect to road accessibility is that in recent times those regions that have performed best are Spanish provinces instead of French departments (Álava, Zaragoza, Lleida, Guipúzcoa, Navarra, Vizcaya, Huesca and Teruel)
4. Air accessibility offers a completely different picture, where the difference is made by the presence of an international airport and not by the physical distance to the pentagon area. Consequently, those areas ranked on top of the distribution are the most urbanised regions (Barcelona, Haute-Garonne, Vizcaya, Gironde …) All these areas show accessibilities by air over ESPON average. As far as air connectivity is concerned, it can be concluded that the French sector of the core Pyrenean area is much better connected than the Southern area through Toulouse hub. Even the important FUA of Zaragoza, situated some 200 km to the South with respect to the mountainous range, lacks of an international airport of sufficient entity. Even more, from 2002 to 2006 Zaragoza has lost more than 25 points measured in percentage of ESPON average for 2006
5. Multimodal accessibility almost mirrors air accessibility, with the most urban areas ranked highest on the distribution and the less populated, more rural regions falling behind on the list. Also those areas that showed a better behaviour in recent years in terms of air accessibility are those ranked best with regard to multimodal accessibility.
6. Road densities proved to be much higher to the French sector of the CBA, while the rail system seemed to be slightly more developed on Spanish regions. Rail connectivity between Spain and France though the central Pyrenees is not possible as some lines are not coincident on both sides of the border or some parts of them are closed. Crossing the Pyrenees through high capacity roads is only possible on the most Western and Eastern extremes of the mountain range. These are the areas that have secularly canalised most of the commercial and passenger exchanges between France and Spain.
7. Last figures available show that broadband penetration and internet usage is above the European average in all NUTS2 regions within the CBA. According to these figures, in 2009 more than half of the households within all regions of the CBA had a broadband internet connection. Either from this

perspective as well as from the point of view of internet infrastructure facilities, it appears that Cataluña is the most connected region within the CBA.

Chapter 6 – Gothenburg and Lisbon/Europe 2020 strategy

6.1. Aims, indicators and methods applied in the study

"To become the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion by 2010"

This was the new strategic goal for the European Union, agreed on 23 and 24 March 2000 by the European Council in a special meeting in Lisbon. The "**Lisbon Strategy**", as it is commonly known, is a ten-year strategy and a commitment by the EU governments to concentrate their efforts on a single overarching goal to bring about economic, social and environmental renewal in the EU. The main instruments of the Lisbon agenda were economic reforms, and investment in growth-enhancing areas like R&D and human capital.

As a complement to the "Lisbon Strategy", the EU adopted an ambitious strategy for sustainable development at the Gothenburg Summit in 2001, hence also known as the "**Gothenburg Strategy**". The Gothenburg European Council added the environmental dimension to the Lisbon process as its "third pillar" to be added to economic and social reform.

The priorities were: combating climate change, ensuring sustainable transport, addressing threats to public health and managing natural resources more responsibly.

In 2004, the European Commission, in line with the conclusions of the Spring 2004, set up a High Level Group of Independent Experts chaired by Mr. Win Kok to do a mid-term review. The Kok's report on the first five years of the strategy concluded that little progress had been made over those years of implementation of the Lisbon Strategy, and it recommended a refocusing of growth and employment and on taking on more responsibility for the Strategy by the Commission itself. Therefore, a new start for the Lisbon strategy was proposed and renewed Lisbon strategy for Growth and Jobs.

The new Europe 2020 Strategy, formally approved by the European Council on 17 June 2010, responds to the European attempt to overcome the shortcomings and poor results of the Lisbon Strategy launched in 2000, by the fulfilment of some impeccable targets for 2020, such as:

1. 75% of the population aged 20 to 64 years of age shall be employed;
2. 3% of EU GDP should be invested in R & D.
3. "20/20/20" objectives will be reached in the field of climate / energy.
4. The dropout rate must be less than 10% and at least 40% of young should have a degree or diploma
5. There will be 20 million fewer people at risk of poverty

In other words, Europe 2020 Strategy aims five main objectives, the promotion of employment, to improve conditions for innovation, research and development, compliance with the Community objectives on energy

and climate change, to improve educational levels, and promote inclusion social, in particular by reducing poverty

In order to meet the targets, action will be required at all levels: EU-level organisations, Member States, local and regional authorities, therefore, it presents recommendations for all level of government in Europe. National (macro), regional (meso) and sub-regional (micro) territorial levels are therefore conditioned by the strategy.

Considering this frame, this chapter presents the performance of the Working Community of the Pyrenees CBA in relation to the revised Lisbon/ Europe 2020 strategy and various objectives of the Gothenburg Strategy by the analysis of the variables shown in table 6.1.:

Table 6.1: Scale, source and time frame of key data for the analysis

Variable name	Geographical scale	Source	Time frame	Observations
GDP	NUTS 3	EUROSTAT, Russian Statistical Institute	1997-2009	Missing for regional level for CH and RU
Share of Natura 2000 areas	NUTS 3	European Commission's 5th Cohesion Report	2009	
Solar energy resources	NUTS 3		1981-1990	
Wind energy potential	NUTS 3		2000-2005	
Ozone concentration exceedances	NUTS 3		2008	
Urban waste water treatment	NUTS 2		2007	
Soil sealed area	NUTS 3		2006	
Long term unemployment	NUTS 2	Eurostat	2009	
Unemployment rate	NUTS 3		2010	
Youth unemployment rate	NUTS 3		2010	
Population at risk of poverty after social transfer	NUTS 3		2008	
Gross value added by NACE	NUTS 3	Eurostat	1997-2008	
Employment by NACE	NUTS 3	Eurostat & National statistical institute Russia	2000-2008	
GERD, HERD, BERD	NUTS 2	Eurostat	2007	
Employment in medium and hich tech manufacturing	NUTS 2	ESPON DB (Regional Innovation Scoreboard)	2004	
EPO Patents by per million of inhabitants	NUTS 2	Eurostat	2007	

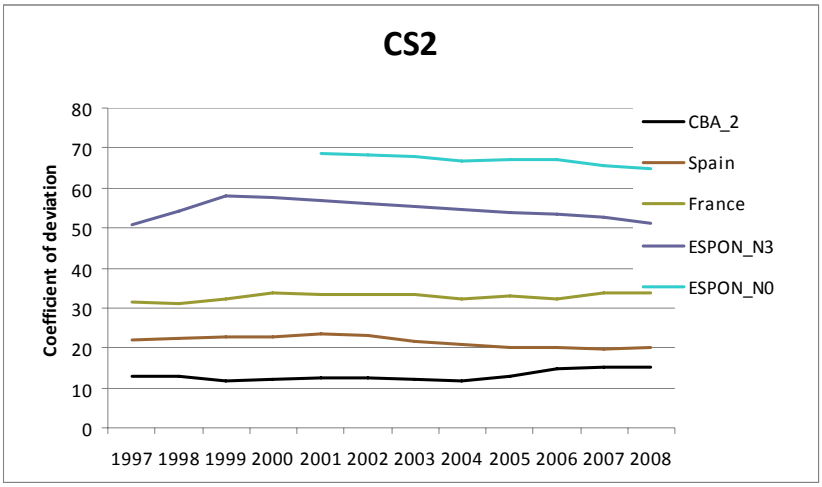
6.2. Economy and Employment

For defining the regional disparities in the GDP per capita per NUTS, the coefficient of deviation was used. This indicator is obtained by calculating the ration of the standard deviation to the mean, and therefore a good way to compare the distribution of geographical units which differ greatly on their average. As a reference the coefficient of deviation was included for the countries of which the CBA is part as well as for the whole NUTS 3 and NUTS 0 of the ESPON space (EU7+CH+NO for the N0 and only EU7 for NUTS 0 excluding the Swiss and Russian regional data because it was not available).

6.2.1. Coefficient of deviation of GDP per capita

$$Coefficient\ of\ deviation = \frac{Standard\ deviation}{Average}$$

Figure 6.1: Coefficient of deviation of the CBA compared to Spain, France and EU.



The higher the coefficient of deviation, the higher are the disparities within the geographical unit analysed.

France and especially Spain show a much lower disparity compared to ESPON area. The addressed CBA regions have even less disparity than France or Spain, so it has quite close GDP values among its regions.

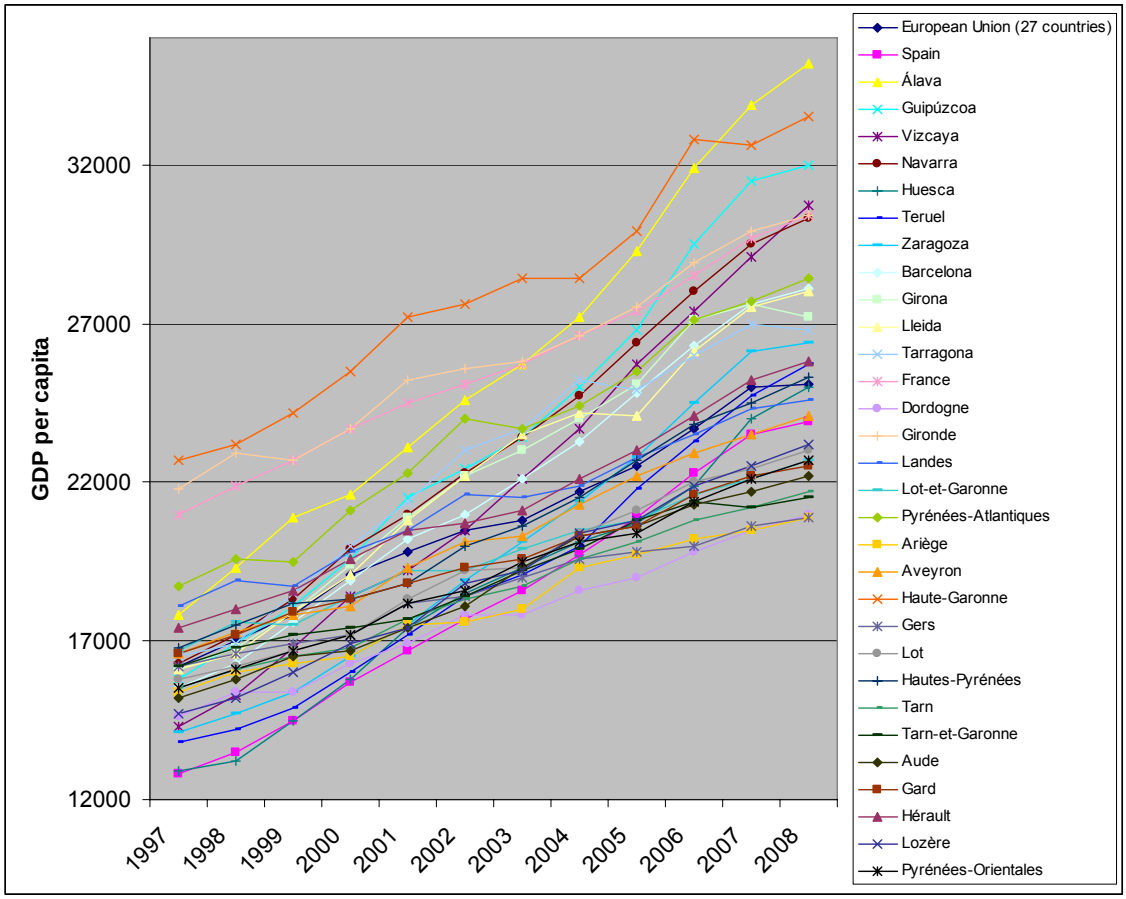
Considering time (years 1997-2008) it can be said that the disparities in GDP have remained stable over the years, in countries as France, while the disparities have diminished a bit in Spain and much more across EU level. Referring to the Working Community of the Pyrenees CBA, GDP disparities have increased slightly from 2005 onwards.

6.2.2. GDP per capita

A look into the evolution of GDP per capita at NUTS3 level reveals the significant growth of GDP per capita in Guipuzcoa, Vizcaya and Álava, which in the timeframe analysed have doubled its value and are now over the value in France, together with Haute-Garonne. Navarra also shows a substantial growth of GDP per

capita, almost reaching the French value. On the contrary, Dordogne, Ariége and Gers are the regions with lowest values and moderate increase.

Figure 6.2. Gross domestic product (GDP) at current market prices at NUTS level 3



The data used for the catching up analysis was the GDP per for the years 1997 and 2008. The undertaken analysis, involves two comparative procedures, performed at a NUTS III level:

A1 - To compare each NUTS III with the leader, in terms of GDP per capita, trough index number analysis;

A2 - Using a logistic function, to establish the relative performance of each NUTS III to the leading region, exploring the notion of territorial catching-up.

6.2.2.1. A1 – GDP indexed to the leading region

This analysis involves the indexation of GDP per capita in each NUTS III to the value of the leading region in 2008 referred to above, which is by definition 100,0. The concerned computation is represented in the following expression:

$$Index\ GDP_n = \left(\frac{GDP_n}{GDP_L}\right) \times 100$$

where GDP_n is the GDP per capita of a given NUTS III and GDP_L is the GDP per capita of NUT II London.

Table 6.2: GDP indexed to the leading region

Nuts ID	Nuts Name	GDP per capita (2008)	Index Number	Class
UKI	**London**	**50600**	**100**	**very rich region**
EU27	European Union	25100		
ES	Spain	23900		
FR	France	30100		
ES211	Álava	35200	69,57	midle income region
ES212	Guipúzcoa	32000	63,24	midle income region
ES213	Vizcaya	30700	60,67	midle income region
ES220	Navarra	30300	59,88	midle income region
ES241	Huesca	25000	49,41	less developed region
ES242	Teruel	25700	50,79	midle income region
ES243	Zaragoza	26400	52,17	midle income region
ES511	Barcelona	28100	55,53	midle income region
ES512	Girona	27200	53,75	midle income region
ES513	Lleida	28000	55,34	midle income region
ES514	Tarragona	26800	52,96	midle income region
FR611	Dordogne	21000	41,50	less developed region
FR612	Gironde	30400	60,08	midle income region
FR613	Landes	24600	48,62	less developed region
FR614	Lot-et-Garonne	22700	44,86	less developed region
FR615	Pyrénées-Atlantiques	28400	56,13	midle income region
FR621	Ariège	20900	41,30	less developed region
FR622	Aveyron	24100	47,63	less developed region
FR623	Haute-Garonne	33500	66,21	midle income region
FR624	Gers	20900	41,30	less developed region
FR625	Lot	23000	45,45	less developed region
FR626	Hautes-Pyrénées	25300	50,00	midle income region
FR627	Tarn	21700	42,89	less developed region
FR628	Tarn-et-Garonne	21500	42,49	less developed region
FR811	Aude	22200	43,87	less developed region
FR812	Gard	22500	44,47	less developed region
FR813	Hérault	25800	50,99	midle income region
FR814	Lozère	23200	45,85	less developed region
FR815	Pyrénées-Orientales	22700	44,86	less developed region

According to this table, if we compare CBA territories to the Leader region (London UKI) we could affirm that half of the regions are “middle income regions”[19] and the other half are “less developed region”. Most of the Spanish ones can be considered as a Middle Income region while most of the French ones are less developed regions, attending to the GDP per capita indexed to the leading region, considered as very rich region.

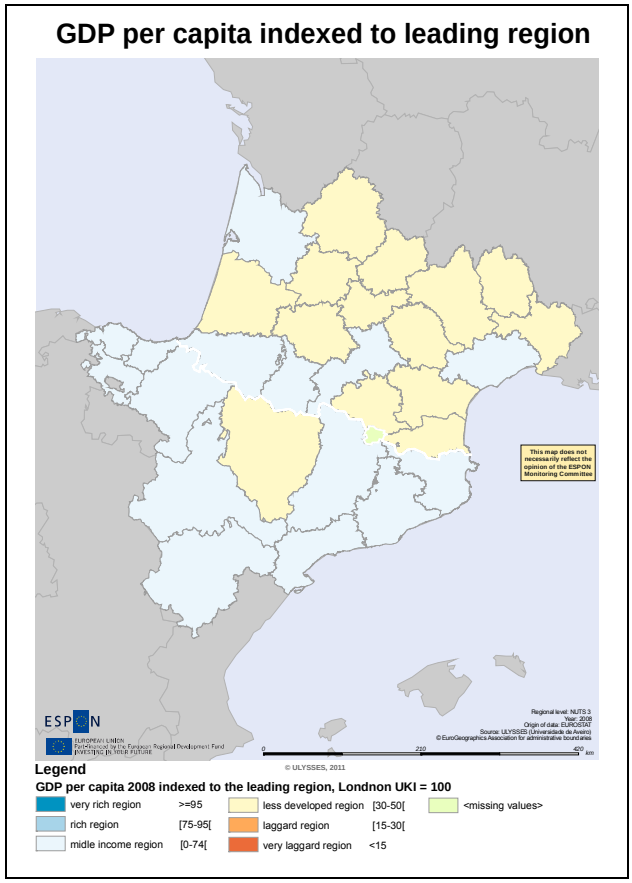
Basque Country, Haute-Garonne and Gironde are the wealthiest regions in the CBA with indexed values over 60, while most of French regions have indexed values below 50. In other words, less developed regions with an index lower than 50% of the reference unit are all found in France (Ariege, Gers 41,30%, etc).

19

very rich region	>=95
rich region	[75-95[
midle income region	[50-74[
less developed region	[30-50[
laggard region	[15-30[
very laggard region	<15

Referring to the confining NUTS3 level units, 70% of them are considered as “middle income regions” and only 30% of them are “less developed region”. Consequently, confining regions’ situation is better than the one of the rest of the regions, especially in the French case, where this area is the wealthiest within the French side of the CBA apart from Gironde.

Map 6.1: Category map of GDP per capita indexed to the leading region



6.2.2.2. A2 - Catching up analysis

This analysis intends to evaluate the speed of catching-up with the leading region, through a standard logistic process. In the present example the catching-up process analysis sets the relative position[20] of each NUTS III and its relative trajectory up to the level of 95% of the GDP of the leading region in 50 years. The difference of performance of each region in comparison to the leading region is, in the present analysis, measured in years needed to reach the level assumed above.

According to these assumptions, the logistic function which describes the problem is represented as follows:

$$X - 0{,}95\,\bar{X} - \frac{\bar{X}}{1 + ke^{-at}} \qquad (1)$$

The analysis distinguishes converging from diverging regions, and the different levels of catching-up performance. Leading regions are the ones who already have a GDP close to that of the London NUTS 2. Fast converging regions have a growth rate which allows them to reach the leader in no more than 20 years, steady catching-up regions between 21 and 50 years, slow catching-up regions between 51 and 100 and slow converging between 101 a 250 years. Non converging region have great distances in terms of GDP and are growing at a rate equal or slightly superior to the leader and diverging regions are growing less than the leader.

Table 6.3: Catching up analysis

NUTS ID	NUTS Name	GDP per capita (1997)	GDP per capita (2008)	Annual growth rate	Relative growth to London	Years to the leader	class
UKI	London	32200	50600	0,0419			Leading region
ES211	Álava	17800	35200	0,0639	0,0211	30,5	steady catching-up region
ES212	Guipúzcoa	15800	32000	0,0663	0,0233	37,8	steady catching-up region
ES213	Vizcaya	14300	30700	0,0719	0,0288	34,3	steady catching-up region
ES220	Navarra	16300	30300	0,0580	0,0154	66,3	slow catching-up region
ES241	Huesca	12900	25000	0,0620	0,0192	78,0	slow catching-up region
ES242	Teruel	13800	25700	0,0582	0,0156	92,1	slow catching-up region
ES243	Zaragoza	14100	26400	0,0587	0,0161	85,1	slow catching-up region
ES511	Barcelona	15500	28100	0,0556	0,0131	92,5	slow catching-up region
ES512	Girona	16100	27200	0,0488	0,0066	195,6	slow converging region
ES513	Lleida	16100	28000	0,0516	0,0093	131,7	slow converging region
ES514	Tarragona	16500	26800	0,0451	0,0030	441,6	non converging region
FR611	Dordogne	14600	21000	0,0336	-0,0080	-240,1	diverging region
FR612	Gironde	21800	30400	0,0307	-0,0108	-93,7	diverging region
FR613	Landes	18100	24600	0,0283	-0,0131	-117,6	diverging region
FR614	Lot-et-Garonne	16700	22700	0,0283	-0,0131	-132,6	diverging region
FR615	Pyrénées-Atlantiques	18700	28400	0,0387	-0,0031	-382,2	diverging region
FR621	Ariège	15400	20900	0,0282	-0,0132	-146,1	diverging region
FR622	Aveyron	16600	24100	0,0345	-0,0072	-221,9	diverging region
FR623	Haute-Garonne	22700	33500	0,0360	-0,0057	-134,9	diverging region
FR624	Gers	16200	20900	0,0234	-0,0178	-108,9	diverging region
FR625	Lot	15800	23000	0,0347	-0,0069	-246,1	diverging region
FR626	Hautes-Pyrénées	16800	25300	0,0379	-0,0039	-381,2	diverging region
FR627	Tarn	15500	21700	0,0311	-0,0104	-176,7	diverging region
FR628	Tarn-et-Garonne	16200	21500	0,0261	-0,0152	-122,5	diverging region
FR811	Aude	15200	22200	0,0350	-0,0066	-270,1	diverging region
FR812	Gard	16600	22500	0,0280	-0,0134	-131,7	diverging region
FR813	Hérault	17400	25800	0,0365	-0,0053	-270,4	diverging region
FR814	Lozère	14700	23200	0,0424	0,0004	4288,8	non converging region
FR815	Pyrénées-Orientales	15500	22700	0,0353	-0,0064	-272,1	diverging region

By the data shown in the table above, Spanish and French NUTS3 regions within the CBA show very diverse cases.

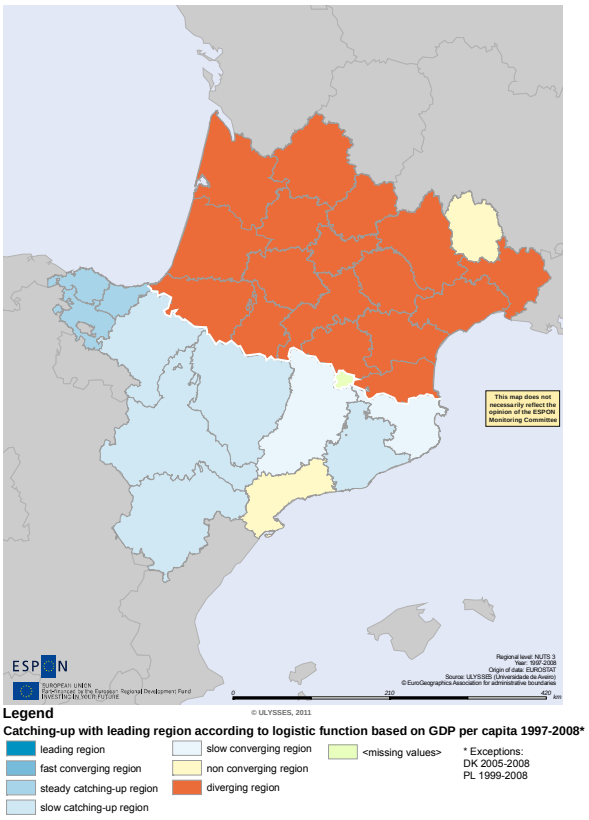
All Spanish NUTS3 level units within the CBA show higher annual growth rates than the leader, especially, Basque Country which is approaching to the leader, which can be considered as “steady catching-up region” matching London in 30 years time. The rest of Spanish regions within the CBA are indexed as “slow catching-up region” or “slow converging region” and would need much more time to catch-up the leader.

On the other side, French NUTS3 level units within the CBA regions have to be indexed as diverging regions, as their growth rate in GDP per capita is below the one for the leading region of Greater London. They will not converge if those growth values are kept over time.

In 1997 GDP per capita values where similar or a bit better in French than in Spanish NUTS3 level units, but thanks to higher growth rates in regions within the Spanish sector, in 2008, in average, Spanish GDP values are clearly above French ones.

A closer look into confining regions show that Spanish NUTS3 level units grew up more than GDP of London, but it does not occur the same in France, where regions grew less. Consequently, confining regions in the Spanish sector can be classified as “steady catching –up region” (this is the case of Guipúzcoa) and as “Slow catching –up regions. French regions are classified as “diverging regions”, being the gap between Greater London area and French sector of the CBA wider over time.

Map 6.2.: Category map of catching –up analysis



6.2.3 Economic sectors

6.2.3.1 Gross value added

The Gross value added, serves to evaluate the overall contribution of the different sectors to the total output of the regions.

Table 6.4: Share of GVA by NACE in the CBA, 2008

		Share of GVA by NACE 2008 (%)					
NUTS ID	NUTS Name	Agriculture; fishing (A_B)	Industry (except construction) (C-E)	Construction (F)	Wholesale and retail trade; hotels and restaurants; transport (G-I)	Financial intermediation; real estate (J_K)	Public administration and community services; activities of households (L-P)
EU27	European Union	1,75	19,61	6,48	21,08	28,27	22,80
ES	Spain	2,66	17,03	11,40	24,47	22,85	21,58
FR	France	2,04	13,63	6,66	18,85	33,38	25,44
ES211	Álava	2,79	35,12	7,76	16,15	17,50	20,68
ES212	Guipúzcoa	0,98	32,19	8,36	21,12	17,35	20,00
ES213	Vizcaya	0,59	24,05	11,08	23,88	20,90	19,51
ES220	Navarra	2,78	28,36	10,68	20,02	17,25	20,91
ES241	Huesca	11,95	17,03	12,52	21,88	16,44	20,18
ES242	Teruel	3,96	24,80	15,05	22,03	12,87	21,28
ES243	Zaragoza	2,59	23,24	10,68	22,07	20,19	21,22
ES511	Barcelona	0,63	23,17	8,76	24,62	24,92	17,90
ES512	Girona	2,25	14,83	13,45	30,55	21,07	17,84
ES513	Lleida	7,92	13,70	11,62	30,88	16,30	19,57
ES514	Tarragona	2,29	19,30	14,49	25,41	21,53	16,98
FR611	Dordogne	4,23	12,85	10,66	18,08	30,42	23,76
FR612	Gironde	3,56	11,43	7,63	19,07	31,11	27,20
FR613	Landes	6,66	14,65	8,73	18,07	24,33	27,56
FR614	Lot-et-Garonne	4,08	12,34	8,62	21,75	25,12	28,09
FR615	Pyrénées-Atlantiques	2,10	16,14	8,35	17,57	30,31	25,53
FR621	Ariège	2,58	14,85	8,59	15,09	26,02	32,87
FR622	Aveyron	5,21	15,02	10,05	18,39	25,46	25,88
FR623	Haute-Garonne	0,60	11,98	8,06	18,07	35,46	25,81
FR624	Gers	11,66	8,81	9,93	19,15	21,25	29,20
FR625	Lot	5,11	14,61	8,84	17,78	25,11	28,56
FR626	Hautes-Pyrénées	2,08	11,22	7,72	19,06	26,67	33,24
FR627	Tarn	3,42	13,61	8,80	16,30	27,34	30,52
FR628	Tarn-et-Garonne	5,24	11,34	9,12	19,26	24,40	30,64
FR811	Aude	5,29	7,91	8,47	20,94	24,36	33,02
FR812	Gard	3,36	13,58	8,76	17,03	29,42	27,85
FR813	Hérault	1,73	7,21	7,88	19,73	35,06	28,39
FR814	Lozère	5,68	9,49	9,86	16,23	20,60	38,14
FR815	Pyrénées-Orientales	3,46	5,31	8,39	21,72	32,01	29,10

The share of Gross Value Added is very different depending on the region considered. In the French sector of the CBA, main contribution to GVA is due to both Financial Intermediation and Real Estate on one side

and Public administration and community services or Activities of households on the other side. On the other side of the border, some of them have Industry as the most important contributor to GVA while others have Wholesale and retail trade or hotels and restaurants as the most important one.

In most NUTS3 level units, Agriculture and Fishing represent less than 5% of share of GVA, and only some regions such as Huesca or Gers have values around 10%. This sector clearly is not the basis of the economy of the CBA.

The CBA is not either a very industrial area, comparing to some other European area. Only in Basque Country and Navarra main contribution to GVA is due to Industry with share of 30% or more. In other regions, the GVA due to industry is around 15-25% in Spanish area and 5-15% in French regions.

Construction is more relevant in Aragon and Cataluña with 10-15% of share, while in the rest of the CBA it only represents 5-10% of total GVA.

Services as a whole represent the most important sector of the CBA, which contributes to GVA with around 70-80%. The share of this sector is distributed with similar percentages into Wholesale and retail trade or hotels and restaurants, Financial Intermediation or Real Estate and Public administration and community services or Activities of households. Wholesale and retail trade or hotels and restaurants is very important in the regions of Cataluña, Financial Intermediation or Real Estate is the most relevant in half of French CBA regions and Public administration and community services is the most important in the other half .

Table 6.5: Annual growth rate of the GVA by NACE in the CBA 1997-2008
(French values from 2004-2008)

		Annual growth rate of the GVA by NACE 1997-2008 (%)						
NUTS ID	Nuts name	All NACE	Agriculture; fishing (A_B)	Industry (except construction) (C-E)	Construction (F)	Wholesale and retail; hotels & restaurants; transport (G-I)	Financial intermediation; real estate (J_K)	Public administration and community services; activities of households (L-P)
EU27	European Union	3,12	1,26	-1,48	-4,33	-2,96	4,36	3,37
ES	Spain	7,21	1,21	4,68	11,90	6,49	9,37	7,48
FR	France	4,13	-0,08	1,28	6,67	4,04	5,50	4,19
ES211	Álava	7,35	8,67	6,39	14,09	5,94	9,22	6,92
ES212	Guipúzcoa	6,96	1,59	5,81	11,58	6,16	8,50	7,43
ES213	Vizcaya	7,31	-3,61	5,75	12,64	7,81	8,43	6,15
ES220	Navarra	6,99	1,62	5,45	11,46	6,21	9,15	7,66
ES241	Huesca	6,81	2,64	6,97	11,70	6,20	8,62	6,85
ES242	Teruel	6,33	-2,09	4,53	12,28	6,42	6,70	8,08
ES243	Zaragoza	6,84	0,75	4,99	12,11	6,13	8,68	7,37

ES511	Barcelona	6,85	4,43	4,09	11,40	6,37	9,11	7,33
ES512	Girona	7,80	3,90	3,44	11,03	8,34	9,35	8,47
ES513	Lleida	6,89	1,28	5,57	8,49	7,42	8,87	7,97
ES514	Tarragona	7,46	2,06	2,57	13,49	8,32	9,53	8,61
FR611	Dordogne	1,35	-0,19	0,35	3,30	0,79	5,11	-1,29
FR612	Gironde	1,62	-4,27	0,81	3,87	1,64	1,68	1,83
FR613	Landes	1,57	1,46	1,61	3,44	1,11	2,82	0,78
FR614	Lot-et-Garonne	1,18	-4,80	-0,24	3,75	0,90	1,44	1,68
FR615	Pyrénées-Atlantiques	1,72	-1,47	2,33	3,70	1,15	2,82	0,45
FR621	Ariège	1,15	-0,35	-0,15	3,70	0,64	2,70	0,48
FR622	Aveyron	1,30	-0,49	0,42	2,92	0,86	3,27	0,35
FR623	Haute-Garonne	2,07	-1,24	2,64	3,86	1,10	2,61	1,40
FR624	Gers	0,95	-1,96	-0,12	3,30	0,31	1,85	1,15
FR625	Lot	1,38	0,35	1,36	3,19	0,52	3,52	0,28
FR626	Hautes-Pyrénées	1,58	-1,10	1,28	3,83	0,45	3,75	0,58
FR627	Tarn	1,29	-0,75	-0,09	3,07	0,77	2,71	0,82
FR628	Tarn-et-Garonne	1,36	-2,18	0,77	3,53	0,43	1,57	1,87
FR811	Aude	1,29	-0,01	0,63	3,49	0,41	1,57	1,63
FR812	Gard	1,33	-0,53	-0,31	3,55	0,81	3,35	0,34
FR813	Hérault	1,89	1,46	1,41	3,85	1,05	3,32	0,74
FR814	Lozère	1,28	2,49	0,43	2,15	1,12	4,06	0,32
FR815	Pyrénées-Orientales	1,55	0,49	0,10	3,42	0,82	3,73	0,18

Gross Value Added has increased much more in the Spanish sector of the CBA (6-8 % annual growth rate) than in the French one (1-2 % annual growth rate).

Construction is the sector that has experienced the highest growth in the whole CBA, especially in Spanish regions where it has grown above 10% annually.

Agriculture and fishing sector has increased just slightly its GVA contribution in some regions but has decreased in some other areas.

The rest of the sectors have grown around 5-8% annually in the Spanish sector of the CBA, with similar growth patterns across regions and sectors. In French NUTS3 regions the rest of the sectors have small growth figures (0-1%) except Financial Intermediation or Real Estate which has grown 2-4% annually depending of the region.

6.2.3.2. Employment by sectors and by NACE

In the following lines, it will be analysed the employment by sectors in order to know the importance of the different sectors in the composition of the workforce.

Table 6.6: Share of employment by NACE 2008(%)

		Share of employment by NACE 2008 (%)					
NUTS ID	Nuts name	Agriculture; fishing (A_B)	Industry (except construction) (C-E)	Construction (F)	Wholesale and retail trade; hotels and restaurants; transport (G-I)	Financial intermediation; real estate (J_K)	Public administration and community services; activities of households (L-P)
EU27	European Union	5,67	18,08	7,72	25,10	14,31	29,13
ES	Spain	4,28	15,41	11,79	28,82	12,09	27,60
FR	France	3,05	14,67	6,93	23,92	16,09	35,35
ES211	Álava	2,97	31,61	7,84	20,20	10,04	27,33
ES212	Guipúzcoa	1,76	28,90	7,89	25,22	9,68	26,55
ES213	Vizcaya	1,49	20,46	10,70	28,63	13,15	25,57
ES220	Navarra	4,63	25,75	11,68	22,74	8,76	26,43
ES241	Huesca	16,46	14,59	11,88	24,32	7,67	25,07
ES242	Teruel	7,88	16,05	15,30	28,23	5,65	26,89
ES243	Zaragoza	4,34	22,12	10,39	25,10	11,05	27,01
ES511	Barcelona	0,95	21,54	8,88	28,81	14,90	24,93
ES512	Girona	3,75	18,01	13,02	34,50	9,19	21,54
ES513	Lleida	9,77	15,43	10,79	36,34	7,48	20,19
ES514	Tarragona	4,76	16,40	15,30	30,73	9,68	23,14
FR611	Dordogne	7,13	13,84	9,99	24,18	7,90	36,97
FR612	Gironde	3,86	11,18	7,22	23,98	16,75	37,01
FR613	Landes	6,27	15,34	7,89	23,08	9,51	37,91
FR614	Lot-et-Garonne	8,56	13,96	8,73	24,66	9,67	34,42
FR615	Pyrénées-Atlantiques	5,01	14,01	8,02	24,11	13,35	35,54
FR621	Ariège	5,80	16,44	8,70	21,08	6,58	41,20
FR622	Aveyron	11,91	15,70	7,94	21,93	8,39	34,21
FR623	Haute-Garonne	1,47	13,48	7,24	23,39	21,03	33,39
FR624	Gers	14,55	10,52	8,07	21,18	8,93	36,74
FR625	Lot	9,28	16,16	9,28	20,00	8,96	36,16
FR626	Hautes-Pyrénées	4,47	11,74	7,83	24,16	11,30	40,49
FR627	Tarn	5,94	15,34	7,63	21,37	11,24	38,55
FR628	Tarn-et-Garonne	8,03	12,55	8,53	24,09	8,66	38,14
FR811	Aude	6,41	8,58	8,49	25,98	9,41	41,13
FR812	Gard	3,88	12,32	9,09	23,83	12,37	38,56
FR813	Hérault	3,11	7,26	7,72	25,83	16,56	39,55
FR814	Lozère	11,61	8,71	7,74	19,03	4,52	48,39
FR815	Pyrénées-Orientales	4,31	7,32	8,69	28,59	11,29	39,81

The share of employment by sectors illustrates similar patterns to the ones shown by the share of GVA.

Agriculture has a strong foothold in Huesca, Aveyron, Gers and Lozere, but few people works in this sector in the other regions.

The industrial workforce generally is bigger in the Spanish side of the border than in the French one, particularly in Alava and Guipuzcoa. The Wholesale and retail trade sectors or hotels and restaurants employ more people in the Spanish regions, especially in Cataluña, than other sectors. In France, on the contrary, it predominates Public administration and community services or Activities of Households, followed by Wholesale and retail trade; hotels and restaurants; transport

Related to GVA, France holds circa 35 -40% of workforce in the public sector, but this sector 's contribution to the GVA is of 25-30 %, contrary to the Financial intermediation sub sector, which employees only 10-15% with a contribution of 25-30% to the GVA.

Table 6.7: Annual Growth rate of employment by NACE 2000-2008 (%)

		Annual growth rate of employment by NACE 2000-2008 (%)						
NUTS ID	Nuts name	All NACE	Agriculture; fishing (A_B)	Industry (except construction) (C-E)	Construction (F)	Wholesale and retail; hotels & restaurants; transport (G-I)	Financial intermediation; real estate (J_K)	Public administration and community services; activities of households (L-P)
EU27	European Union	0,82	-4,05	-0,48	2,00	1,18	2,59	1,47
ES	Spain	2,85	-2,04	0,29	3,63	3,59	5,32	3,34
FR	France	0,63	-1,73	-1,74	2,50	0,70	1,73	1,11
ES211	Álava	2,83	-2,05	1,70	3,66	4,13	5,28	2,93
ES212	Guipúzcoa	2,34	-3,15	0,49	3,50	2,49	5,14	3,68
ES213	Vizcaya	2,50	-4,12	1,37	4,57	2,58	4,69	2,10
ES220	Navarra	2,66	-1,63	1,60	3,11	3,60	4,55	3,13
ES241	Huesca	2,01	-1,08	1,45	1,81	3,53	3,98	2,85
ES242	Teruel	3,33	0,00	0,47	5,72	5,91	2,58	2,90
ES243	Zaragoza	2,47	-0,59	0,78	3,02	2,61	5,39	3,17
ES511	Barcelona	2,55	-0,29	-0,86	3,11	3,45	4,17	4,12
ES512	Girona	3,12	-1,11	1,23	2,48	3,85	4,17	4,66
ES513	Lleida	2,61	-2,30	0,60	-0,24	5,38	5,01	3,85
ES514	Tarragona	3,35	-2,10	1,22	3,09	4,73	4,32	4,60
FR611	Dordogne	0,29	-2,41	-1,96	3,10	0,29	1,41	0,91
FR612	Gironde	0,89	-4,83	-1,30	3,14	0,45	2,65	1,57
FR613	Landes	0,82	-2,37	-0,92	2,33	1,13	2,61	1,34
FR614	Lot-et-Garonne	0,27	-2,35	-1,50	3,41	0,17	1,80	0,77
FR615	Pyrénées-Atlantiques	0,97	-0,85	-1,03	3,31	1,11	2,05	1,14
FR621	Ariège	0,75	-1,18	-0,85	4,35	1,08	-0,36	1,05
FR622	Aveyron	0,53	-1,34	-0,56	2,02	0,74	0,98	1,26
FR623	Haute-Garonne	2,28	0,00	0,43	4,26	1,84	4,88	1,68
FR624	Gers	0,73	-1,17	-0,34	2,49	0,43	2,47	1,30

FR625	Lot	0,30	-2,32	0,12	2,94	-0,30	1,43	0,57
FR626	Hautes-Pyrénées	0,62	-1,18	-1,76	2,83	1,03	2,64	0,42
FR627	Tarn	0,23	-1,42	-2,76	2,66	0,58	2,60	0,64
FR628	Tarn-et-Garonne	0,85	-2,60	-1,30	3,66	1,38	0,94	1,59
FR811	Aude	1,40	-2,46	-1,26	4,27	1,45	2,60	1,90
FR812	Gard	1,16	-2,70	-1,04	4,01	1,55	2,31	1,22
FR813	Hérault	2,12	-1,13	-0,54	4,03	1,54	4,19	2,22
FR814	Lozère	0,58	0,35	0,00	0,53	0,21	-0,86	1,05
FR815	Pyrénées-Orientales	1,48	-2,79	-0,68	4,54	1,47	2,35	1,64

According to the data of the table referred to employment, total employment has increased from 2000 to 2008 in the CBA. The Spanish sector has increased its workforce at a 2-3% rate annually while employment in the French side shows a growth rate of 0-1%, except than Haute-Garonne and Herault with higher growth rates.

The employment in Primary sector (agriculture and fishing) has decreased from 1997 to 2008 in most CBA regions. Vizcaya and Gironde are the regions with highest decreases (4%).

The industrial employment has behaved differently at different sides of the border. While industrial employment increases slightly at the Spanish side, it decreases at the French one, except in the Haute-Garonne department. This is understandable as large establishments are the structure of the regional economy around the pole Toulouse, in the forefront of aeronautics and space, which hosts some assembly lines such as the Airbus.

The employment in the rest of the sectors has been different in Spanish regions than in French ones. In Spanish NUTS3 level units, Construction and Services sectors have increased its workforce at a 3-6% rate annually depending on the sector and region. In the French ones, Construction sector is the one with highest increases (3-4%), especially in Mediterranean area, while the Services sectors have grown less and with different behaviour depending on the region. In Haute-Garonne and Herault, nevertheless, Financial Intermediation or Real Estate has increased its employment more than 4% annually.

6.3. Innovation and research

Research and innovation are central elements of the Europe 2020 Strategy, as Europe wants to live up to its ambitions and tackle today's major challenges. To do so, Europe needs breakthroughs that only research and innovation can deliver.

Europe 2020 Strategy reaffirms the objective of increasing spending on research and development (R & D) in Europe of 1.9% of gross domestic product (GDP) to 3%. One of the keys of this plan is the importance given to public spending to support research, development and innovation, as knowledge is declared as a source of competitiveness in the new economy and it is linked to public spending on education among others. Therefore, an EU Budget needs to have research and innovation as a core component.

A study21 shows that meeting the Europe 2020 target of increasing R&D investment to 3 percent of GDP could create 3.7 million jobs and increase annual GDP by up to €795 billion by 2025. One million extra researchers will be needed.

For innovation and research the data sources where similar to the one's used in the Regional Innovation Scoreboard 2009 (Hollanders et al, 2009). These authors distinguish between tree types of indicators: enablers, firm activities and outputs. Here, only some of the indicators for all of these three areas have been included, as the NUTS 2 coverage is very poor for most of the indicators:

- Total intramural R&D expenditures (R&D expenditures in the government sector (GOVERD) and the higher education sector (HERD) Business R&D expenditures (BERD) and as a percentage of GDP)
- EPO patents
- Employed persons in high and medium tech manufacturing activities

Table 6.8: Indicators for innovation and research: R&D expenditure in percentage of GDP, patents and employed persons in the CBA French data - 2004

	Total intramural R&D expenditure 2007					
NUTS 2 name	Total	Business enterprise sector	Government sector	Higher education sector	EPO patents per million of inhabitants 2007	Employed persons in high and medium tech manufacturing activities (% total workforce EU 25 = 100) 2004 *
EU27	:	1,18	0,24	0,42	#N/A	#N/A
France	2,07	1,31	0,34	0,4	79,68	103,78
Spain	1,27	0,71	0,22	0,33	19,01	76,28
Aquitaine	1,62	1,16	0,09	0,37	33,38	70,54
Midi-Pyrénées	4,15	2,57	1,01	0,57	54,50	68,73
Languedoc-Roussillon	2,08	0,69	0,79	0,6	29,23	32,93
País Vasco	1,87	1,52	0,08	0,27	41,61	148,19
Comunidad Foral de Navarra	1,88	1,23	0,2	0,44	46,51	167,83
Aragón	0,9	0,5	0,2	0,2	36,01	128,55
Cataluña	1,47	0,93	0,2	0,34	46,88	146,83

21 1.P. Zagamé, (2010) The cost of a non-innovative Europe

According to the data shown in the table above, the total R&D expenditure in 2007 was higher in France than in Spain. The same happens when comparing the French and Spanish NUTS2 level units within the CBA. At the French side, Midi-Pyrénées outstands considerably among the three regions, while in Spain, 3 out of 4 Autonomous communities have similar values, although lower than French ones. Once again this can be explained as the regions with more industrial activity are the regions where more R&D is carried out, therefore where more is invested for it.

By sector of performance, the private sector (companies and private non-profit organizations) has the highest percentage of the R&D total expenditure, followed in importance by the higher education sector, and finally, Public Administration.

6.3.1. Total intramural R&D expenditures (R&D expenditures in the government sector (GOVERD) and the higher education sector (HERD) Business R&D expenditures (BERD) and as a percentage of GDP)

R&D expenditures as a percentage of GDP

Table 6.9: R&D expenditures as a percentage of GDP

GEO/TIME	Increase	Average annual growth
European Union (27 countries)	8%	1,3%
France	2%	0,3%
Spain	31%	4,7%
Noreste (ES)	44%	7,6%
Este (ES)	28%	5,0%
País Vasco	42%	7,3%
Comunidad Foral de Navarra	45%	7,7%
Aragón	47%	8,0%
Cataluña	28%	5,0%

As the table shows, the increase of R&D expenditure as percentage of GDP in Spain is more than significant comparing to France even to the EU. Although the lack of data referred to NUTS2 level units in the French side of the border, the data corresponding to the Spanish sector of the border reveals that there is an increase of R&D expenditure in terms of the GDP in the Spain.

R&D expenditures in Business (BERD)

Table 6.10: R&D expenditures in Business (BERD)

GEO/TIME	Increase	Average annual growth
European Union (27 countries)	1,0%	6%
France	1%	0,1%
Spain	4,0%	26%
Noreste (ES)	8,2%	48%
Este (ES)	4,6%	25%

País Vasco	8,6%	51%
Comunidad Foral de Navarra	6,9%	40%
Aragón	8,8%	53%
Cataluña	3,3%	18%

The R&D in Business enterprise sector is very high in Midi-Pyrenees, but at the other side of the border Basque Country has the highest percentage of the R & D total expenditure (1,6% in 2008) and Aragon the lowest, although it has increased the most (8,8%) and has an annual growth rate of 53%, a lot comparing to EU (6%) or Spain (26%).

R&D expenditures in the government sector (GOVERD)

Table 6.11: R&D expenditures in the government sector (GOVERD)

GEO/TIME	Increase	Average annual growth
European Union (27 countries)	2,0%	13%
France	0%	0%
Spain	9,8%	75%
Noreste (ES)	14,9%	100%
Este (ES)	16,0%	110%
País Vasco	12,5%	80%
Comunidad Foral de Navarra	20,1%	150%
Aragón	16,0%	110%
Cataluña	17,6%	125%

The R&D expenditure in the Government sector is very low, just 0,27% and 0,28% in the EU an Spain respectively. This values are even lower at Spanish NUTS 2 of our case study, although they are increasing the expenditure and faster than in Spain and EU as a whole.

Navarra is the region with highest increase and highest average annual growth (150%) in comparison to EU. Cataluña is where more is spent and Basque Country where less is spent, lowest increase and slowest growth.

In France the rates are high in Midi-Pyrénées and Langedouc-Roussillon.

R&D expenditures in higher education sector (HERD)

Table 6.12: R&D expenditures in higher education sector (HERD)

GEO/TIME	Increase	Average annual growth
European Union (27 countries)	14%	2,3%
France	22%	3,4%
Spain	16%	3,0%
Noreste (ES)	12%	2,2%
Este (ES)	7%	1,2%
País Vasco	4%	0,7%

Comunidad Foral de Navarra	45%	7,7%
Aragón	16%	3,0%
Cataluña	16%	3,0%

According to this data, Navarra outstands over the rest of NUTS2 level units, as well as over corresponding NUTS1, country and EU level values. It shows high increase of expenditure over time with 7,7% as average annual growth rate. Basque Country, on the contrary, shows the lowest increase and annual average growth. Referring to France, values (from 2004) are higher than Spanish values (2007) and also important in Midi-Pyrénées and Langedouc-Roussillon.

6.3.2. EPO patents

Table 6.13: EPO patents

GEO/TIME	2006	2007	Increase over 1996	Average annual growth
Spain	30,232	19,011	178%	10,8%
Noreste (ES)	54,515	39,504	174%	10,6%
País Vasco	62,62	41,606	185%	11,0%
Comunidad Foral de Navarra	75,284	46,508	227%	12,6%
Aragón	38,233	36,006	108%	7,6%
Este (ES)	48,517	30,558	155%	9,8%
Cataluña	73,767	46,882	175%	10,7%
France	130,871	79,684	9%	1,3%
Sud-Ouest (FR)	85,72	41,202	73%	5,7%
Aquitaine	51,138	33,375	31%	2,8%
Midi-Pyrénées	128,878	54,502	99%	7,1%
Méditerranée	83,642	48,6	55%	4,5%
Languedoc-Roussillon	56,098	29,232	38%	3,3%

As it can be seen in the table above, France develops many more patents than Spain. The analysis at NUTS 1 level shows that French values still are higher and NUTS 2 reveals more homogeneous values, although Midi Pyrenees stands among CBA regions and also does Langedouc-Roussillon, but because of the contrary.

As it is seen, Spain lags behind France in this issue, but the Spanish number of patent publication is growing. The growth over the years is higher in Spain than in France (almost twice), so thanks to such strong increases; Spanish NUTS 2 have caught up their neighbours.

According to data available, the ratio of patent applications to the EPO per million of inhabitants is higher at the confining Spanish regions comparing to the corresponding country values, and just the opposite occurs in France, where the ratio is lower than the national one.

Another significant note is that after steady growth until 2006, the number of patent applications in Spain and France decreased markedly in 2007 at the time of the recession, so once again R&D seems to be resented by the crisis.

6.3.3. Employed persons in high and medium tech manufacturing activities

Table 6.14: Employed persons in high and medium tech manufacturing activities

Geo object name:	Employed persons in high and medium tech manufacturing activities (2004)2004
Spain	76,284
Pais Vasco	148,187
Comunidad Foral de Navarra	167,825
Aragón	128,55
Cataluña	146,828
France	103,776
Aquitaine	70,5438
Midi-Pyrénées	68,7311
Languedoc-Roussillon	32,9305

This table shows that French NUTS 2 regions are below the EU average, when talking about persons employed in high and medium tech manufacturing activities, especially low in Langedouc-Roussillon.

The opposite happens in the Spanish NUTS 2 regions within the CBA, where Navarra, Basque Country, Cataluña and Aragón present the highest values. Nevertheless, at national level the value of France is 28 percentage points higher than the Spanish one.

In other words, the employment in high and medium technology draws a very different picture on both sides of the border, both at national and at CBA level, highlighting the diverse reality on economic and social scene.

6.4. Social Cohesion

The indicators considered to evaluate the social cohesion of the regions are: youth unemployment rate, long term unemployment rate, infant mortality rate, and population at risk of poverty after social transfers. While all the other indicators are standard demographic variables and therefore need no explanation, population at risk of poverty is defined as “having equivalised disposable income (i.e. adjusted for household size and composition) of less than 60% of national median” (European Commission’s 5th Cohesion Report database).

Table 6.15: Social Cohesion data (Source: Eurostat and European Commission’s 5th Cohesion Report

NUTS 2 name	Unemployment rate, 2010	Long-term unemployment rate, 2009 (>=12 months)	Youth unemployment rate, 2010 (% of labour force aged 15-24)	Population at risk of poverty after social transfers, 2008 (% total pop)	Infant mortality rate 2008	Population aged 25-64 with tertiary education, 2010
EU27	8,9	3,1	20,9	17,0	4,3	25,9
Spain	18	1,7	41,6	19,6	3,5	30,7
País Vasco	11	1,5	30,3	8,5	3,3	44,1
Comunidad Foral de Navarra	10,9	0,7	30,3	6,5	2,7	38,6
Aragón	12,8	0,9	32	13,3	3,4	33,1
Cataluña	16,2	1,3	39,5	12,8	2,8	30,8
France	9,5	3,5	23,4	12,7	3,7	29,0
Aquitaine	8,7	2,6	24,4	13,1	3,7	29,1
Midi-Pyrénées	9,4	2,9	22,6	14,1	3,0	34,9
Languedoc-Roussillon	13,9	4,9	33,1	18,7	3,6	25,3

According to the data shown at the table above, the unemployment rate in the CBA is higher than in the EU, in some areas higher than in France but in other areas lower than in Spain. Unemployment rate is especially high in Cataluña and Languedoc-Roussillon. However, long term unemployment is low in the whole CBA but in Languedoc-Roussillon. Youth unemployment, on the contrary, is quite high in Languedoc-Roussillon and Spanish CBA area, especially in Cataluña with a 40% rate. (More detailed analysis in following pages)

According to all the indicators, Languedoc-Roussillon and Cataluña are the regions where Social Cohesion is at risk, especially in Languedoc where there is the highest lack of social cohesion. The rest of the areas in the CBA show medium social cohesion indicators while Basque country enjoys a more pleasant situation with good social cohesion.

In general terms, the economic, social and territorial disparities at both regional and national level have increased in the enlarged Union. In the case of the Working Community of the Pyrenees CBA, we could say that disparities exist but not very pronounced, although Languedoc-Rousillon, which situation is the weakest in all the variables analysed, deserves to be mentioned.

6.4.1. Unemployment rates in youth

Table 6.16: Unemployment in youth

NUTS 2 name	Unemployment rate, 2010	Youth unemployment rate, 2010 (% of labour force aged 15-24)
EU27	9,6	20,9
Spain	20,1	41,6
País Vasco	10,5	30,3
Comunidad Foral de Navarra	11,8	30,3
Aragón	14,8	32
Cataluña	17,8	39,5
France	9,7	23,4
Aquitaine	8,5	24,4
Midi-Pyrénées	8,3	22,6
Languedoc-Roussillon	14,4	33,1

In general terms, unemployment rates in youth have slightly increased in the last two years (2009 and 2010) in European Union. In Spain, the increase has been notably higher. This is also reflected at regional level. The Autonomous communities also suffer the increase of unemployment, although some more than others. The context of the current economic downturn has to be taken into account. On the contrary, a slight decrease of unemployment in youth is acknowledged.

The recession has hit young workers hardest, as young people have more temporary contracts, are lowest-paid. The highest rise in unemployment has been in the construction sector, which attracted mostly younger workers and immigrants.

6.4.2. Long term unemployment

Long term unemployment, understood as unemployment of 12 months and more, has decreased notably over the last 10 years in the European Union, more exactly a 75% in Spain and only a 40% in France. Nevertheless, in this country as a whole and the NUTS1 and NUTS2 level units within this sector of the CBA, long term unemployment starts increasing in 2008, and this trend is even more intense in 2009, specially in Cataluña. The figures suggest that the economic downturn hits Spain earlier and stronger than France as in this side of the border it is not until 2009 when the long term unemployment in France starts increasing but in a quite moderate manner in the majority of the NUTS1 and NUTS2 level units within the CBA. Languedoc-Rousillon is the region where long term unemployment has increased the most in this sector of the CBA.

Table 6.17: Long term unemployment

GEO/TIME	1999	2007	2008	2009
Spain	7,15	1,69	2,03	4,27
Noreste (ES)	5,54	1,17	1,24	2,38
País Vasco	7,20	1,52	1,54	2,69
Comunidad Foral de Navarra	3,39	0,69	0,85	1,72
Aragón	3,80	0,90	0,94	2,11
Este (ES)	5,08	1,31	1,56	4,06
Cataluña	5,23	1,34	1,53	3,87
France	4,66	3,52	3,11	3,51
Sud-Ouest (FR)	4,40	2,75	2,19	2,64
Aquitaine	4,29	2,56	2,41	2,70
Midi-Pyrénées	4,80	2,93	2,01	2,73
Méditerranée	7,69	4,18	3,62	4,21
Languedoc-Roussillon	7,73	4,91	4,43	5,86

6.4.3. Infant mortality rate

Infant mortality has long been recognized as an important public health indicator refers to the risk of death in the first year of life.

Infant mortality rate (IMR) has been steadily falling in recent decades. It has experienced a clear decline in developed countries, although not at all in the same manner.

As it can be seen at the table bellow, Infant mortality has decreased notably in the last 10 years in all the regions within the CBA. In the Spanish sector of the CBA, Navarra is by far the one which shows the lowest rate and Basque Country the highest. In France, Midi Pyrenees has the lowest value and Aquitaine the highest.

Tabla 6.18. Infant mortality

GEO/TIME	1997	2007
Spain	5,0	3,4
Noreste (ES)	4,9	3,8
País Vasco	5,1	4,3
Comunidad Foral de Navarra	3,8	2,3
Aragón	4,9	3,8
Este (ES)	4,5	3,0
Cataluña	4,6	2,6
France	4,7	3,7
Sud-Ouest (FR)	4,2	3,5
Aquitaine	4,4	3,7
Midi-Pyrénées	3,9	3,0
Méditerranée	4,4	3,5
Languedoc-Roussillon	4,9	3,6

6.4.4. Population at risk of poverty

Tabla 6.19: Population at risk of poverty

NUTS NAME	Population at risk of poverty after social transfers, 2008 (% total pop)
European Union	***17***
País Vasco	8,5
Comunidad Foral de Navarra	6,5
Aragón	13,3
Cataluña	12,8
Aquitaine	13,1
Midi-Pyrénées	14,1
Languedoc-Roussillon	18,7

The risk of poverty is especially low in Basque Country and Navarra, and a bit high in Languedoc-Roussillon according to table 6.19.

In 2008, 17% of the population in the EU27 was at risk of poverty. This means that their income after social transfers was below the poverty threshold. Since 2005, the at-risk-of-poverty rate in the EU27 has been nearly stable, varying between 16% and 17%.

Population at risk of poverty within the CBA is below the EU values, especially in the Spanish case. The extent to which inequality in the distribution of income and in the risk of poverty varies across regions is a relevant issue.

In France, the variation in the risk of poverty is less, but the proportion of people with income below the poverty line still amounts to 20% in the Mediterranean region in the south, which has among the lowest levels of income per capita. It should be considered the regional aspects of the problem, such as a low rate of employment, even youth employment, less population with tertiary studies, etc.

6.4.5. Population Tertiary education

According to Table 6.20., Spanish CBA regions seem to have more population with tertiary education. Basque Country, which has a great tertiary education rate, ranks on the top. On the opposite side is Languedoc-Rousillon.

Table 6.20. Population with tertiary education

GEO/TIME	2008	2009	2010
European Union (27 countries)	24,3	25,2	25,9
Spain	29,2	29,7	30,7
Noreste (ES)	37,5	38,4	39,5
País Vasco	42,2	43,6	44,1
Comunidad Foral de Navarra	35,7	36,0	38,6
Aragón	32,1	31,6	33,1
Este (ES)	27,6	28,1	29,0
Cataluña	29,5	30,1	30,8
France	27,2	28,6	29,0
Sud-Ouest (FR)	27,0	30,1	30,9
Aquitaine	24,5	27,2	29,1
Midi-Pyrénées	30,9	34,6	34,9
Méditerranée	25,4	26,1	26,5
Languedoc-Roussillon	26,7	26,1	25,3

6.5. Environment

For the environmental analysis, two sets of indicators are available. On one hand, the indicators from the European Commission's 5th Cohesion Report, and on the other hand, indicators from the ESPON Climate Project regarding the region's sensitivity for climate change.

Six indicators from the 5th Cohesion Report were considered: soil sealed area, ozone exceedance, waste water treatment, Natura 2000 areas, solar energy, wind potential. While the first four show some concrete elements on environmental issues in the region, the last two are only a broad hint at what could be the region's capacity in exploiting alternative energy sources in an energy source transition scenario and not its actual production.

6.5.1. Soil sealed area

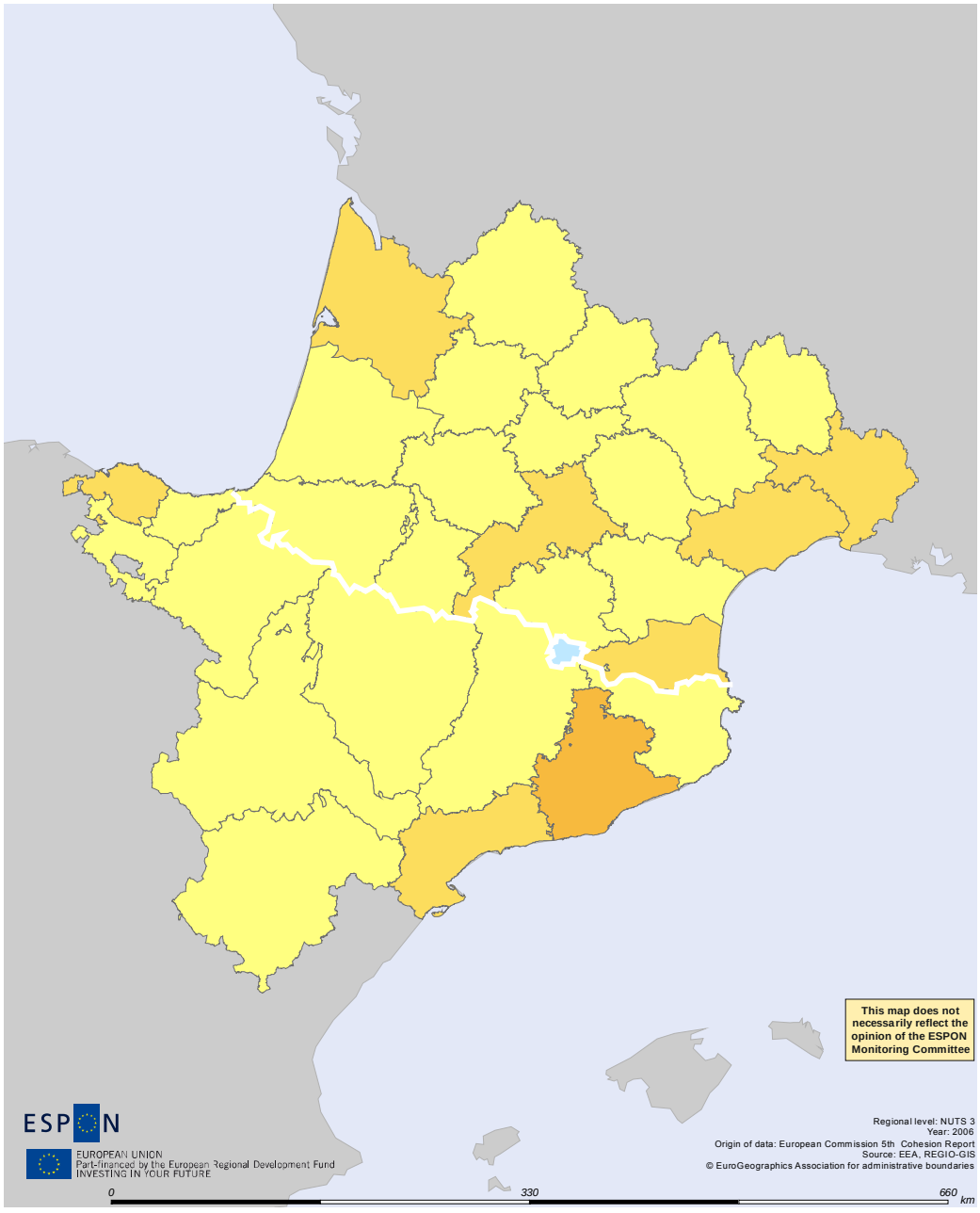
Table 6.21: Soil sealed area in relation to total areas and soil seal in per capita in the CBA in 2006

NUTS CODE	NUTS NAME	Soil sealed area, 2006 (% total area)	Soil sealing per inhabitant (m2 per inhabitant), 2006
EU		6,72	214
FR		4,85	249,45
ES		2,98	198,44
FR611	Dordogne	1	233
FR612	Gironde	4	277
FR613	Landes	1	328
FR614	Lot-et-Garonne	1	242
FR615	Pyrénées-Atlantiques	2	286
FR621	Ariège	1	214
FR622	Aveyron	1	212
FR623	Haute-Garonne	4	221
FR624	Gers	1	240
FR625	Lot	1	153
FR626	Hautes-Pyrénées	2	308
FR627	Tarn	2	270
FR628	Tarn-et-Garonne	1	205
FR811	Aude	2	286
FR812	Gard	3	251
FR813	Hérault	4	222
FR814	Lozère	0	250
FR815	Pyrénées-Orientales	3	255
ES211	Álava	2	165
ES212	Guipúzcoa	2	69
ES213	Vizcaya	3	67
ES220	Navarra	1	178
ES241	Huesca	0	277
ES242	Teruel	0	348
ES243	Zaragoza	1	183
ES511	Barcelona	6	88
ES512	Girona	2	197
ES513	Lleida	1	212
ES514	Tarragona	3	233

Concerning soil sealed area per inhabitant, more than half of the NUTS 3 units within the CBA are above the EU average (214 sqm per inhabitant of soil sealing). Similar values are found in France, where half of the NUTS3 are above the national average (249,45 sqm per inhabitant) but not in Spain, where only four out of 11 NUTS 3 level units are above the national average (198,44 sqm per inhabitant). Urbanised areas such as Barcelona and Vizcaya have the lowest figures of soil sealing per inhabitant, while areas such as Teruel have the highest value. Landes and Hautes-Pyrénées have the highest values in France, contrary to Lot and Tarn-et- Garonne.

Regarding the soil sealed area as percentage of total area. Barcelona and Vizcaya are the Spanish NUTS3 regions with highest values at this regard, 6% and 3% respectively and Gironde and Haut Garone and Herault 4% in France.

Map 6.3: Category map of soil sealed area in the CBA



Legend

Soil sealed area, 2006 (% total area)

- <= 2,00
- 2,01 - 4,00
- 4,01 - 8,00
- 8,01 - 13,00
- 13,01 - 23,00
- >= 23,01
- <missing value>

NUTS 3 average
EU27 = 6,72
FR = 4,85
ES = 2,98

6.5.2. Ozone

Table 6.22: Days with ground-level ozone concentration above 120 µg/m³

NUTS CODE	NUTS NAME	Ozone concentration exceedances in NUTS 3 regions (days), 2008
EU		9,99
FR		7,82
ES		4,68
FR611	Dordogne	5
FR612	Gironde	7
FR613	Landes	6
FR614	Lot-et-Garonne	5
FR615	Pyrénées-Atlantiques	7
FR621	Ariège	0
FR622	Aveyron	5
FR623	Haute-Garonne	2
FR624	Gers	2
FR625	Lot	6
FR626	Hautes-Pyrénées	2
FR627	Tarn	4
FR628	Tarn-et-Garonne	3
FR811	Aude	6
FR812	Gard	20
FR813	Hérault	18
FR814	Lozère	3
FR815	Pyrénées-Orientales	15
ES211	Álava	4
ES212	Guipúzcoa	3
ES213	Vizcaya	8
ES220	Navarra	0
ES241	Huesca	1
ES242	Teruel	2
ES243	Zaragoza	1
ES511	Barcelona	26
ES512	Girona	18
ES513	Lleida	3
ES514	Tarragona	6

The amount of days with ground-level ozone concentration above 120 µg/m³, reflect emissions of fossil fuels, especially form the transport sector.

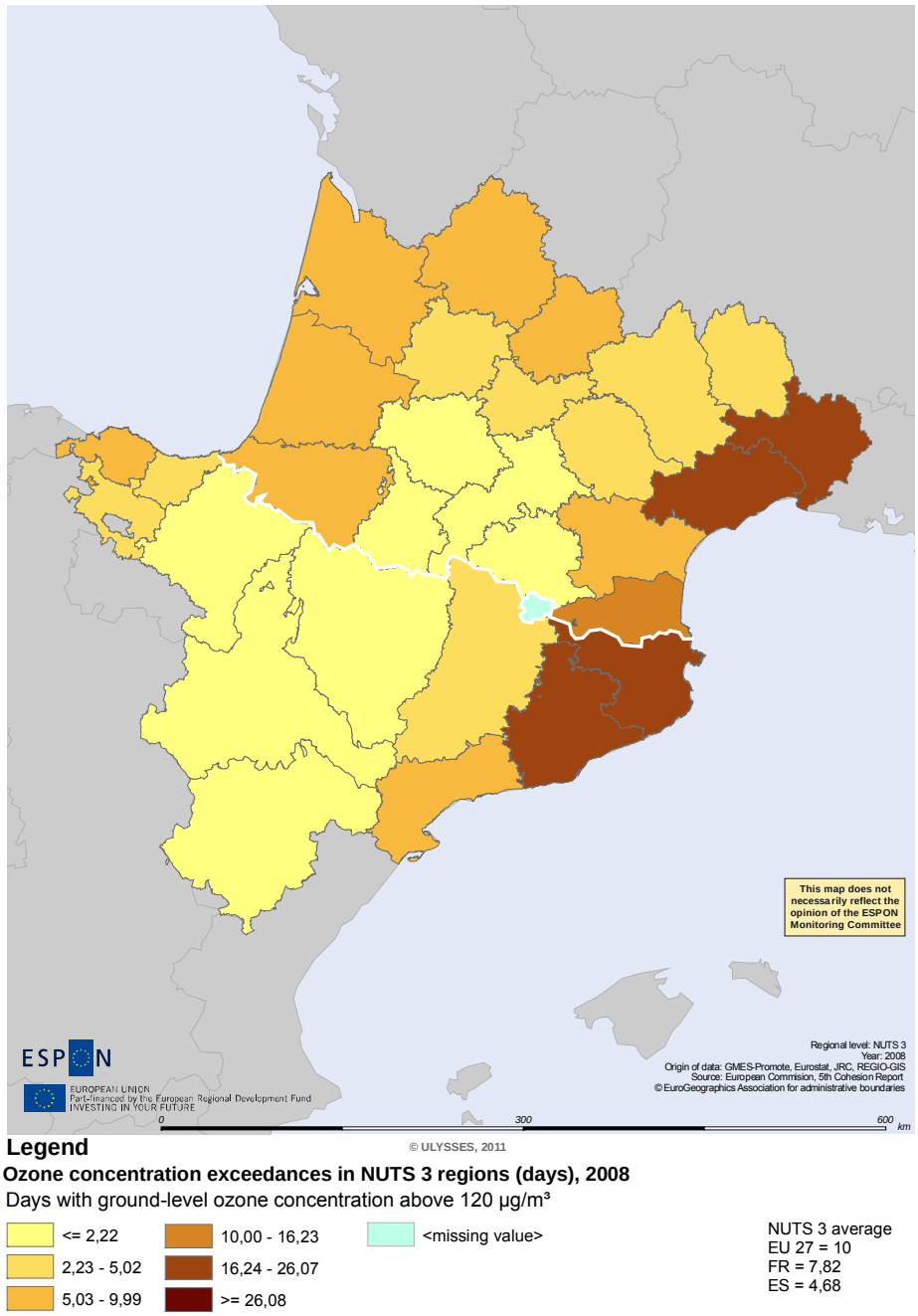
France (7,82 days/year) and Spain(4,68 days/year) are below the EU average of 9,99 days/year with ground-level ozone concentration above 120 µg/m³.

In French case, the region of Midi-Pyrenees concentrates the lowest values, for example:

Ariege (0 days/year), Gers and Haute Pyrenees with only 2 days/year, while the Region of Languedoc – Roussillon suffers from more days, this is the case of: Gard, Herault and Pyrénées Orientales, with 20, 18 and 15 days/year respectively.

In the Spanish case, Cataluña has the highest values, (Barcelona 26 days/year and Girona 18 days/year) and the contrary happens in Navarra and Aragón (Huesca and Zaragoza with only 1 day/year). This variation is due to the specific characteristics of the zone, chemical products and pollution levels.

Map 6.4: Ozone concentration exceedance in the CBA 2008



6.5.3. Urban waste water treatment capacity

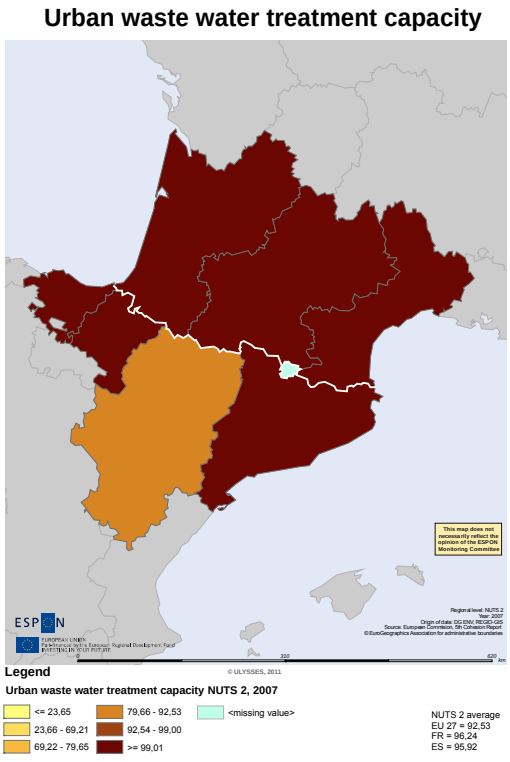
The urban waste water treatment capacity indicates how effective waste water can be treated before it is reverted into the natural circle.

Table 6.23: Urban waste water treatment capacity in the CBA 2007

NUTS CODE	NUTS NAME	Urban waste water treatment capacity, 2007
EU		92,53
ES		95,92
FR		96,24
ES21	País Vasco	100
ES22	Comunidad Foral de Navarra	100
ES24	Aragón	91
ES51	Cataluña	100
FR61	Aquitaine	100
FR62	Midi-Pyrénées	100
FR81	Languedoc-Roussillon	100

Both France and Spain averages are higher that the EU average, and every NUTS2 units of the CBA reach 100% of urban waste water treatment capacity, except Aragon, although it also shows optimal treatment capacity (91%).

Map 6.5.: Category map of urban waste water treatment capacity in the CBA 2007



6.5.4. Natura 2000

Table 6.24: Natura 2000 areas in relation to total area in the CBA 2009

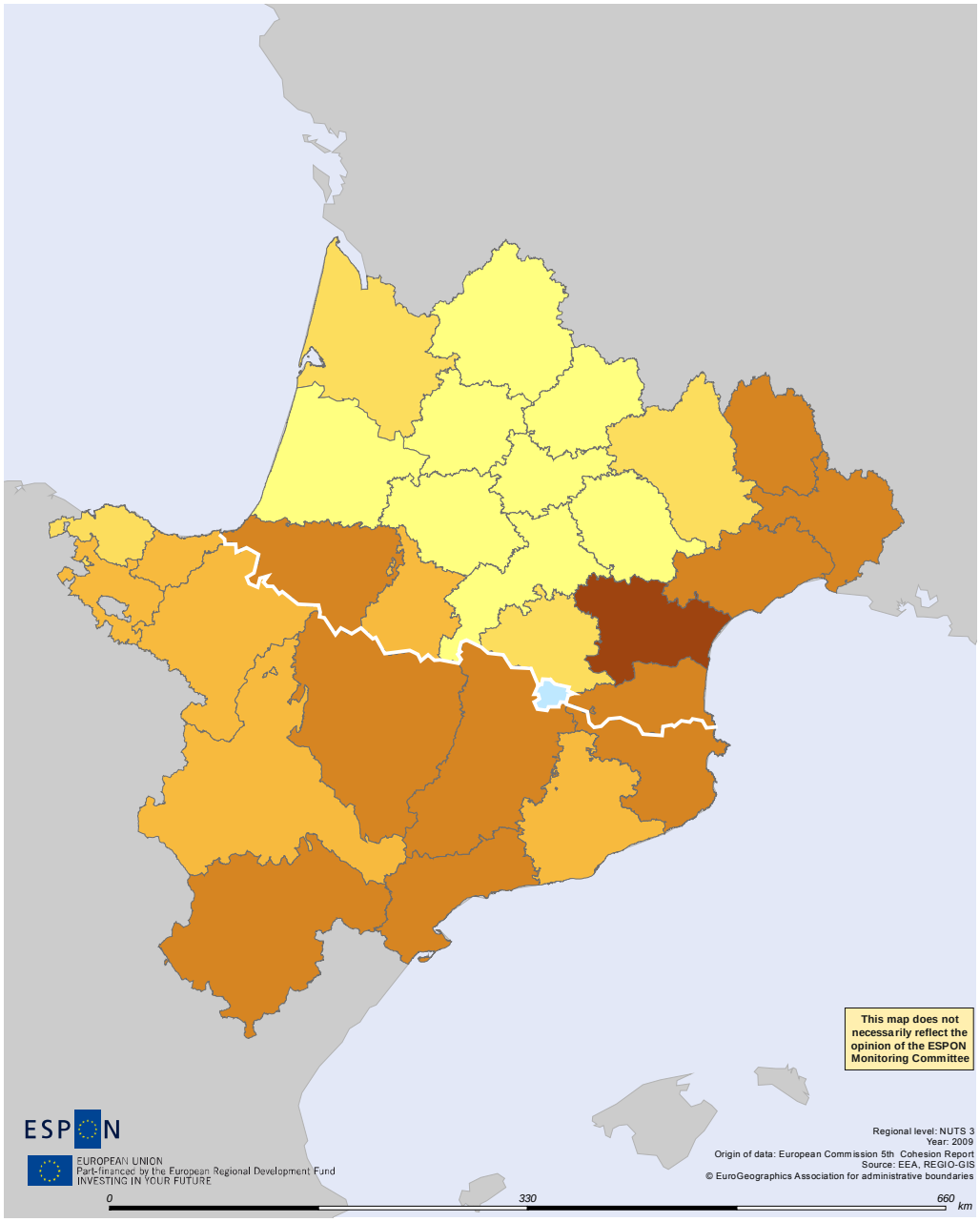
NUTS CODE	NUTS NAME	NATURA 2000 areas, 2009 (% of total)
EU		14,24
FR		11,81
ES		28,88
ES211	Álava	26
ES212	Guipúzcoa	20
ES213	Vizcaya	11
ES220	Navarra	24
ES241	Huesca	31
ES242	Teruel	29
ES243	Zaragoza	25
ES511	Barcelona	22
ES512	Girona	34
ES513	Lleida	31
ES514	Tarragona	33
FR611	Dordogne	4
FR612	Gironde	10
FR613	Landes	6
FR614	Lot-et-Garonne	1
FR615	Pyrénées-Atlantiques	30
FR621	Ariège	14
FR622	Aveyron	10
FR623	Haute-Garonne	7
FR624	Gers	2
FR625	Lot	6
FR626	Hautes-Pyrénées	19
FR627	Tarn	7
FR628	Tarn-et-Garonne	3
FR811	Aude	40
FR812	Gard	32
FR813	Hérault	31
FR814	Lozère	32
FR815	Pyrénées-Orientales	31

Natura 2000 is the centrepiece of EU nature & biodiversity policy. It is an EU wide network of nature protection areas aimed at assuring long-term survival of Europe's most valuable and threatened species and habitats. According to the data above, Spain seems to have an important percentage of Natura areas comparing to France and EU average.

As mentioned earlier, Spain shows higher values (28,88%) than France (11,81%) and the doubles the EU average (14,24%). Overall the CBA has vast Natura 2000 areas, in particular in Huesca Teruel, GIrona and LIleida, being Vizcaya the region with the lowest share (11%).

On the French sector of the CBA, Languedoc-Roussillon shows very high values, up to 40%, highly influenced by the more than 20 Natura 2000 sites that can be found in Pyrénées-Orientales department. On the contrary, Midi-Pyrenees is the region with lowest values.

Map 6.6: Category map of Natura 2000 areas in relation to total area in the CBA 2009



6.5.5. Solar energy potential

Table 6.25: Solar energy potential in the CBA: Average is calculated on the yearly sum of global irradiation optimally-inclined surface (kWh/m2)

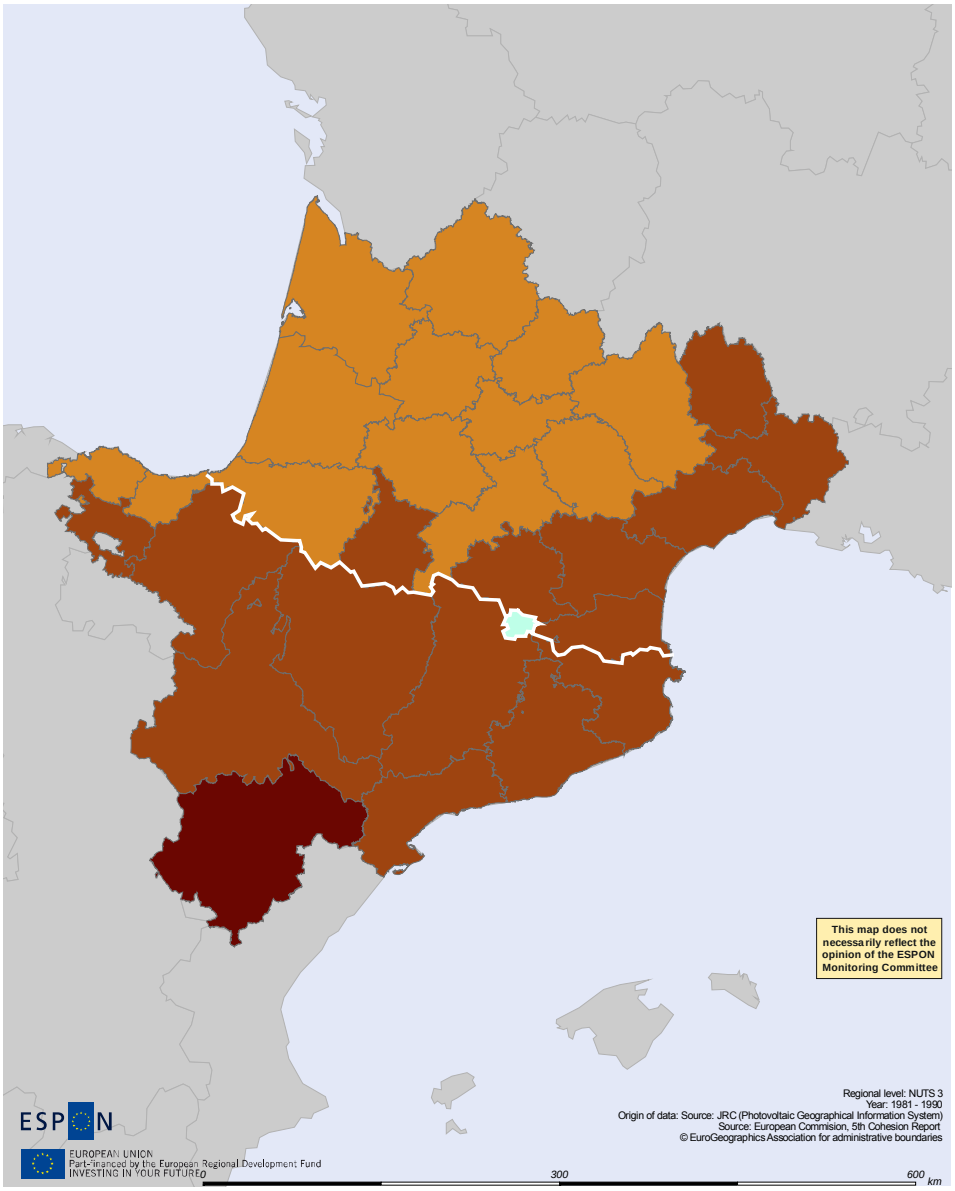
NUTS CODE	NUTS NAME	Solar energy resources per NUTS 3 regions (kWh per year, 1981-1990)
EU		1304,46
FR		1431,18
ES		1789,47
ES211	Álava	1.627
ES212	Guipúzcoa	1.567
ES213	Vizcaya	1.539
ES220	Navarra	1.642
ES241	Huesca	1.717
ES242	Teruel	1.862
ES243	Zaragoza	1.737
ES511	Barcelona	1.777
ES512	Girona	1.778
ES513	Lleida	1.777
ES514	Tarragona	1.761
FR611	Dordogne	1.467
FR612	Gironde	1.490
FR613	Landes	1.508
FR614	Lot-et-Garonne	1.482
FR615	Pyrénées-Atlantiques	1.569
FR621	Ariège	1.724
FR622	Aveyron	1.573
FR623	Haute-Garonne	1.590
FR624	Gers	1.520
FR625	Lot	1.497
FR626	Hautes-Pyrénées	1.660
FR627	Tarn	1.595
FR628	Tarn-et-Garonne	1.516
FR811	Aude	1.661
FR812	Gard	1.713
FR813	Hérault	1.682
FR814	Lozère	1.628
FR815	Pyrénées-Orientales	1.768

The solar energy potential of Spain is higher than the average of France and even more the EU average, which is not rare as it is one of the countries of Europe with more hours of sun.

Among the NUTS 3, Spanish ones show higher values, especially Cataluña (1778), and in particular in Girona and Barcelona. In France Languedoc-Roussillon shows higher values than the rest of French NUTS3, as it is also a sunny area with important solar infrastructure, such as the solar oven of Odeillo Font-

Romeu22, one of the two largest solar furnace in the world. Since 1990, the CNRS offers an information center open to the public.

Map 6.7.: Category map of solar energy potential in the CBA: Average is calculated on the yearly sum of global irradiation on optimally-inclined surface (Kwh/m2)



Legend

Solar energy resources per NUTS 3 regions (kWh per year, 1981-1990)

Average is calculated on the yearly sum of global irradiation on optimally-inclined surface (kWh/m2)

- <= 1100,53
- 1100,54 - 1182,65
- 1182,66 - 1303,99
- 1304,00 - 1595,14
- 1595,15 - 1777,86
- >= 1777,87
- <missing value>

NUTS 3 average
EU 27 = 1.304
FR = 1436,20
ES = 1789,47

[22] Concentrateurs solaires, CNRS,

http://www.promes.cnrs.fr/index.php?page=concentrateurs-solaires

6.5.6. Wind energy potential

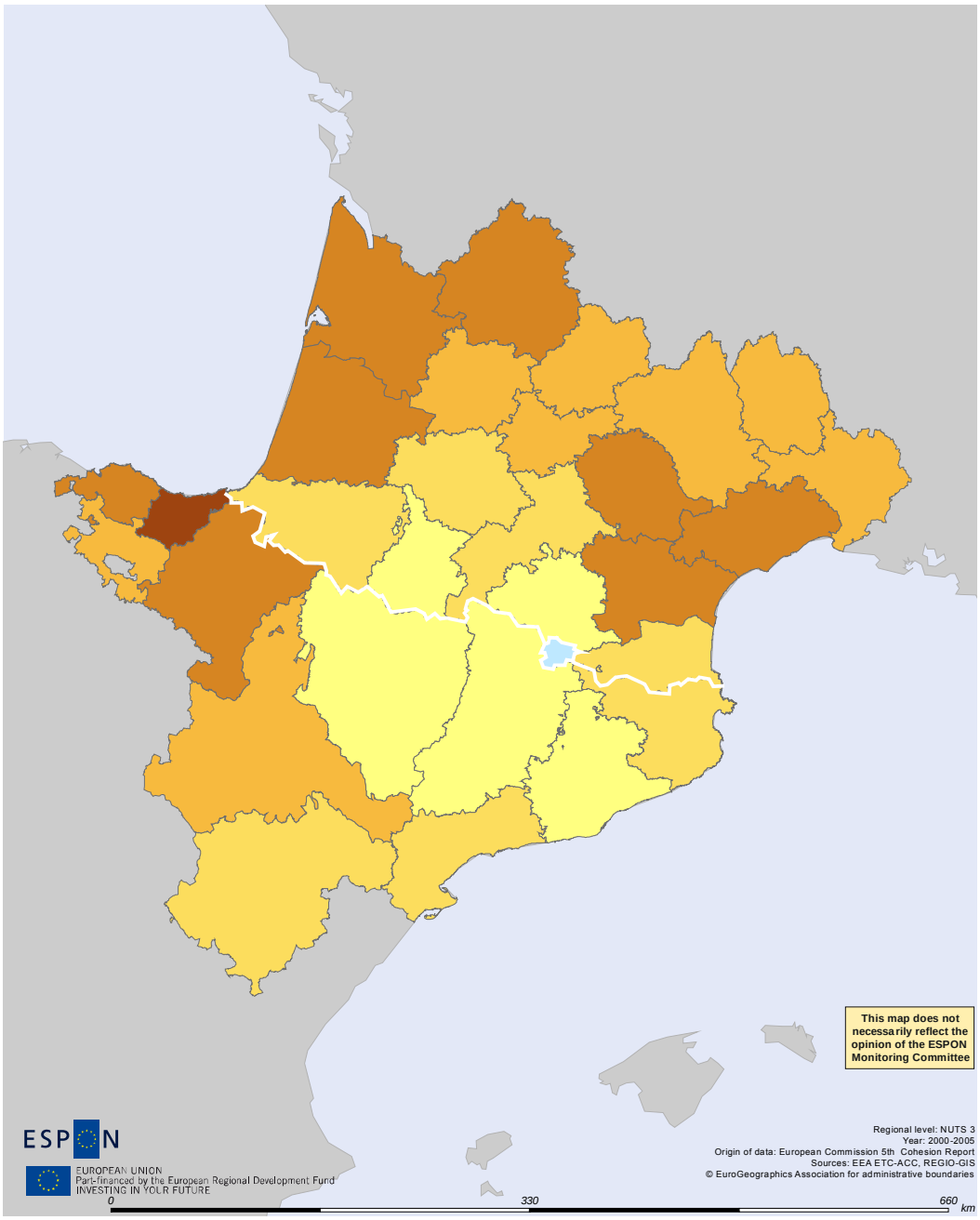
Table 6.26: Wind energy potential in the CBA

NUTS CODE	NUTS NAME	Wind energy potential: onshore full load hours, 2000-2005 (number hours year) At 80 m hub height.
EU		1378,98
FR		1213,93
ES		873,52
ES211	Álava	982
ES212	Guipúzcoa	1.515
ES213	Vizcaya	1.158
ES220	Navarra	1.091
ES241	Huesca	372
ES242	Teruel	707
ES243	Zaragoza	829
ES511	Barcelona	276
ES512	Girona	557
ES513	Lleida	65
ES514	Tarragona	499
FR611	Dordogne	1.183
FR612	Gironde	1.429
FR613	Landes	1.195
FR614	Lot-et-Garonne	878
FR615	Pyrénées-Atlantiques	630
FR621	Ariège	196
FR622	Aveyron	977
FR623	Haute-Garonne	538
FR624	Gers	634
FR625	Lot	936
FR626	Hautes-Pyrénées	156
FR627	Tarn	1.224
FR628	Tarn-et-Garonne	865
FR811	Aude	1.298
FR812	Gard	971
FR813	Hérault	1.269
FR814	Lozère	941
FR815	Pyrénées-Orientales	663

France and Spain are below the EU average in terms of wind energy potential. Four Spanish NUTS 3 level units within the CBA are over the national average, particularly Guipuzcoa. Navarra, although not being the region with the highest potential, currently covers 70% of their energy use through renewable energy, meeting the objective of f 20% of Europe's energy consumption must come from renewable calls.

In France, values are higher, although only five out of the seventeen NUTS 3 level units are above the corresponding country value. Aquitaine and Languedoc-Roussillon are the top ranked regions.

Map 6.8.: Category map of wind energy potential in the CBA



Legend

Onshore full load hours, 2000-2005 (number hours year) at 80 m hub height

<= 408,58	1009,15 - 1429,33	<missing value>
408,59 - 726,17	1429,34 - 1985,82	
726,18 - 1009,14	>= 1985,83	

NUTS 3 average
EU27 = 1378,98
FR = 1213,93
ES = 873,52

6.6. Climate

Table 6.27: ESPON Climate, Scientific Report.

id	sens_phys	sens_soc	sens_env	sens_cult	sens_econ
es211	0,15	0,30	0,60	0,00	0,59
es212	0,18	0,38	0,56	0,01	0,62
es213	0,17	0,53	0,53	0,04	0,63
es220	0,19	0,35	0,57	0,00	0,61
es241	0,19	0,29	0,65	0,06	0,45
es242	0,12	0,14	0,52	0,03	0,37
es243	0,23	0,49	0,50	0,09	0,38
es511	0,39	1,00	0,56	0,02	0,85
es512	0,18	0,39	0,64	0,03	0,50
es513	0,21	0,37	0,70	0,02	0,70
es514	0,29	0,26	0,59	0,00	0,69
fr611	0,16	0,16	0,32	0,08	0,61
fr612	0,37	0,30	0,49	0,16	0,42
fr613	0,10	0,10	0,47	0,06	0,40
fr614	0,15	0,17	0,43	0,06	0,34
fr615	0,23	0,25	0,61	0,07	0,33
fr621	0,18	0,23	0,54	0,00	0,38
fr622	0,13	0,14	0,44	0,03	0,39
fr623	0,25	0,31	0,51	0,04	0,36
fr624	0,12	0,14	0,42	0,04	0,28
fr625	0,09	0,11	0,31	0,04	0,34
fr626	0,23	0,27	0,58	0,03	0,50
fr627	0,13	0,15	0,40	0,07	0,38
fr628	0,13	0,16	0,42	0,00	0,32
fr811	0,23	0,18	0,59	0,10	0,38
fr812	0,20	0,21	0,52	0,10	0,62
fr813	0,23	0,23	0,55	0,06	0,38
fr814	0,12	0,13	0,60	0,00	0,38
fr815	0,22	0,29	0,59	0,13	0,40

6.6.1. Combined physical sensitivity

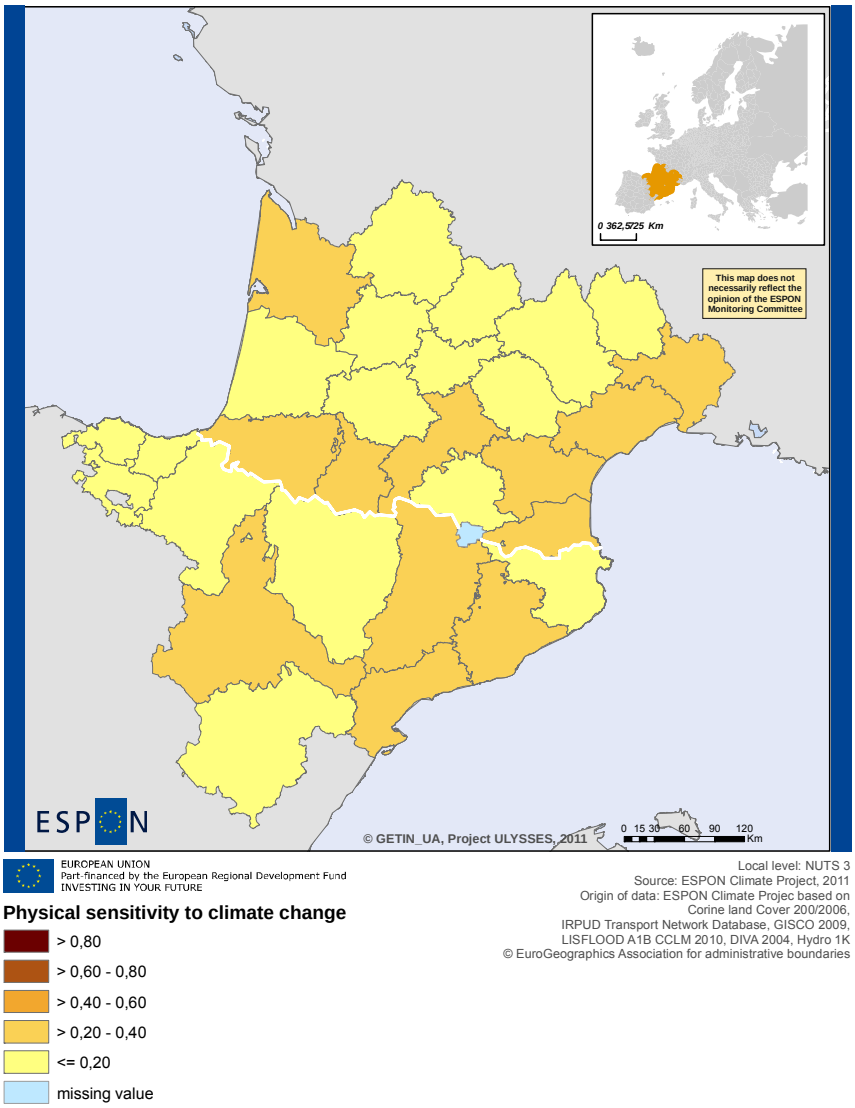
Physical sensitivity relates to all human artefacts that are important for territorial development and which are potentially affected by climate change. This includes settlements, roads, railways, airports and harbours. These physical assets of a region are typically adapted to normal regional weather conditions and can withstand smaller climatic changes. However, buildings and infrastructure are sensitive to extreme weather events like flash floods, large scale river floods and coastal storm surges which's frequency and magnitude may change due to climate change.

Sensitivity indicators used are: settlements sensitive to flash floods, roads and railways sensitive to flash flood, settlements sensitive to river flooding, roads and railways sensitivity to river flooding, airports and harbours sensitive to coastal flooding, settlements sensitive to coastal flooding, roads and railways sensitive to coastal flooding, and airports and harbours sensitive to coastal flooding.

Exposure indicators used are changes in number of days of heavy rainfall, changes in occurrence of river flooding, change of mean sea level.

Minor physical sensitivity is seen in the Working Community of the Pyrenees CBA. In the Spanish side, Barcelona shows the highest value and Teruel the lowest. In France, Gironde is the NUTS3 region with highest value and Lot the lowest. It is worth mentioning that both values are even lower than the values for the aforementioned Spanish NUTS 3 level units.

Map 6.9.: Category map of physical sensitivity to climate change in the CBA



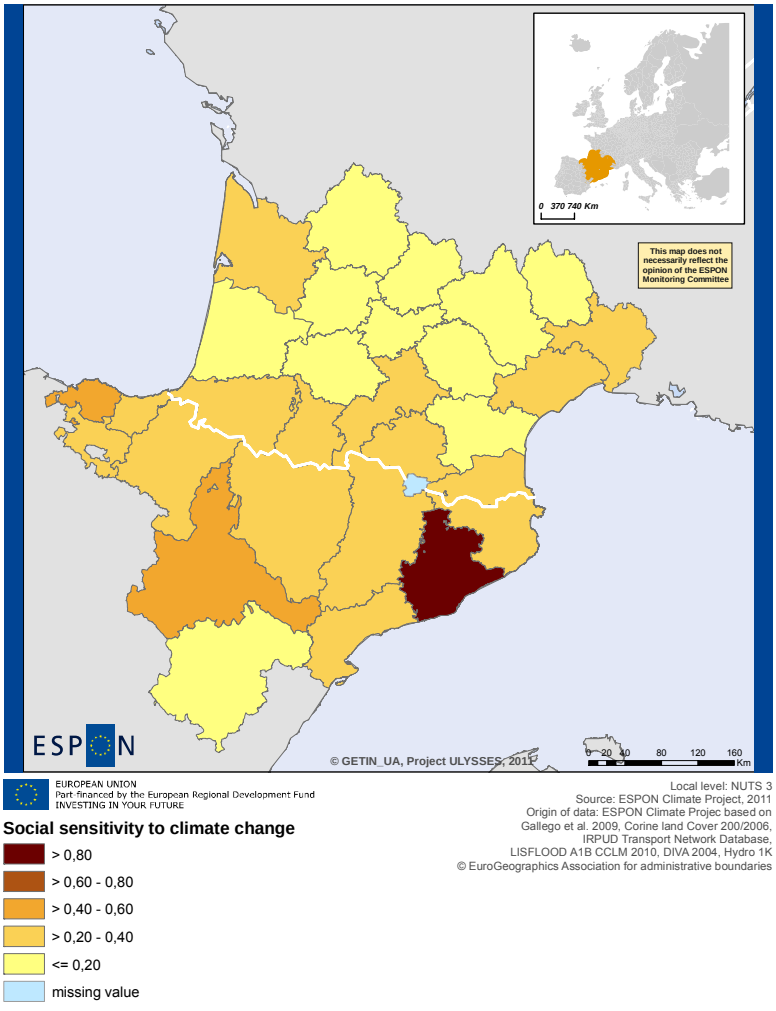
6.6.2. Combined social sensitivity

Social sensitivity relates to human populations that may be adversely or positively affected by climate change. In particular, this encompasses climate-related sensitivities in regard to public health and personal mobility. In particular this dimension includes populations sensitive to river flooding, coastal flooding, flash floods and heat.

Exposure indicators taken into account are changes in number of heavy rainfall days, changes of number of summer days, changes in occurrence of river flooding, and change of mean sea level.

The CBA as a whole shows middle social sensitivity to climate change, being Barcelona the most sensitive (1), followed by Vizcaya (0,53)and Zaragoza (0,49).In the opposite side is Teruel with only 0,14. On the other side of the border, Haute-Garonne and Gironde show the highest values, while in Landes and Lot show the lowest.

Map 6.10.: Category map of social sensitivity to climate change in the CBA



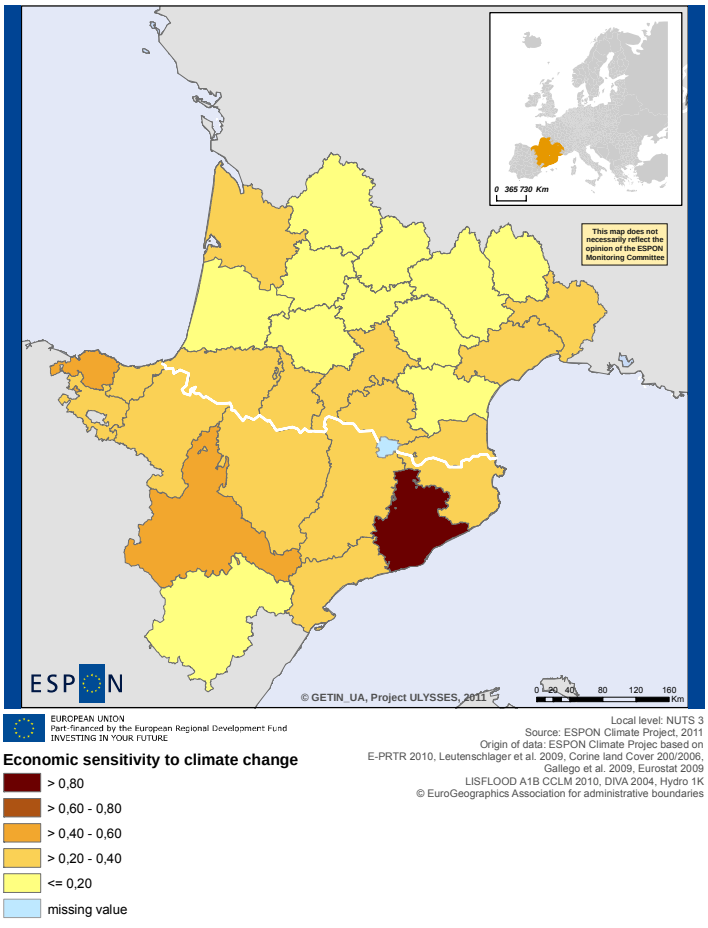
6.6.3 Combined economic sensitivity

Economic sensitivity related to economic activities or sectors that are especially sensitive to climatic changes. This includes agriculture and forestry whose economic goods are highly dependent on suitable climate. Tourism, both summer and winter tourism, capitalizes on specific climatic conditions. The energy sector is also very sensitive: Power plants need water for cooling and are sensitive to flooding. Private households and the service sector require heating and/or cooling and thus demand more or less energy.

The sensitivity indicators analysed are agriculture sensitive to water availability, forestry sensitive to water availability, summer tourism sensitive to summer temperatures, winter tourism sensitive to snow cover changes, energy demand sensitive to summer heat, energy demand sensitive to winter frost, energy supply sensitive to changing river water levels.

Barcelona (0,85) and Teruel (0,37) outstand in the Spanish side, as they show extreme values referring g to economic sensitivity. In the French side there are many disparities regarding this issue, being Gard the region with the highest value, although not as high as in the Spanish side (0,62) and Gers (0,28) the lowest, even below the lowest value found in Spain.

Map 6.11.: Category map of economic sensitivity to climate change in the CBA



6.6.4 Combined cultural sensitivity

Cultural sensitivity encompasses cultural assets like museums and internationally recognised historic sites that may potentially be damaged or destroyed due to climate change. While this may to a minor degree be true for all temperature and moisture changes, the highest and most sure sensitivity relates to extreme weather events like river flooding and coastal flooding.

According to the data available in the table Zaragoza exhibits high cultural sensitivity values (0.09) maybe owing to the fact that many old cities and historic sites are deliberately located along major rivers, for example Ebro river in this case. Another interesting fact to note is the International Exposition, whose main theme was "Water and Sustainable Development", celebrated in 2008. On the contrary, Alava, Navarra and Tarragona got 0 in this regard.

In the French side of the border, Gironde, where the largest estuary in Europe is located and Pyrenees Orientales show 0, 16 and 0,13 respectively, while Ariege and Tarn et Garonne show 0.

6.7. CONCLUSION

As a first conclusion we can say that there are different (and diverse) capacities to contribute to innovation, growth and Employment across the CBA NUTS 3 level units. Not all regions have the same capacity to deal with certain challenges. Therefore, the coping towards the main objectives of Europe 2020; Employment, research and innovation, climate change and energy, education and fighting poverty will be faced in different ways depending on the regions and their circumstances.

Concerning the challenges referring to **climate change and energy**, it could be said that the Working Community of the Pyrenees is not far away of a good situation on this field. The undertaken analysis according to variables such as soil sealed area, ozone exceedances, waste water treatment, Natura 2000 areas, solar energy and wind potential shows that the CBA is quite well positioned. It is above the EU average in soil sealed areas per inhabitant, below the EU average regarding ozone concentration exceedances, good capacity for urban waste water treatment reaching 100% of the capacity and important and significant percentage of NATURA 2000 areas.

In relation to solar and wind energy, the available data shows values above the EU average in solar energy but not in wind energy, although there are NUTS3 level units where the wind energy values are high and good. Finally, referring to sensitivity to climate change, minor and middle sensitivity is shown regarding physical social economic and cultural aspects, highlighting the case of Barcelona where both, economic and social sensitivity is very high comparing to the rest, being these two aspects very related or dependant between them.

As regards **economy**, there is a disparity in GDP per capita among regions on both sides of the border, although this disparity decreases if they are bordering areas themselves (confining NUTS 3). It could be seen that half of NUTS 3 areas within the CBA were classified *as Middle Income Regions*, especially the Spanish ones, but if we focus on confining NUTS 3 level units, 70% are *Middle Income regions*, so their situation is better than the rest.

Another example of disparity is the result of the catching up analysis, which shows that French NUTS3 level units within the CBA are considered as diverging regions, in other words, they are getting apart, even not converging. On the contrary, on the other side of the border, NUTS3 level units such as Guipuzcoa could reach leading GDP rates in 38 years time.

Every single NUTS 3 level unit has its own characteristics and potential in terms of weather (tourism, etc), specific crops (vineyards, etc), specific Industry (aeronautics, etc.), specific gastronomic products (cheese, wine, etc), natural sceneries (natural parks, skiing areas, etc) which conditioned the activity and evolution of the area. As a matter of fact, the Spanish side is more industrial in general terms than the French one.

As regards to **Social Cohesion**, we could say that disparities exists but not very pronounced, although it is worth mentioning the situation of Languedoc-Rouisllon, which is the weakest in all the variables analysed in this chapter (i.e. long –term unemployment rate, youth unemployment rate, etc).

To tackle the lack of social cohesion, Article 158 and 159 of the Treaty establish the need to strengthen economic and Social cohesion and state that the action will be supported by the Structural Funds, European Investment Bank (EIB) and the other existing financial instruments.

Therefore, the cohesion policy should contribute to increasing growth, competitiveness and employment, for which it has to incorporate not only community priorities specified in the European Council Lisbon, but also requirements of sustainability addressed environment as agreed at the Gothenburg Council.

Concerning **Research and Innovation** the reality is far away from the goal of Europe 2020 Strategy which pursues that 3% of EU GDP is invested in R&D. Total EU expenditure in 2007 did not reached this value, but data say that despite all, there have been increases of expenditure on R&D, in every sector analysed, in spite of the existing differences on the amount of expenditure devoted to each sector.

Technological capability of regions in the Spanish side of the border, as measured by patent level, is higher than the corresponding country value. The contrary happens in France. If patents encourage the creativity of the inventor, they also make governments promote the creation of industrially applicable inventions, the development of industry and trade and the transfer of technology. But patents' publication also is resented by the crisis, as at recession time, the number of applications decreased markedly in both sides of the border.

Over 90% of public research and innovation funding in Europe comes from national or regional levels, therefore innovation budget of Each Country should be influenced by it. As mentioned at the beginning of this chapter, action at all levels is required to meet the Lisbon, Gothenburg and Europe 2020 targets. Despite some progress, national and regional governments still work largely according to their separate strategies, which lead to inefficiencies.

To conclude, considering the economic and financial current situation, since the period of widespread government budget cuts, the Commission launched in April 2010 a study on Member States' plans for public investment in R & D in 201123. Hence it is known that among the four Member States that intended to cut their budgets for R & D is included Spain, while France did not give information.

Consequently, progress towards Europe 2020 Strategy goals will be reached if Member States translate it into national targets and comply with their regional objectives, which are determined by the decision structures of each country. If the States are not aware of and do not devote significant part of their budget to this end, or if the goals across different administration levels (national and regional) do not go in the same direction, there is not much to do.

[23] European Commission: Research Directorate-General, Brussels, 2 July 2010, “Note to ERAC Members” PV/BH/rtd.c.3 (2010)433761

Chapter 7 – Integrated Territorial Analysis

7.1. Aims, Indicators and Methods

The objective of the integrated territorial analysis is to examine the relation between the territorial characteristics and the performance of the cross border area from the perspective of Lisbon/Europe 2020 Strategy and Gothenburg objectives. The rationale of this type of analysis is that the performance of the cross-border areas may be conditioned by the territorial characteristics of the region and that there may be potential to improve some of the characteristics via policy actions and thus improve the regional performance.

Two sets of indicators were established: one for territorial profile variables and one for territorial performance variables.

The first set considered variables linked to overall territorial characteristics of the different regions, on the themes considered (Table 49). Polycentricity was excluded at this point, as it makes no sense on a NUTS 3 level at which the analysis was performed. On the other hand, indicators that are normally associated with the Lisbon/Europe 2020 and Gothenburg objectives at the input level (such as R&D investment, active population with tertiary education and so forth) have also been included, since the differentiation was made between dependent and independent variables and not merely based on thematic categories. Unlike most studies on innovation, the EPO patent applications have also been included at this level. This is because, although they can be understood as an output of innovation, innovation in itself is an input for economic performance.

The second set considered variables linked to the performance of the regions concerning indicators related to the Lisbon/Europe 2020 and Gothenburg indicators at the output level.

In order to analyse the relations between the territorial profile and the regions performance, two different analysis where performed. First, a factor analysis for each set of indicators. Second, several multiple linear regressions having as independent variables each factor of the performance indicators and as dependent variables all the factors of the territorial profile.

Table 7.1.. Indicators for territorial profile analysis of the EU27 NUTS3 areas.

Indicator	UNITS	Year	Geographical unit
Population density	inhabitant/km2	2009	NUTS 3
Crude rate of pop increase	per 1000	2008	NUTS 3
Crude rate net migration	per 1000	2008	NUTS 3
Crude rate of natural increase	per 1000	2008	NUTS 3
Young age dependency	%	2008	NUTS 3
Old age dependency	%	2008	NUTS 3
Total fertility rate		2008	NUTS 2
Commuters to other region	per 1000	2009	NUTS 2
Rural typology	nominal	2008	NUTS 3
Percent_agric_area	%	2006	NUTS 3

Annual growth rate 90-06 agricultural areas	per 10000	1900-2006	NUTS 3
Net formation of urban fabric by total area 00-06	per 10000	1900-2006	NUTS 3
Potential accessibility by air index	%	2006	NUTS 3
Potential accessibility by rail index	%	2006	NUTS 3
Potential accessibility by road index	%	2006	NUTS 3
Change of the standardized rail index	%	2001-2006	NUTS 3
Change of the standardized road index	%	2001-2006	NUTS 3
Change of the standardized air index	%	2001-2006	NUTS 3
Share of employment in agriculture and fishing (A_B)	%	2008	NUTS 3
Share of employment in industry (except construction) (C-E)	%	2008	NUTS 3
% employment in construction (F)	%	2008	NUTS 3
% employment in wholesale and retail trade; hotels and restaurants; transport (G-I)	%	2008	NUTS 3
% employment financial intermediation; real estate (J_K)	%	2008	NUTS 3
% employment in public administration and community services; activities of households (L-P)	%	2008	NUTS 3
Agriculture; fishing (A_B)	%	2008	NUTS 3
Industry (except construction) (C-E)	%	2008	NUTS 3
Construction (F)	%	2008	NUTS 3
Wholesale and retail trade; hotels and restaurants; transport (G-I)	%	2008	NUTS 3
Financial intermediation; real estate (J_K)	%	2008	NUTS 3
Public administration and community services; activities of households (L-P)	%	2008	NUTS 2
Total intramural R&D expenditure by GDP	%	2007	NUTS 2
Intramural R&D expenditure of business enterprise sector by GDP	%	2007	NUTS 2
intramural R&D expenditure government sector by GDP	%	2007	NUTS 2
intramural R&D expenditure higher education sector by GDP	%	2007	NUTS 2
EPO patents per million of inhabitants by GDP	%	2007	NUTS 2
Employed persons in high and medium tech manufacturing activities by total workforce (EU 25 = 100)	%	2004	NUTS 2
Population aged 25-64 with tertiary education	%	2010	NUTS 2
Physical sensitivity to climate change	rate	n/a	NUTS 3
Social sensitivity to climate change	rate	n/a	NUTS 3
Environmental sensitivity to climate change	rate	n/a	NUTS 3
Cultural sensitivity to climate change	rate	n/a	NUTS 3
Economic sensitivity to climate change	rate	n/a	NUTS 3

Table 7.2:. Indicators for the territorial performance analysis.

Indicator	UNITS	Year	Geographical unit
Unemployment rate	%	2008	NUTS 3
Long-term unemployment rate (>=12 months)	%	2009	NUTS 2
Youth unemployment rate, per labor force aged 15-24	%	2008	NUTS 3
Infant mortality rate	%	2008	NUTS 2
GDP per capita indexed EU average	%	2008	NUTS 3
Catching-up	nominal	1997-2008	NUTS 3
Natura 2000 area	%	2006	NUTS 3
Ozone concentration exceedance, per year	%	2008	NUTS 3
Waste water treatment capacity	%	2007	NUTS 2
Soil sealed area	%	2006	NUTS 3

7.2. Territorial Profile Analysis

Factor analysis was applied on the indicators for territorial profile (Table xx), aiming

a) to obtain a smaller set of variables (preferably uncorrelated) from a large set of variables (most of which are correlated to each other), and

b) to create indexes (called factors) with variables that measure similar things.

The results of the factor analysis are shown in Tables xx and xx. It occurs that eleven factors are having eigenvalues higher than 1 (based on the Kaiser criterion), are derived from this analysis, explaining cumulatively 74.327% of the total system's variance. By default, axes rotation is Varimax, implying that the factors produced are orthogonal, and therefore, not correlated to each other. Table xx presents the indicators defining each of the eleven factors together with the corresponding rotated factor loadings.

Table 7.3. Factor analysis results on the indicators for territorial profile matrix for the NUTS3 areas of the EU27 space.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.892	21.171	21.171	8.892	21.171	21.171	6.228	14.828	14.828
2	5.637	13.422	34.593	5.637	13.422	34.593	3.528	8.401	23.229
3	3.225	7.679	42.271	3.225	7.679	42.271	3.51	8.357	31.586
4	2.544	6.057	48.328	2.544	6.057	48.328	3.033	7.221	38.807
5	2.391	5.692	54.02	2.391	5.692	54.02	2.904	6.915	45.722
6	1.933	4.602	58.622	1.933	4.602	58.622	2.487	5.921	51.643
7	1.697	4.039	62.662	1.697	4.039	62.662	2.373	5.649	57.292
8	1.373	3.27	65.932	1.373	3.27	65.932	2.189	5.213	62.505
9	1.282	3.051	68.983	1.282	3.051	68.983	2.017	4.802	67.306
10	1.158	2.758	71.741	1.158	2.758	71.741	1.565	3.727	71.033
11	1.086	2.586	74.327	1.086	2.586	74.327	1.383	3.294	74.327

Table 7.4.: Rotated factor loadings of territorial profile factor analysis.

	Rotated Component Matrix										
	1	2	3	4	5	6	7	8	9	10	11
Share of employment in agriculture and fishing	-0,84										
Potential accessibility by rail index	0,806										
GVA Agriculture and fishing	-0,8										
Potential accessibility by road index	0,783										
Potential accessibility by air index	0,752										
Share of employment financial intermediation and real estate	0,649										
Commuters to other region	0,594										
Share of employment in high and medium tech manufacturing activities	0,57										
GVA Financial intermediation; real estate	0,551										
Rural typology	-0,51										
Change of the standardized air index											
Share of total R&D expenditure of GDP		0,898									
Share of business enterprise sector R&D expenditure of GDP		0,798									
Share of government sector R&D expenditure		0,687									
Share of higher education sector R&D expenditure of GDP		0,633									
Population aged 25-64 with tertiary education		0,533									
EPO patents per million of inhabitants by GDP		0,509									
GVA Public administration and community services			0,878								

Share of employment in public administration			0,825									
Share of employment in industry			-0,79									
GVA Industry			-0,74									
Young age dependency				0,814								
Total fertility rate				0,747								
Crude rate of natural increase				0,687								
Old age dependency				-0,65								
Change of the standardized rail index				-0,52								
Physical sensitivity to climate change					0,852							
Social sensitivity to climate change					0,843							
Cultural sensitivity to climate change					0,774							
Environmental sensitivity to climate change												
GVA Wholesale and retail trade; hotels and restaurants; transport						0,837						
Share of employment in wholesale and retail trade; hotels and restaurants; transport						0,836						
Crude rate net migration							0,897					
Crude rate of pop increase							0,861					
Economic sensitivity to climate change												
Share of employment in construction								0,851				
GVA Construction								0,791				
Net formation of urban fabric by total area 00-06												
Population density									-0,75			
Annual growth rate 90-06 agricultural areas									0,673			
Change of the standardized road index										-0,67		
Share of agricultural area											0,669	

Factor 1: Centrality

Results show that Factor 1 expresses the 'proximity to central urban centers' (or else centrality) of the NUTS3 areas of the EU27 space. This factor explains 14.83% of the total system's variance. of employment and GVA in agriculture and fishing and rural typology.

Factor 1 has high positive correlations with all the indicators expressing potential accessibility and, to a lesser extent, with the share of employment in the financial intermediation and real estate, the employment in high and medium tech manufacturing activities and with commuting to other regions. It also has a strong negative correlation with the share of employment and GVA in agriculture and fishing.

Mapping the spatial distribution of factor scores for Factor1, it is seen that this factor has its highest values in central European countries, especially in the Ruhr, Belgium and Southern England areas, in a pattern that clearly lines out the blue banana. In the less central regions, the higher values tend to be concentrated around capitals and other major urban agglomerations.

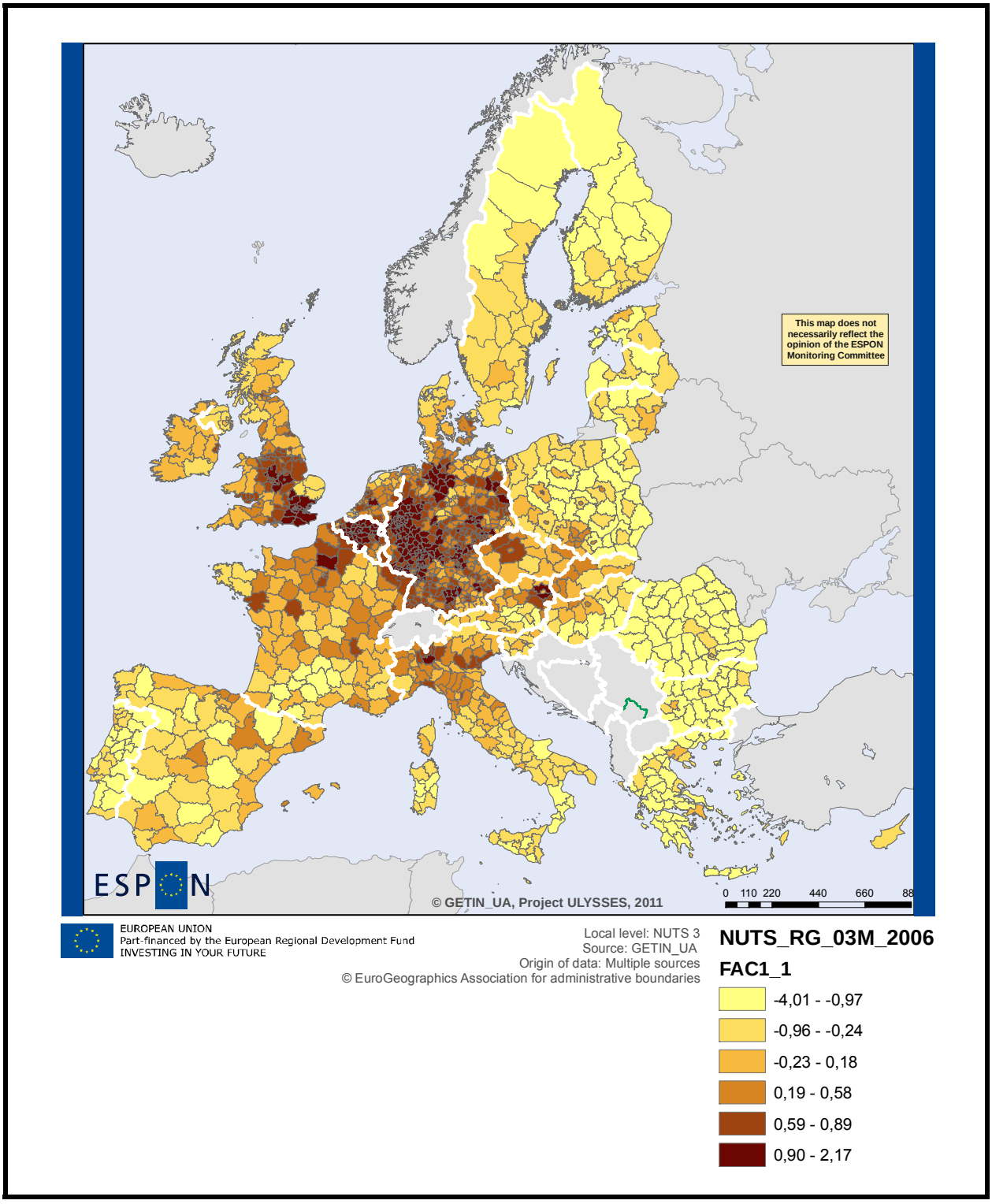
As shown in the Table 7.4., the Pyrenees CBA shows moderate factor scores ranging between -1.76 (Gers) and 0.35 (Vizcaya). Four Spanish NUTS3 areas yield to the 80 percentile group Vizcaya, Zaragoza, Barcelona and Guipúzcoa and thus showing relatively high centrality score. The rest of the Pyrenees CBA regions score between 20 and 50 percentile groups and thus can be called moderately central regions.

When these factor scores are weighted by national scores (ES = -0.18 and FR = 0.18), some patterns can be found within the Pyrenees CBU. The Spanish regions are showing higher centrality within Spain with the exception of Huesca, Teruel and Lleida, whereas all the French regions receive negative factor scores demonstrating limited centrality at national level. When compared to all cross border regions examined, six regions - Vizcaya (0.32), Zaragoza (0.26), Barcelona (0.24), Guipúzcoa (0.2) , Tarragona (0.04) and Gironde (0.01) yield to higher than average factor scores in respect of centrality.

Table 7.5. Factor scores for Factor 1 (centrality) of NUTS3 areas of the Pyrenees CBA.

NUTS code	NUTS name	FAC1						
		Scores	Country comparison (weighted NUTS 3 average)				Country /CBA country level (+ -)	Percentile all NUTS 3
CS2			ES	FR	AD	All CBA countries		
All	All Countries	0,03						50
ES	Spain	-0,18				-0,20		50
FR	France	0,18				0,15		50
AD	n.a.							
ES211	Álava	-0,07	0,11			-0,10	- +	50
ES212	Guipúzcoa	0,23	0,41			0,20	+ +	80
ES213	Vizcaya	0,35	0,53			0,32	+ +	80
ES220	Navarra	-0,07	0,10			-0,10	- +	50
ES241	Huesca	-1,28	-1,10			-1,31	- -	20
ES242	Teruel	-0,30	-0,12			-0,33	- -	50
ES243	Zaragoza	0,28	0,46			0,26	+ +	80
ES511	Barcelona	0,26	0,44			0,24	+ +	80
ES512	Girona	-0,01	0,17			-0,03	- +	50
ES513	Lleida	-0,88	-0,70			-0,90	- -	20
ES514	Tarragona	0,07	0,24			0,04	+ +	50
FR611	Dordogne	-0,15		-0,33		-0,18	- -	50
FR612	Gironde	0,03		-0,14		0,01	+ -	50
FR613	Landes	-0,71		-0,88		-0,73	- -	50
FR614	Lot-et-Garonne	-0,43		-0,61		-0,46	- -	50
FR615	Pyrénées-Atlantiques	-0,15		-0,32		-0,17	- -	50
FR621	Ariège	-1,11		-1,29		-1,14	- -	20
FR622	Aveyron	-1,30		-1,47		-1,33	- -	20
FR623	Haute-Garonne	-0,22		-0,40		-0,25	- -	50
FR624	Gers	-1,76		-1,94		-1,79	- -	20
FR625	Lot	-1,17		-1,34		-1,19	- -	20
FR626	Hautes-Pyrénées	-1,05		-1,22		-1,07	- -	20
FR627	Tarn	-0,99		-1,17		-1,02	- -	20
FR628	Tarn-et-Garonne	-1,01		-1,19		-1,04	- -	20
FR811	Aude	-0,88		-1,05		-0,91	- -	20
FR812	Gard	-0,35		-0,52		-0,37	- -	50
FR813	Hérault	-0,21		-0,39		-0,24	- -	50
FR814	Lozère	-1,28		-1,45		-1,30	- -	20
FR815	Pyrénées-Orientales	-0,44		-0,61		-0,46	- -	50

Map 7.1.: Spatial distribution of rotated factor scores for factor 1 representing the ‘proximity to central urban centers’.



Factor 2: Research, development and innovation

Results show that Factor 2 represents the innovation dynamic and the scientific development of each NUTS3 area of the EU27 space. Factor 2 appears mostly related to R&D investment of the different sectors and, to a lesser extent, to EPO patent application and the tertiary educated active population. This factor explains 8.40% of the total system's variance. Mapping the spatial distribution of factor scores for Factor 2, it is interesting to note that, besides the capital cities, it is possible to identify specific innovation strongholds such as important university towns or high tech industries (Airbus in the Toulouse area, Volkswagen around Wolfsburg, Cambridge or the Silicon Glen). The Scandinavian countries also have a very favourable position in this factor.

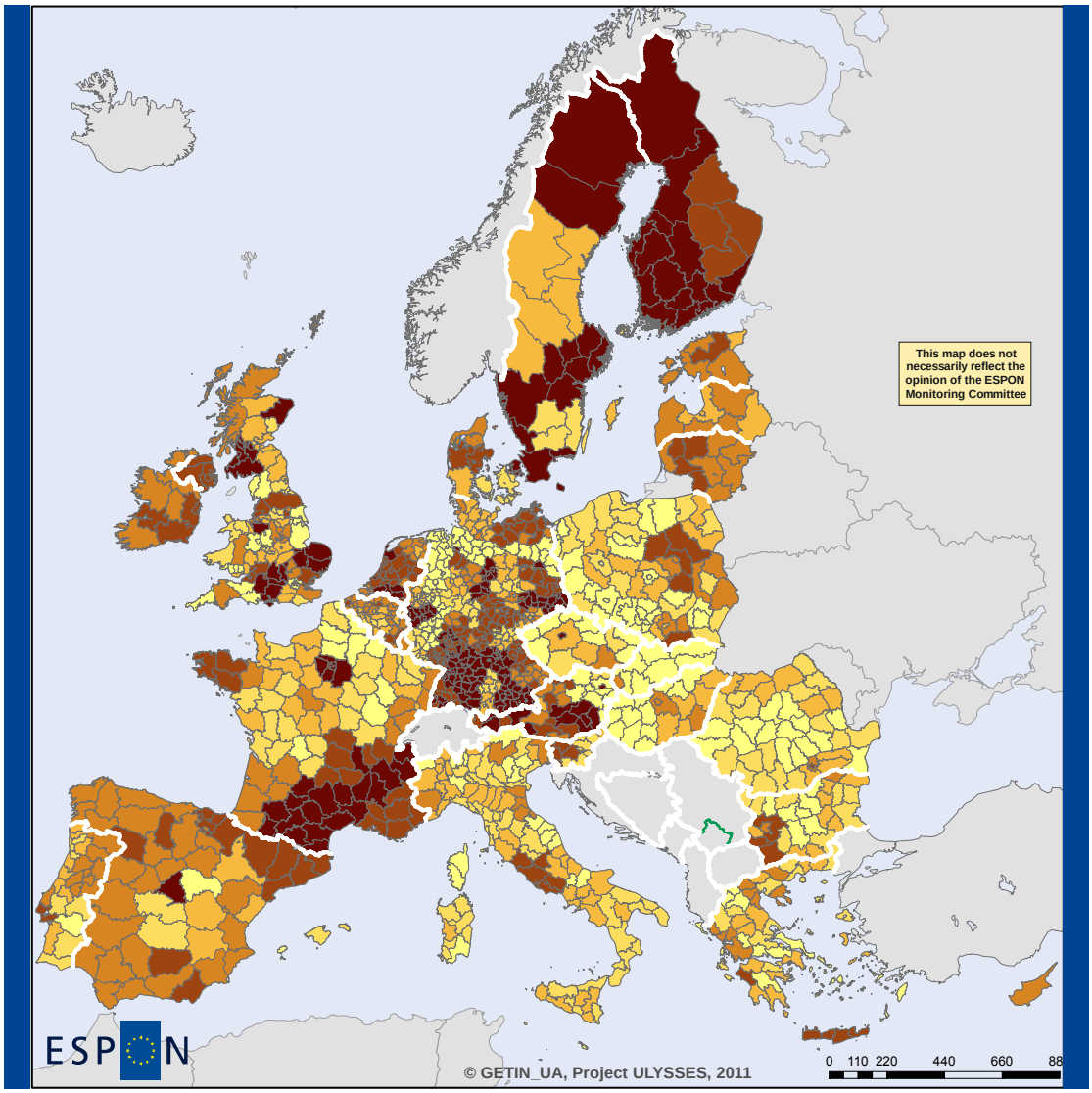
In respect of the Factor 2, the Pyrenees CBA shows relatively high factor scores ranging between -0.28 (Zaragoza) and 2.65 (Gers) (see Table 7.6. below). Most of the CBU areas score at the 80th or 95th percentile of all EU27 NUTS3 areas and eight French regions are classified as "top performers" (> 95 percentile).

Weighting these factor scores to the national factor score (ES = 0.15; FR = 0.25), a group of regions with negative factor scores (i.e. lower R&D&I level than national level) is formed by Zaragoza (-0.43), Girode (-0.34), Dordogne (-0.33), Pyrénées-Atlantiques (-0.32), Lot-et-Garonne (-0.29), Landes (-0.28) and Teruel (-0.17). On the contrary, in Midi-Pyrénées and in Languedoc-Roussillon, all the NUTS3 level regions have higher scores in R&D&I relative to national average. These above mentioned regions receive also a high score when compared to all the cross border regions.

Table 7.6. Factor scores for Factor 2 (R&D investments) of NUTS3 areas of the Pyrenees CBA.

NUTS code	NUTS name	FAC2						
		Scores	Country comparison (weighted NUTS 3 average)				Country /CBA country level	Percentile all NUTS 3
CS2			ES	FR	AD	All CBA countries		
All	All Countries	0,21						80
ES	Spain	0,15				-0,06		80
FR	France	0,25				0,04		80
AD	n.a.							
ES211	Álava	0,47	0,32			0,26	+ +	80
ES212	Guipúzcoa	0,39	0,24			0,19	+ +	80
ES213	Vizcaya	0,57	0,42			0,36	+ +	80
ES220	Navarra	0,56	0,41			0,36	+ +	80
ES241	Huesca	0,28	0,13			0,08	+ +	80
ES242	Teruel	-0,02	-0,17			-0,23	- -	80
ES243	Zaragoza	-0,28	-0,43			-0,48	- -	50
ES511	Barcelona	0,25	0,10			0,04	+ +	80
ES512	Girona	0,35	0,20			0,14	+ +	80
ES513	Lleida	0,60	0,45			0,39	+ +	80
ES514	Tarragona	0,24	0,08			0,03	+ +	80
FR611	Dordogne	-0,08		-0,33		-0,28	- -	80
FR612	Gironde	-0,09		-0,34		-0,29	- -	80
FR613	Landes	-0,03		-0,28		-0,24	- -	80
FR614	Lot-et-Garonne	-0,04		-0,29		-0,25	- -	80
FR615	Pyrénées-Atlantiques	-0,07		-0,32		-0,27	- -	80
FR621	Ariège	2,38		2,13		2,18	+ +	> 95
FR622	Aveyron	2,55		2,30		2,34	+ +	> 95
FR623	Haute-Garonne	2,38		2,13		2,17	+ +	> 95
FR624	Gers	2,65		2,40		2,44	+ +	> 95
FR625	Lot	2,44		2,19		2,23	+ +	> 95
FR626	Hautes-Pyrénées	2,47		2,22		2,26	+ +	> 95
FR627	Tarn	2,41		2,16		2,20	+ +	> 95
FR628	Tarn-et-Garonne	2,48		2,23		2,27	+ +	> 95
FR811	Aude	1,03		0,78		0,83	+ +	95
FR812	Gard	0,95		0,70		0,74	+ +	95
FR813	Hérault	0,95		0,70		0,74	+ +	95
FR814	Lozère	1,05		0,80		0,84	+ +	95
FR815	Pyrénées-Orientales	1,01		0,76		0,81	+ +	95

Map 7.2. Spatial distribution of rotated factor scores for factor 2 representing the ‘R&D investments’.



Factor 3: Public administration

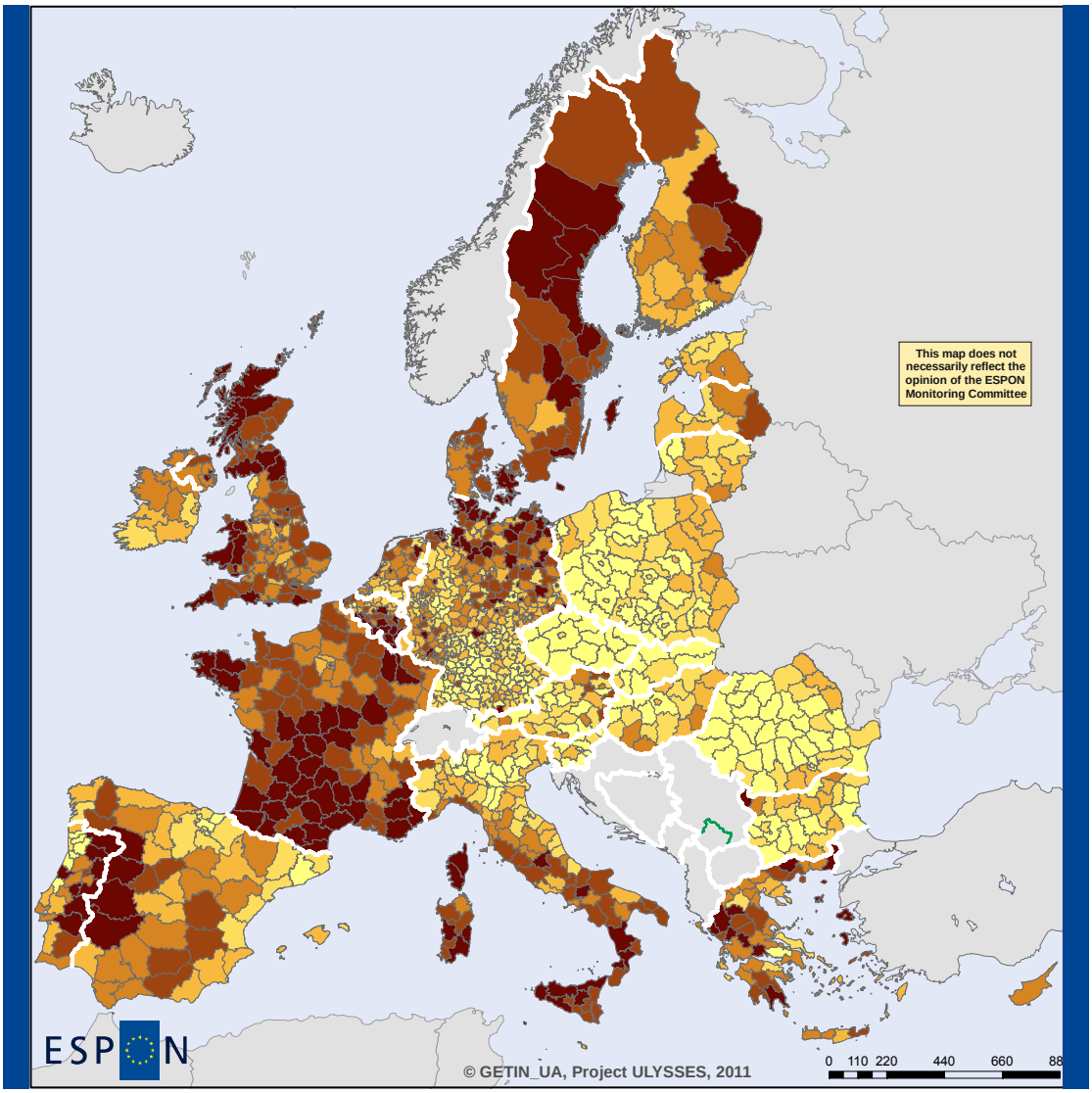
Regarding Factor 3, it appears to represent the proximity of NUTS3 areas to public administration centres, as the indicators positively correlated with this factor are the share of employment and the GVA in public administration, community services and activities of household and the indicators negatively correlated with this factors are the share of employment and the GVA in industry. This factor explains 8.36% of the total system's variance. The regions with the highest scores of this factor are in majority depressed regions in which, because of their poor economic performance, the public sector assumes an important position. It is interesting to see that most of the borders NUTS3 areas in Spain and Portugal have very high scores in this factor, as well as Karelia. The other cross-border regions seem to be closer to the national patterns. On a different note, this indicator also relates to the different levels of state interventionism, with the Scandinavian countries and France revealing overall high scores.

The Spanish NUTS3 areas of the Pyrenees CBA shows relatively low factor scores ranging between -1.05 (Álava) and 0.26 (Huesca). On the contrary, all the French NUTS3 areas belonging to Pyrenees CBA show high positive factor scores (mean = 1.47). These areas score up to the 95th percentile of all EU27 NUTS3 areas. Weighting these factor scores to the national factor score (ES = -0.18; FR = 0.68), a cluster with positive factor scores (i.e., with relatively increased administrative significance at national level) is formed comprised of all French Pyrenees CBA regions (with an exception of Haute-Garonne (-0.15) and by Spanish region Aragón. The rest of the Spanish regions receive very low factor scores indicating relatively low share of employment and GVA in public administration, and high importance of manufacturing industry for employment and economic output.

Table 7.7. Factor scores for Factor 3 (public administration) of NUTS3 areas of the Pyrenees CBA.

NUTS code	NUTS name	FAC3						
		Scores	Country comparison (weighted NUTS 3 average)				Country /CBA country level	Percentile all NUTS 3
CS2			ES	FR	AD	All CBA countries		
All	All Countries	0,32						80
ES	Spain	-0,18				-0,50		50
FR	France	0,68				0,37		80
AD	n.a.							
ES211	Álava	-1,05	-0,87			-1,37	- -	20
ES212	Guipúzcoa	-1,04	-0,85			-1,36	- -	20
ES213	Vizcaya	-0,79	-0,60			-1,11	- -	50
ES220	Navarra	-0,67	-0,48			-0,98	- -	50
ES241	Huesca	0,26	0,44			-0,06	- +	80
ES242	Teruel	0,08	0,26			-0,24	- +	80
ES243	Zaragoza	0,04	0,23			-0,27	- +	50
ES511	Barcelona	-1,03	-0,85			-1,35	- -	20
ES512	Girona	-0,76	-0,58			-1,08	- -	50
ES513	Lleida	-0,44	-0,25			-0,75	- -	50
ES514	Tarragona	-0,77	-0,58			-1,08	- -	50
FR611	Dordogne	1,56		0,88		1,25	+ +	> 95
FR612	Gironde	0,90		0,22		0,58	+ +	95
FR613	Landes	1,34		0,65		1,02	+ +	95
FR614	Lot-et-Garonne	1,21		0,52		0,89	+ +	95
FR615	Pyrénées-Atlantiques	1,00		0,32		0,69	+ +	95
FR621	Ariège	1,63		0,94		1,31	+ +	> 95
FR622	Aveyron	1,11		0,42		0,79	+ +	95
FR623	Haute-Garonne	0,53		-0,15		0,22	+ -	80
FR624	Gers	1,62		0,94		1,30	+ +	> 95
FR625	Lot	1,41		0,73		1,10	+ +	95
FR626	Hautes-Pyrénées	1,66		0,97		1,34	+ +	> 95
FR627	Tarn	1,42		0,74		1,10	+ +	95
FR628	Tarn-et-Garonne	1,31		0,63		1,00	+ +	95
FR811	Aude	1,91		1,23		1,60	+ +	> 95
FR812	Gard	1,44		0,75		1,12	+ +	95
FR813	Hérault	1,67		0,99		1,36	+ +	> 95
FR814	Lozère	2,53		1,85		2,22	+ +	> 95
FR815	Pyrénées-Orientales	2,11		1,43		1,80	+ +	> 95

Map 7.3.: Spatial distribution of rotated factor scores for factor 3 representing the ‘public administration centers’.



Factor 4: Demographic dynamism

Factor 4 seems expressing the demographic dynamism of NUTS3 areas, as the indicators positively correlated with this factor are the young age dependency rate, the crude rate of natural population increase and the total fertility rate. This factor depicts negative correlation to the old age dependency rate parameter. This factor explains 7.22% of the total system's variance.

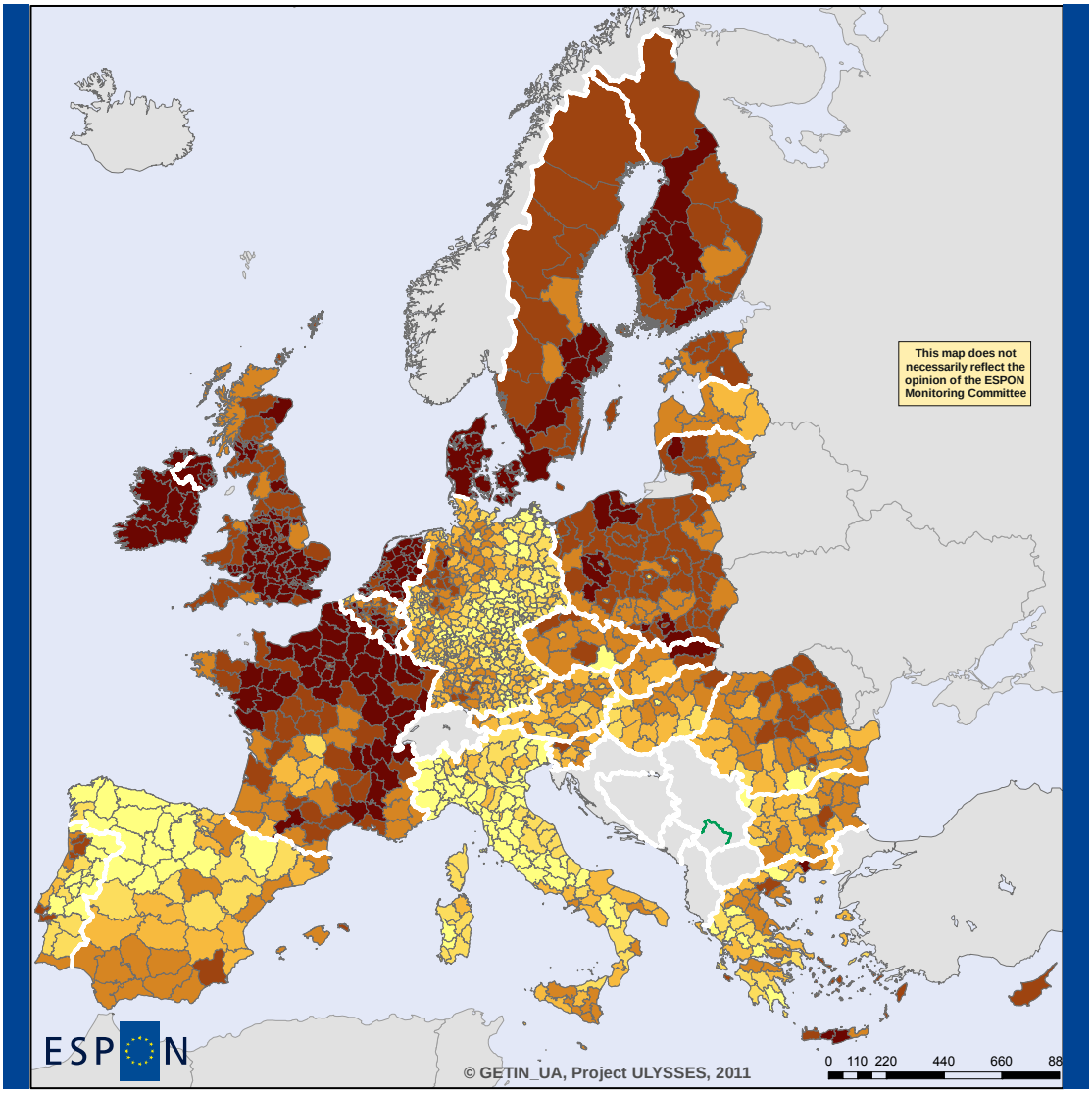
Mapping the spatial distribution of factor scores it occurs that the regions with the lowest scores of this factor are located in the Mediterranean countries, such as Portugal, Spain and Greece, as well as Germany. On the contrary, the northern parts of France, Ireland, central Great Britain, Scondinavia and eastern Europe are the regions with the highest positive scores (Map 7.4).

Factor 4 Demographic dynamism shows a clear country patterns in the cross border area of Pyrenees. In the Spanish area, all the NUTS3 areas (with exceptions of Navarra (0.09) and Girona (0.03) show negative factor scores, ranging between -1,11 (Huesca) and -0,06 (Tarragona). In the French area of Pyrenees CBA, most of the NUTS3 regions with receive positive factor scores (i.e. increased demographic dynamism) ranging between 0,13 (Gers) and 1,13 (Gard) with exception of three regions (Dordogne, Hautes-Pyrénées and Lot) that receive negative values. When weighting with national scores, the Spanish NUTS3 areas improve their Demographic dynamism score indicating that in relation to national average the areas show moderately improved situation. In French area, the situation is reverse – when comparing the scores to the national average, all the CBA NUTS3 areas receive a negative score showing that these regions are actually less dynamic than France in average. However, all the Pyrenees CBA NUTS3 areas are belonging to the lowest percentile group when compared to the other CBA regions.

Table 7.8. Factor scores for Factor 4 (demographic dynamism) of NUTS3 areas of the Pyrenees CBA.

NUTS code	NUTS name	FAC4						
		Scores	Country comparison (weighted NUTS 3 average)				Country /CBA country level	Percentile all NUTS 3
CS2			ES	FR	AD	All CBA countries		
All	All Countries	0,46						5
ES	Spain	-0,45				-0,91		5
FR	France	1,12				0,66		5
AD	n.a.							
ES211	Álava	-0,27	0,18			-0,73	- +	5
ES212	Guipúzcoa	-0,12	0,33			-0,58	- +	5
ES213	Vizcaya	-0,77	-0,32			-1,23	- -	5
ES220	Navarra	0,09	0,54			-0,37	- +	5
ES241	Huesca	-1,11	-0,66			-1,57	- -	5
ES242	Teruel	-0,92	-0,48			-1,38	- -	5
ES243	Zaragoza	-0,83	-0,38			-1,29	- -	5
ES511	Barcelona	-0,45	0,00			-0,91	- -	5
ES512	Girona	0,03	0,48			-0,43	- +	5
ES513	Lleida	-0,68	-0,23			-1,14	- -	5
ES514	Tarragona	-0,06	0,39			-0,52	- +	5
FR611	Dordogne	-0,34		-1,46		-0,79	- -	5
FR612	Gironde	0,56		-0,57		0,10	+ -	5
FR613	Landes	0,32		-0,80		-0,14	- -	5
FR614	Lot-et-Garonne	0,30		-0,82		-0,16	- -	5
FR615	Pyrénées-Atlantiques	0,19		-0,94		-0,27	- -	5
FR621	Ariège	0,13		-1,00		-0,33	- -	5
FR622	Aveyron	0,24		-0,89		-0,22	- -	5
FR623	Haute-Garonne	1,09		-0,04		0,63	+ -	5
FR624	Gers	0,13		-1,00		-0,33	- -	5
FR625	Lot	-0,14		-1,26		-0,60	- -	5
FR626	Hautes-Pyrénées	-0,28		-1,40		-0,74	- -	5
FR627	Tarn	0,53		-0,59		0,07	+ -	5
FR628	Tarn-et-Garonne	0,86		-0,26		0,40	+ -	5
FR811	Aude	0,52		-0,60		0,06	+ -	5
FR812	Gard	1,13		0,00		0,67	+ +	5
FR813	Hérault	0,93		-0,19		0,47	+ -	5
FR814	Lozère	0,43		-0,70		-0,03	- -	5
FR815	Pyrénées-Orientales	0,23		-0,90		-0,23	- -	5

Map 7.4. Spatial distribution of rotated factor scores for factor 4 representing ‘demographic dynamism’.



Factor 5: Sensitivity to climate change

Factor 5 appears related to NUTS3 areas' sensitivity to climate change, as this factor is correlated with the environmental, social and cultural sensitivity indicators. This factor explains 6.91% of the total system's variance. Mapping the spatial distribution of factor scores it occurs that the highly sensitive to climatic change risks are regions essentially located in coastal areas and other flood prone areas, such as areas close to the Delta of Danube River or Po River (Map 7.5.).

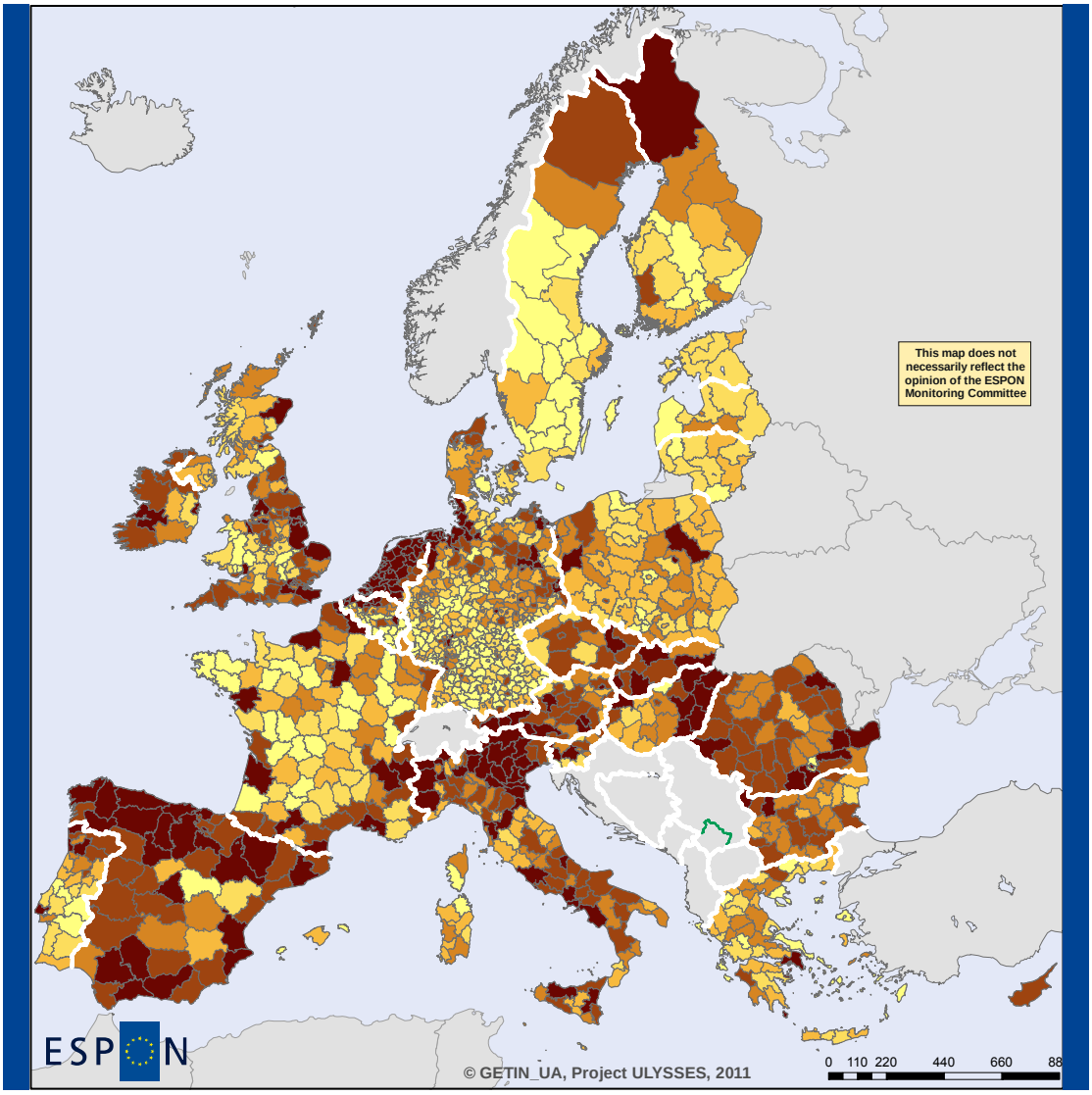
When looking at Pyrenees CBA, it can be seen that most Spanish NUTS3 areas show positive factor scores, indicating their relative exposure to climate change. The exception is the region of Teruel (-0.58). From the Spanish regions however, all except of Barcelona (1.84) are less sensitive to climate change than Spain in average (1.35). In the French area, there is more variation Gironde (1.08) having the highest sensitivity to climate change, and Lot (-1.01) being the least climate change sensitive region.

In general, there are lots of variations in Pyrenees CBA regarding the climate change sensitivity. There are several areas that score at the highest percentile level (95 percentile) among European NUTS3 areas and other areas that belong to the group of 20th percentile indicating moderately low sensitivity to climate change.

Table 7.9. Factor scores for Factor 5 (climate change sensitivity) of NUTS3 areas of the Pyrenees CBA.

NUTS code	NUTS name	FAC5						
		Scores	Country comparison (weighted NUTS 3 average)				Country /CBA country level	Percentile all NUTS 3
CS2			ES	FR	AD	All CBA countries		
All	All Countries	0,66						95
ES	Spain	1,35				0,69		95
FR	France	0,15				-0,51		80
AD	n.a.							
ES211	Álava	0,22	-1,13			-0,44	- -	80
ES212	Guipúzcoa	0,44	-0,91			-0,21	- -	80
ES213	Vizcaya	1,08	-0,27			0,42	+ -	95
ES220	Navarra	0,36	-0,99			-0,29	- -	80
ES241	Huesca	0,70	-0,65			0,04	+ -	95
ES242	Teruel	-0,58	-1,93			-1,24	- -	50
ES243	Zaragoza	1,26	-0,09			0,60	+ -	95
ES511	Barcelona	3,19	1,84			2,53	+ +	> 95
ES512	Girona	0,31	-1,04			-0,34	- -	80
ES513	Lleida	0,55	-0,80			-0,11	- -	95
ES514	Tarragona	0,28	-1,07			-0,38	- -	80
FR611	Dordogne	-0,38		-0,53		-1,03	- -	50
FR612	Gironde	1,08		0,92		0,42	+ +	95
FR613	Landes	-0,95		-1,10		-1,61	- -	20
FR614	Lot-et-Garonne	-0,60		-0,75		-1,26	- -	50
FR615	Pyrénées-Atlantiques	0,29		0,14		-0,37	- +	80
FR621	Ariège	-0,27		-0,42		-0,93	- -	50
FR622	Aveyron	-0,53		-0,68		-1,18	- -	50
FR623	Haute-Garonne	0,62		0,47		-0,04	- +	95
FR624	Gers	-0,47		-0,62		-1,12	- -	50
FR625	Lot	-1,01		-1,16		-1,66	- -	20
FR626	Hautes-Pyrénées	0,24		0,09		-0,42	- +	80
FR627	Tarn	-0,50		-0,65		-1,15	- -	50
FR628	Tarn-et-Garonne	-0,80		-0,95		-1,46	- -	20
FR811	Aude	0,12		-0,03		-0,54	- -	80
FR812	Gard	0,38		0,23		-0,28	- +	80
FR813	Hérault	0,30		0,15		-0,36	- +	80
FR814	Lozère	-0,52		-0,67		-1,18	- -	50
FR815	Pyrénées-Orientales	0,67		0,52		0,02	+ +	95

Map 7.5. Spatial distribution of rotated factor scores for factor 5 representing ‘climate change sensitivity’.



Factor 6: Trade, tourism and transport

Factor 6 appears related to trade, tourist services and transport, since positively correlated to this factor are indicators as the share of employement and the GVA produced by the wholesale and retail trade, hotels and restaurants and transport sector (NACE G-I). This factor explains 5.92% of the total system's variance.

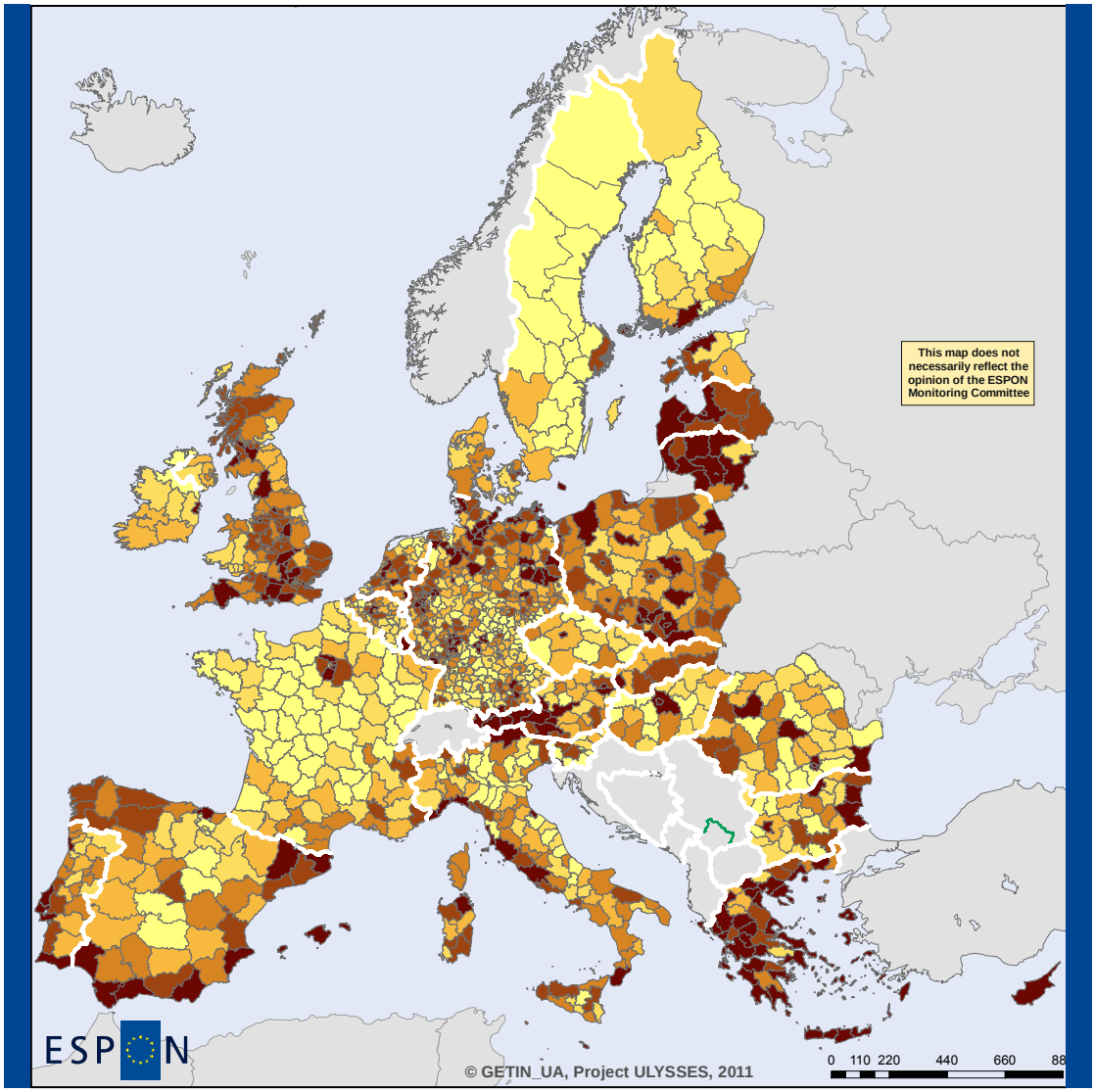
Mapping the spatial distribution of factor scores in Factor 6 (Map 7.6.) it may be noted that many of the regions with the high scores seem to be linked to tourism (as Southern Spain and Portugal, the alpine regions, Paris, Greece, Rome, etc.).

Focusing in the Pyrenees CBA, it can be seen that almost all French NUTS3 areas show negative factor score, indicating low impact of trade, tourism and transport in local economy. The only exeptions are the areas of Hérault (0.19), Pyrénées-Orientales (0.15), and Haute-Garonne (0.09) with slightly positive factor scores. In the Spanish CBA of Pyrenees, the Barcelona metropolitan area (Barcelona; Girona and Lleida) appears as a nod of service sector concentration among the Spanish CBA. Apart from the Cataluña, also Vizcaya (ES213) receives a positive factor score.

Table 7.10. Factor scores for Factor 6 (trade, tourism and transport) of NUTS3 areas of the Pyrenees CBA.

NUTS code	NUTS name	FAC6						
		Scores	Country comparison (weighted NUTS 3 average)				Country /CBA country level	Percentile all NUTS 3
CS2			ES	FR	AD	All CBA countries		
All	All Countries	0,00						80
ES	Spain	0,56				0,56		80
FR	France	-0,41				-0,41		50
AD	n.a.							
ES211	Álava	-0,95	-1,51			-0,95	- -	20
ES212	Guipúzcoa	0,08	-0,49			0,08	+ -	80
ES213	Vizcaya	0,85	0,29			0,85	+ +	95
ES220	Navarra	-0,66	-1,22			-0,65	- -	50
ES241	Huesca	-0,39	-0,96			-0,39	- -	50
ES242	Teruel	-0,07	-0,63			-0,07	- -	80
ES243	Zaragoza	-0,87	-1,43			-0,87	- -	20
ES511	Barcelona	0,61	0,05			0,61	+ +	80
ES512	Girona	1,41	0,84			1,41	+ +	95
ES513	Lleida	1,48	0,91			1,48	+ +	95
ES514	Tarragona	0,49	-0,07			0,49	+ -	80
FR611	Dordogne	-1,11		-0,69		-1,11	- -	20
FR612	Gironde	-0,33		0,09		-0,32	- +	50
FR613	Landes	-0,93		-0,52		-0,93	- -	20
FR614	Lot-et-Garonne	-0,34		0,08		-0,33	- +	50
FR615	Pyrénées-Atlantiques	-0,50		-0,09		-0,50	- -	50
FR621	Ariège	-1,13		-0,72		-1,13	- -	20
FR622	Aveyron	-0,40		0,01		-0,40	- +	50
FR623	Haute-Garonne	0,09		0,50		0,09	+ +	80
FR624	Gers	-0,58		-0,16		-0,58	- -	50
FR625	Lot	-1,01		-0,60		-1,01	- -	20
FR626	Hautes-Pyrénées	-0,13		0,28		-0,13	- +	50
FR627	Tarn	-0,81		-0,40		-0,81	- -	20
FR628	Tarn-et-Garonne	-0,42		0,00		-0,42	- -	50
FR811	Aude	-0,06		0,36		-0,06	- +	80
FR812	Gard	-0,51		-0,10		-0,51	- -	50
FR813	Hérault	0,19		0,60		0,19	+ +	80
FR814	Lozère	-1,03		-0,61		-1,02	- -	20
FR815	Pyrénées-Orientales	0,15		0,56		0,15	+ +	80

Map 7.6. Spatial distribution of rotated factor scores for factor 6 representing ‘trade, tourism and transport’.



Factor 7: Immigration

Factor 7 seems related to immigration, since the positively correlated to this factor indicators are population growth and net migration rates. This factor explains 5.64% of the total system's variance.

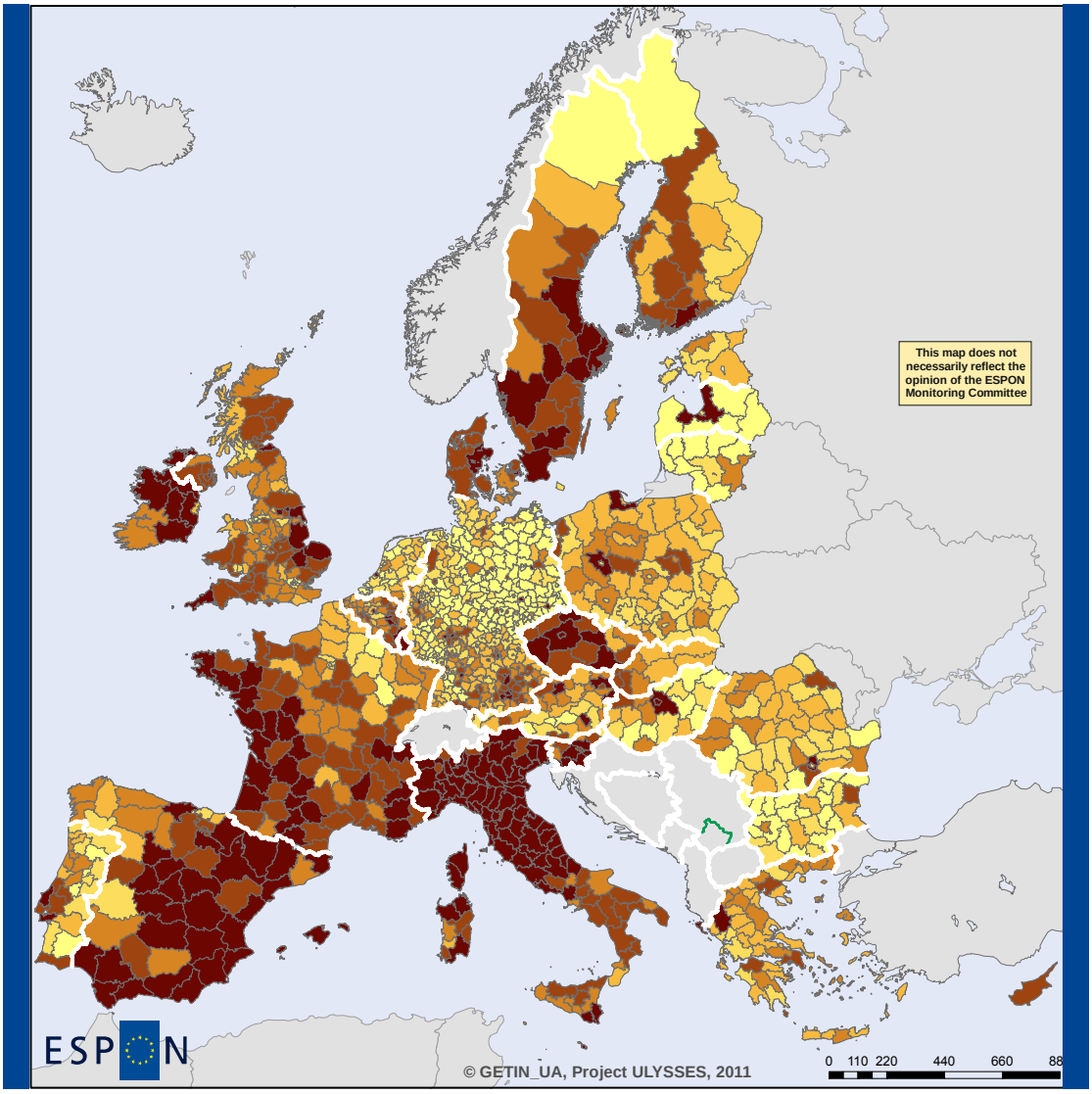
Mapping the spatial distribution of factor scores in Factor 7 (Map 7.7.) it occurs that many regions in Central and Western Europe show very high scores in this factor, while in the Eastern Europe countries, these high scores are generally restricted to the capital cities. Interestingly, in Portugal and Finland the border regions in general (and Karelia and the Alentejo in particular) have much lower values than the coastal regions, suggesting an internal migrations process towards the coast.

Almost all the Pyrenees CBA NUTS3 areas are showing a positive factor score values, meaning that these regions show positive trend in population growth in general and especially, in immigration. The only areas showing negative development are Vizcaya (-0.54) and Guipúzcoa (-0.28). Similarly, excepting these two regionas, all the rest of the Pyrenees cross border area scores to the 80th or higher percentile level when compared to EU-27 NUTS3 regions. Thus majority of the Pyrenees CBA is positively influenced by population growth and immigration. In majority of the French regions the population growth is higher than in France (0.36) in average. In Spain, this helds true only for Navarra, Zaragoza and for Catalonian regions Tarragona, Girona and Lleida.

Table 7.11.: Factor scores for Factor 7 (immigration) of NUTS3 areas of the Pyrenees CBA.

NUTS code	NUTS name	FAC7						
		Scores	Country comparison (weighted NUTS 3 average)				Country /CBA country level	Percentile all NUTS 3
CS2			ES	FR	AD	All CBA countries		
All	All Countries	0,77						80
ES	Spain	1,34				0,56		95
FR	France	0,36				-0,41		80
AD	n.a.							
ES211	Álava	0,43	-0,91			-0,35	- -	80
ES212	Guipúzcoa	-0,28	-1,61			-1,05	- -	50
ES213	Vizcaya	-0,54	-1,88			-1,32	- -	50
ES220	Navarra	1,47	0,13			0,70	+ +	95
ES241	Huesca	0,99	-0,35			0,22	+ -	95
ES242	Teruel	0,65	-0,69			-0,12	- -	80
ES243	Zaragoza	1,91	0,57			1,14	+ +	> 95
ES511	Barcelona	0,13	-1,20			-0,64	- -	80
ES512	Girona	1,99	0,66			1,22	+ +	> 95
ES513	Lleida	1,82	0,48			1,05	+ +	> 95
ES514	Tarragona	3,78	2,44			3,00	+ +	> 95
FR611	Dordogne	1,45		1,08		0,67	+ +	95
FR612	Gironde	0,98		0,62		0,20	+ +	95
FR613	Landes	1,59		1,23		0,82	+ +	95
FR614	Lot-et-Garonne	0,81		0,44		0,03	+ +	95
FR615	Pyrénées-Atlantiques	0,80		0,44		0,03	+ +	95
FR621	Ariège	1,15		0,79		0,38	+ +	95
FR622	Aveyron	0,44		0,08		-0,33	- +	80
FR623	Haute-Garonne	1,37		1,00		0,59	+ +	95
FR624	Gers	0,85		0,49		0,08	+ +	95
FR625	Lot	1,16		0,80		0,39	+ +	95
FR626	Hautes-Pyrénées	0,21		-0,15		-0,56	- -	80
FR627	Tarn	0,98		0,61		0,20	+ +	95
FR628	Tarn-et-Garonne	1,55		1,18		0,77	+ +	95
FR811	Aude	0,82		0,45		0,04	+ +	95
FR812	Gard	0,82		0,46		0,05	+ +	95
FR813	Hérault	0,90		0,54		0,12	+ +	95
FR814	Lozère	0,06		-0,30		-0,71	- -	80
FR815	Pyrénées-Orientales	0,89		0,53		0,12	+ +	95

Map 7.7.: Spatial distribution of rotated factor scores for factor 7 representing ‘immigration’.



Factor 8: Construction sector

Factor 8 seems related to the Construction sector, since the positively correlated to this factor indicators are the share of employment and the GVA produced by Construction. This factor explains 5.21% of the total system's variance.

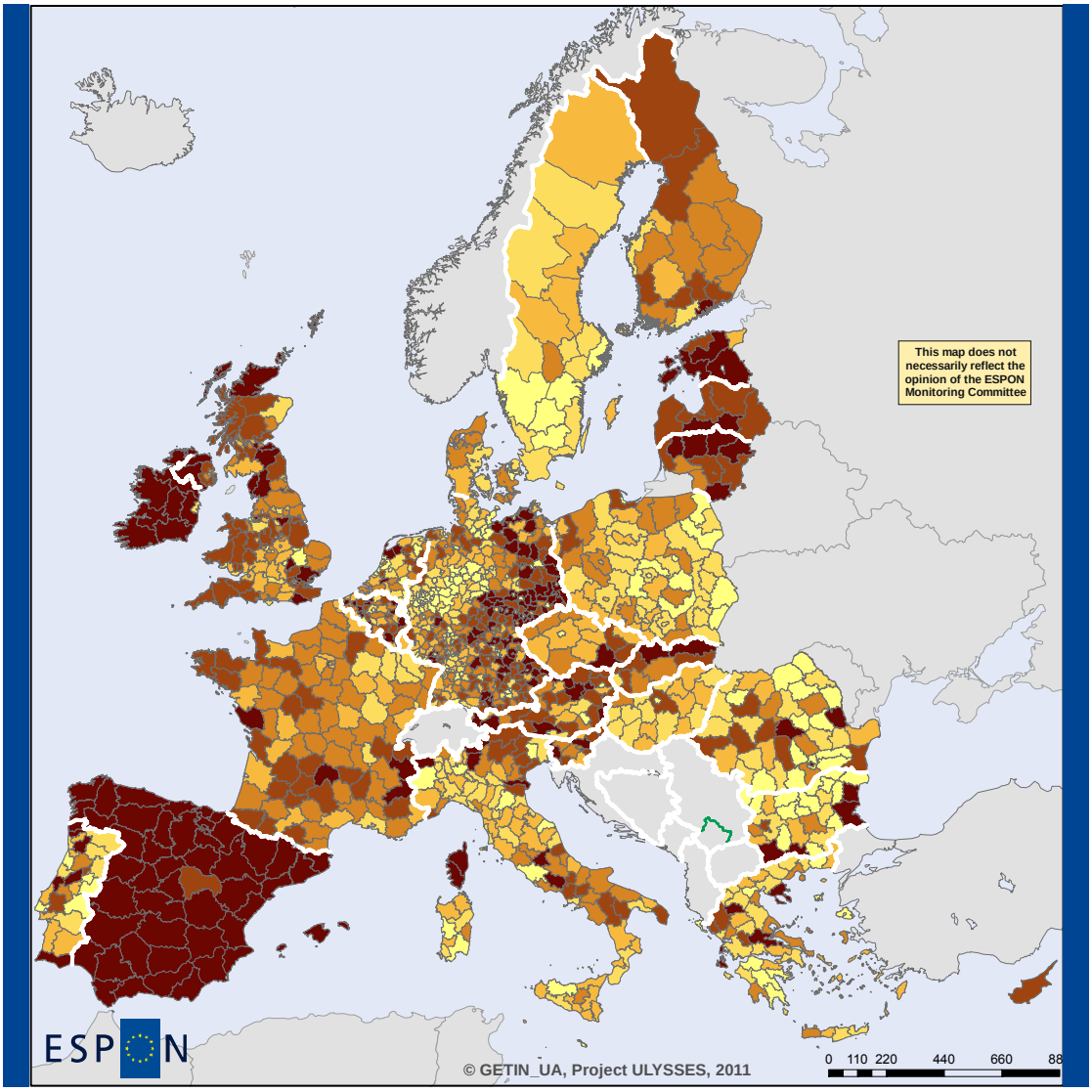
Mapping the spatial distribution of factor scores in Factor 8 (Map 7.8.) it occurs that the regions with the highest factor scores in this factor appear in Ireland, Spain, the Baltic States and Eastern Germany.

In Pyrenees CBA, most of the NUTS3 areas portray a positive factor score values, implying that these regions show generally high level of construction sector activities. The only regions having negative factor scores are Hérault (-0.18), Haute-Garonne (-0.15) and Gironde (-0.12). When weighting the factor scores with national average scores (ES = 1.74; FR = -0.02) the countries show quite different patterns however. In Spain, more than half of the Pyrenees CBA regions are less influenced by construction sector than Spain in average, whereas in France majority of the regional economy is more dependent on construction sector than France in average. In general, large share of Pyrenees CBA scores to high (80^{th} percentile) or very high (95^{th} percentile) scores when compared to the rest of European NUTS3 regions.

Table 7.12.: Factor scores for Factor 8 (construction) of NUTS3 areas of the Pyrenees CBA.

NUTS code	NUTS name	FAC8						
		Scores	Country comparison (weighted NUTS 3 average)				Country /CBA country level	Percentile all NUTS 3
CS2			ES	FR	AD	All CBA countries		
All	All Countries	0,72						95
ES	Spain	1,74				1,02		95
FR	France	-0,02				-0,74		80
AD	n.a.							
ES211	Álava	1,04	-0,70			0,31	+ -	95
ES212	Guipúzcoa	0,93	-0,81			0,21	+ -	95
ES213	Vizcaya	1,92	0,18			1,20	+ +	> 95
ES220	Navarra	1,71	-0,04			0,98	+ -	95
ES241	Huesca	1,87	0,13			1,14	+ +	95
ES242	Teruel	3,03	1,29			2,31	+ +	> 95
ES243	Zaragoza	1,61	-0,13			0,89	+ -	95
ES511	Barcelona	1,01	-0,73			0,28	+ -	95
ES512	Girona	2,23	0,49			1,51	+ +	> 95
ES513	Lleida	1,66	-0,08			0,94	+ -	95
ES514	Tarragona	2,48	0,74			1,75	+ +	> 95
FR611	Dordogne	0,77		0,79		0,05	+ +	95
FR612	Gironde	-0,12		-0,10		-0,85	- -	50
FR613	Landes	0,10		0,12		-0,62	- +	80
FR614	Lot-et-Garonne	0,39		0,41		-0,33	- +	80
FR615	Pyrénées-Atlantiques	0,39		0,42		-0,33	- +	80
FR621	Ariège	0,48		0,50		-0,24	- +	80
FR622	Aveyron	0,30		0,32		-0,43	- +	80
FR623	Haute-Garonne	-0,18		-0,15		-0,90	- -	50
FR624	Gers	0,20		0,22		-0,52	- +	80
FR625	Lot	0,35		0,37		-0,38	- +	80
FR626	Hautes-Pyrénées	0,31		0,33		-0,42	- +	80
FR627	Tarn	0,14		0,16		-0,59	- +	80
FR628	Tarn-et-Garonne	0,35		0,37		-0,37	- +	80
FR811	Aude	0,18		0,20		-0,54	- +	80
FR812	Gard	0,08		0,10		-0,64	- +	80
FR813	Hérault	-0,27		-0,25		-0,99	- -	50
FR814	Lozère	0,22		0,24		-0,50	- +	80
FR815	Pyrénées-Orientales	0,19		0,22		-0,53	- +	80

Map 7.8.: Spatial distribution of rotated factor scores for factor 8 representing ‘construction’.



Factors 9, 10 and 11

The last three factors have very small variances and will therefore not be subjected to a more detailed analysis. The factor 9 essentially refers to rurality, as its correlated variables are population density and growth of agricultural areas. The factor 10's only significantly correlated indicator is the road index change and the factor 11's the share of agricultural areas.

7.3. Territorial Performance Analysis

Factor analysis was applied on the indicators for the territorial performance matrix as well, aiming to obtain a smaller set of variables from a large set of variables, and to create indexes (called factors) with variables that measure similar things. The results of the factor analysis are shown in Table 7.13. It occurs that only four factors have eigenvalues higher than 1 (based on the Kaiser criterion). These factors explain cumulatively 72.28% of the total system's variance. By default, axes rotation is Varimax, implying that the factors produced are orthogonal, and therefore, not correlated to each other.

Table 7.14 presents the indicators defining each of the four system's factors together with the corresponding rotated factor loadings. It can be derived that factor 1 represents unemployment, factor 2 the catching-up trend of the regions, factor 3 areas economic development while factor 4 air pollution.

Table 7.13.: Factor analysis results on the indicators for terrirorial performance matrix for the NUTS3 areas of the EU27 space.

Total Variance Explained

	Initial Eigenvalues			Extract Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Comp.	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,898	28,983	28,983	2,898	28,983	28,983	2,419	24,194	24,194
2	1,847	18,471	47,454	1,847	18,471	47,454	1, 871	18,708	42,902
3	1,434	14,344	61,798	1,434	14,344	61,798	1,757	17,568	60,470
4	1,049	10,486	72,284	1,049	10,486	72,284	1,181	11,814	72,284
5	,902	9,017	81,301						
6	,604	6,044	87,345						
7	,439	4,392	91,737						
8	,370	3,697	95,434						
9	,303	3,034	98,468						
10	,153	1,532	100,000						

Extraction Method: Principal Component Analysis.

Table 7.14. Rotated factor loadings of terrirorial performance factor analysis.

Rotated Component Matrix[a]

	Component			
	1	2	3	4
Unemployment	,947			
Long_unemploy	,884			
Youth_unemploy	,785			
Infant_m		,839		
GDP_pc_index			,755	
Catching_up		,733		
NATURA_2000_percent			-,546	
Ozone_conc_exceed				,961
Waste_water_treat_perc		-,697		
Soil_sealed_area_perc			,858	

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 4 iterations.

Factor 1 seems related to Unemployment, as the variables highly correlated to this factor are the total unemployment, long-term unemployment and youth-unemployment rates. This factor explains 24.19% of the total system's variance.

The geographical distribution of this factor's scores (Map 7.8.) shows a concentration of the highest values in the more depressed areas of Europe, and particularly in countries with structurally high unemployment rates such as (e.g. Southern Italy and Spain, Eastern Germany, Slovakia and Greece). Regions which used to have a strong industrial base, also illustrate relatively high scores in this factor, namely some regions in northern France and Portugal, Wallonia, the Setúbal Peninsula, Liverpool and Manchester.

In some borders, the regions seem to have higher scores in this indicator than the more centrally located regions. This is the case in Portugal, on the northern border of France and Bulgaria, Finnish Karelia or the Czech Republic, where it borders with eastern Germany.

As it can be seen from Table xx, the CBA Pyrenees yields rather moderate scores varying between -0.43 and 0.90, except for French area Languedoc-Roussillon (FR81; average of the NUT2 area 1.18) that in general seems to be affected more by unemployment. When weighting the scores with national averages (ES = 1.09; FR = 0.25), all the Pyrenees CBA NUTS3 areas seem to have less unemployment than the national scores, again except for the above mentioned Languedoc-Roussillon region.

Map 7.8.:. Spatial distribution of rotated factor scores for factor 1 representing ‘unemployment’.

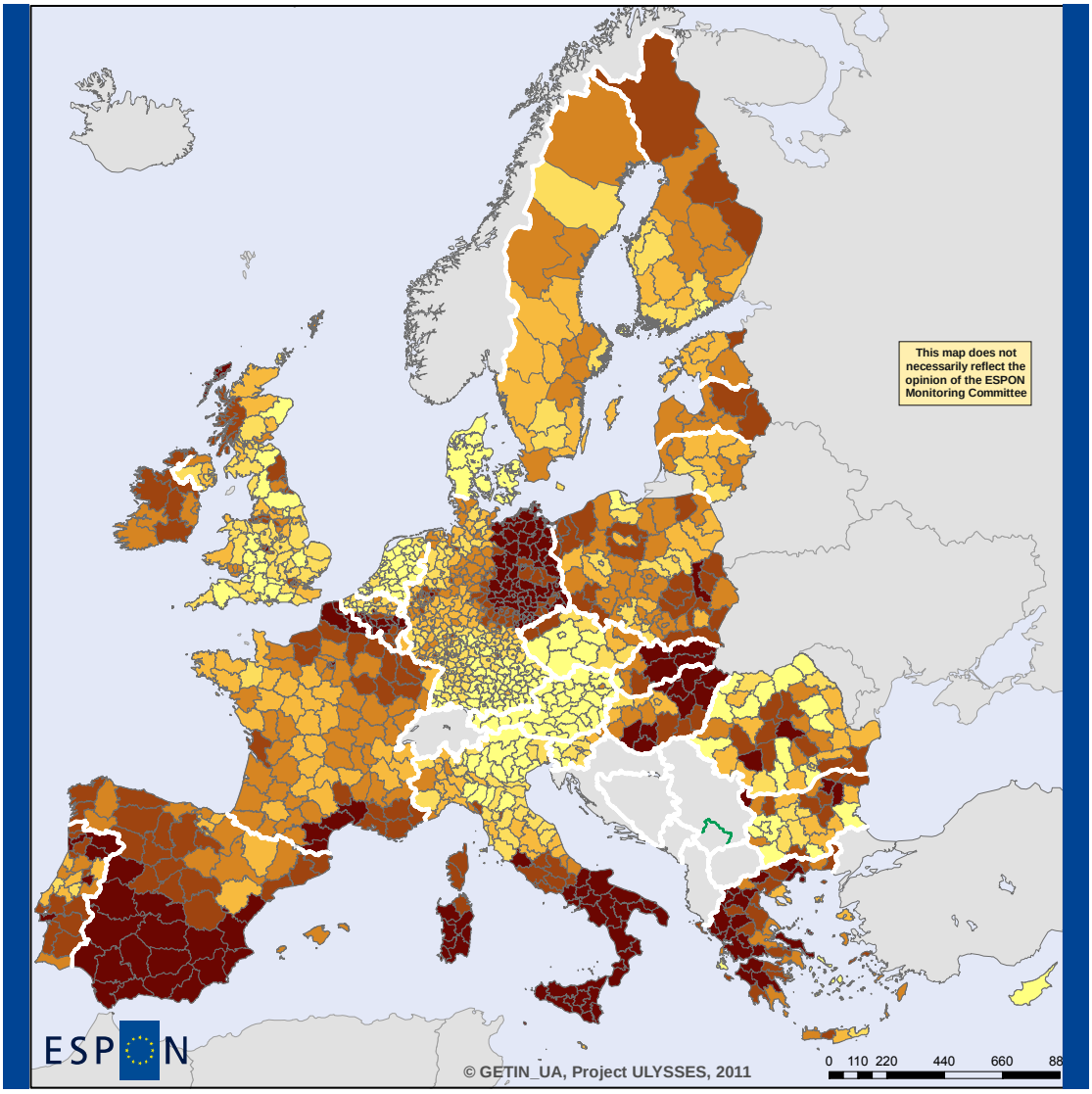


Table 7.15:. Factor scores for Factor 1 (unemployment) of NUTS3 areas of the Pyrenees CBA.

NUTS code	NUTS name	FAC1_2						
		Scores	Country comparison (weighted NUTS 3 average)				Country /CBA country level	Percentile all NUTS 3
CS2			ES	FR	AD	All CBA countries		
All	All Countries	0,61						80
ES	Spain	1,09				0,49		95
FR	France	0,25				-0,36		80
AD	n.a.							
ES211	Álava	-0,25	-1,35			-0,86	- -	50
ES212	Guipúzcoa	-0,41	-1,50			-1,01	- -	50
ES213	Vizcaya	0,23	-0,86			-0,37	- -	80
ES220	Navarra	-0,16	-1,25			-0,76	- -	80
ES241	Huesca	-0,43	-1,52			-1,04	- -	50
ES242	Teruel	-0,28	-1,37			-0,88	- -	50
ES243	Zaragoza	0,14	-0,96			-0,47	- -	80
ES511	Barcelona	0,53	-0,56			-0,08	- -	80
ES512	Girona	0,90	-0,19			0,30	+ -	95
ES513	Lleida	0,12	-0,97			-0,49	- -	80
ES514	Tarragona	0,84	-0,26			0,23	+ -	95
FR611	Dordogne	0,13		-0,11		-0,47	- -	80
FR612	Gironde	0,21		-0,04		-0,40	- -	80
FR613	Landes	0,10		-0,15		-0,50	- -	80
FR614	Lot-et-Garonne	0,16		-0,09		-0,44	- -	80
FR615	Pyrénées-Atlantiques	0,12		-0,13		-0,49	- -	80
FR621	Ariège	0,02		-0,23		-0,59	- -	80
FR622	Aveyron	-0,39		-0,64		-0,99	- -	50
FR623	Haute-Garonne	-0,06		-0,31		-0,67	- -	80
FR624	Gers	-0,36		-0,61		-0,97	- -	50
FR625	Lot	-0,23		-0,48		-0,84	- -	50
FR626	Hautes-Pyrénées	-0,06		-0,31		-0,66	- -	80
FR627	Tarn	0,00		-0,25		-0,61	- -	80
FR628	Tarn-et-Garonne	0,00		-0,25		-0,61	- -	80
FR811	Aude	1,31		1,06		0,70	+ +	95
FR812	Gard	1,31		1,06		0,70	+ +	95
FR813	Hérault	1,38		1,13		0,77	+ +	95
FR814	Lozère	0,59		0,34		-0,02	- +	80
FR815	Pyrénées-Orientales	1,29		1,04		0,68	+ +	95

Performing a regression analysis of factor 1 variables with those representing the territorial profile factors, it is possible to see that, although the overall variation explained by this factor is small, its relation to most of them is statistically significant (Table 7.16.). The coefficients indicate that the high levels of unemployment have a strong negative relation to the high investments in R&D, the demographic dynamism and the high levels of immigration. On the other hand, areas with high levels of unemployment are positively associated with public administration centers and increased construction activity.

Table 7.16. Regression analysis results between territorial performance factor 1 (unemployment) and all territorial profile factors.

Regression Statistics	
Multiple R	0,59374
R Square	0,35252
Adjusted R Square	0,34699
Standard Error	0,80809
Observations	1298

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower*	*Upper*
Intercept	-3,4E-09	0,022430	-1,5E-07	1	-0,0440	0,0440	-0,0440	0,0440
FAC1_1	-0,13913	0,022438	-6,20045	7,57172E-10	-0,1831	-0,0951	-0,1831	-0,0951
FAC2_1	-0,17056	0,022438	-7,60142	5,62205E-14	-0,2146	-0,1265	-0,2146	-0,1265
FAC3_1	0,35445	0,022438	15,79682	1,64522E-51	0,3104	0,3985	0,3104	0,3985
FAC4_1	-0,17954	0,022438	-8,00162	2,72054E-15	-0,2236	-0,1355	-0,2236	-0,1355
FAC5_1	-0,01938	0,022438	-0,86369	0,387920516	-0,0634	0,0246	-0,0634	0,0246
FAC6_1	0,04804	0,022438	2,140949	0,032465709	0,0040	0,0921	0,0040	0,0921
FAC7_1	-0,12934	0,022438	-5,76408	1,02676E-08	-0,1734	-0,0853	-0,1734	-0,0853
FAC8_1	0,07384	0,022438	3,29098	0,001025468	0,0298	0,1179	0,0298	0,1179
FAC9_1	-0,16827	0,022438	-7,49914	1,19255E-13	-0,2123	-0,1242	-0,2123	-0,1242
FAC10_1	-0,29276	0,022438	-13,0475	1,24326E-36	-0,3368	-0,2487	-0,3368	-0,2487
FAC11_1	-0,08551	0,022438	-3,81081	0,000145058	-0,1295	-0,0415	-0,1295	-0,0415

Factor 2 refers to the convergence dynamism of each NUTS3 area of the EU27 space to the leading region (London NUTS2), since it is related to the GDP and the GDP growth in the period 1997 – 2008. Its correlated variables also include urban waste water treatment capacity and infant mortality. This factor explains 18.71% of the total system's variance.

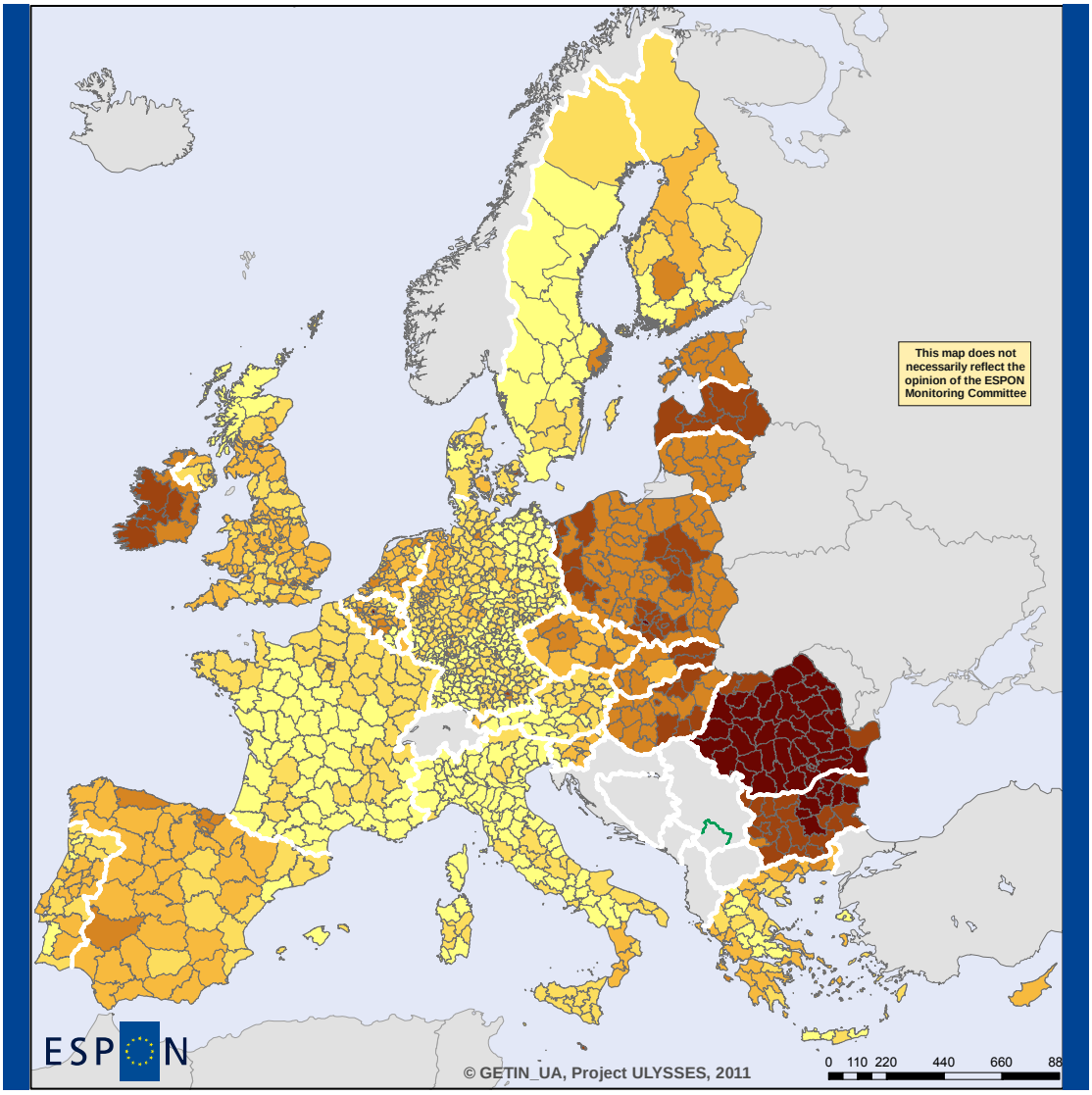
As can be seen in the map (Map 7.9.), the correlation between high GDP growth and poor social conditions is essentially a consequence of the very high growth rate witnessed by the eastern European countries throughout the late 1990 and early 2000 (some countries even had occasional double digit growth rates), while the central European countries, although starting from a high initial position, witnessed relatively small growth rates. The overall pattern of the border regions seem to essentially follow the national tendency.

The CBA Pyrenees show diverse patterns when focusing on convergence dynamism. All the French area have negative scores, implying that the GDP growth has been moderate in these regions. Similarly, Spanish region Cataluña and Navarra show negative convergence tendency, where as País Vasco and Aragón have had a positive GDP growth pattern. When compared to rest of the cross border regions, all Spanish regions, except for Cataluña (average -0.21), mark positive convergence dynamism (average 0.75) and all the French regions a negative pattern varying between -0.17 (Lozère) and -0.60 (Gard and Hérault).

Table 7.17.. Factor scores for Factor 2 (convergence dynamism) of NUTS3 areas of the Pyrenees CBA.

NUTS code	NUTS name	FAC2_2						
		Scores	Country comparison (weighted NUTS 3 average)				Country /CBA country level	Percentile all NUTS 3
CS2			ES	FR	AD	All CBA countries		
All	All Countries	-0,28						80
ES	Spain	-0,04				0,24		80
FR	France	-0,46				-0,18		50
AD	n.a.							
ES211	Álava	0,59	0,64			0,88	+ +	95
ES212	Guipúzcoa	0,66	0,70			0,94	+ +	95
ES213	Vizcaya	0,71	0,75			0,99	+ +	95
ES220	Navarra	-0,08	-0,04			0,20	+ -	80
ES241	Huesca	0,44	0,49			0,73	+ +	80
ES242	Teruel	0,44	0,48			0,72	+ +	80
ES243	Zaragoza	0,48	0,52			0,77	+ +	80
ES511	Barcelona	-0,24	-0,19			0,05	+ -	80
ES512	Girona	-0,58	-0,54			-0,30	- -	50
ES513	Lleida	-0,43	-0,39			-0,15	- -	50
ES514	Tarragona	-0,73	-0,68			-0,44	- -	20
FR611	Dordogne	-0,57		-0,11		-0,29	- -	50
FR612	Gironde	-0,68		-0,22		-0,40	- -	20
FR613	Landes	-0,62		-0,16		-0,34	- -	50
FR614	Lot-et-Garonne	-0,57		-0,11		-0,28	- -	50
FR615	Pyrénées-Atlantiques	-0,81		-0,35		-0,52	- -	20
FR621	Ariège	-0,65		-0,19		-0,36	- -	50
FR622	Aveyron	-0,67		-0,21		-0,39	- -	50
FR623	Haute-Garonne	-0,69		-0,23		-0,41	- -	20
FR624	Gers	-0,57		-0,11		-0,28	- -	50
FR625	Lot	-0,65		-0,19		-0,37	- -	50
FR626	Hautes-Pyrénées	-0,71		-0,25		-0,43	- -	20
FR627	Tarn	-0,63		-0,17		-0,34	- -	50
FR628	Tarn-et-Garonne	-0,61		-0,15		-0,32	- -	50
FR811	Aude	-0,82		-0,35		-0,53	- -	20
FR812	Gard	-0,89		-0,43		-0,60	- -	20
FR813	Hérault	-0,89		-0,43		-0,60	- -	20
FR814	Lozère	-0,45		0,01		-0,17	- +	50
FR815	Pyrénées-Orientales	-0,83		-0,37		-0,55	- -	20

Map 7.9.: Spatial distribution of rotated factor scores for factor 2 representing ‘convergence dynamism’.



As explained above, the negative correlation of the convergence indicator with other performance indicators in this factor is essentially linked to the high growth rates of the eastern countries in the initial decades of

their transition to a market economy. As this is an historic contingency and does not follow a deeper causal nexus, the regression analysis was made only for the convergence indicators.

The regression of this indictor, which showed a slightly higher R square then the previous one, shows that it is statistically related to many components of the territorial profile. Confirming what has previously been said about this indicator, the catching up process is especially strong in eastern countries and therefore the highest negative coefficients occur in factor 1 (centrality) and factor 3 (public administrative centres). On the other hand, in central Europe the regions which perform best in this indicator are the ones located in the 'blue banana' and, even in Eastern Europe, the top performing regions tend to be the more central ones. This might explain why the catching-up process is also negatively related to rurality (factor 9 - low density and growth of agricultural areas).

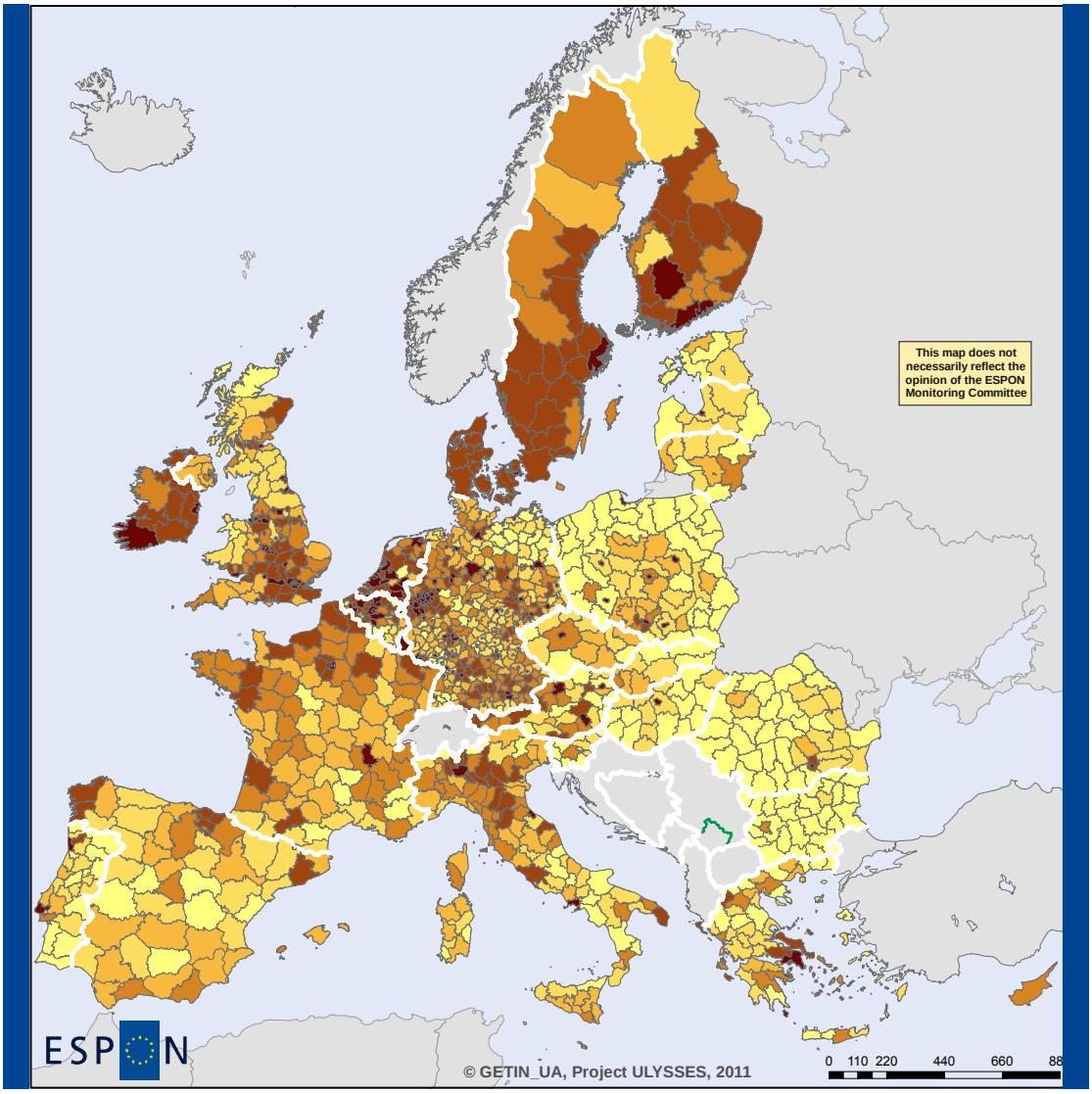
Table 7.18.: Regression analysis results between territorial performance factor 2 (convergence dynamism) and all territorial profile factors.

Regression Statistics	
Multiple R	0,6261119
R Square	0,3920161
Adjusted R Square	0,3868156
Standard Error	0,7830609
Observations	1298

	Coefficients	*Standard*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower*	*Upper*
Intercept	-6,26829E-08	0,0217	-2,884E-06	0,9999977	-0,043	0,043	-0,043	0,043
FAC1_1	-0,352	0,0217	-16,197241	7,7102E-54	-0,395	-0,310	-0,395	-0,310
FAC2_1	-0,102	0,0217	-4,7047433	2,8164E-06	-0,145	-0,060	-0,145	-0,060
FAC3_1	-0,326	0,0217	-14,995851	5,713E-47	-0,369	-0,283	-0,369	-0,283
FAC4_1	0,053	0,0217	2,4167366	0,01579882	0,010	0,095	0,010	0,095
FAC5_1	0,140	0,0217	6,44670648	1,6131E-10	0,098	0,183	0,098	0,183
FAC6_1	0,091	0,0217	4,18168723	3,0895E-05	0,048	0,134	0,048	0,134
FAC7_1	0,042	0,0217	1,9210766	0,05494291	-0,001	0,084	-0,001	0,084
FAC8_1	-0,049	0,0217	-2,2370838	0,02545166	-0,091	-0,006	-0,091	-0,006
FAC9_1	-0,297	0,0217	-13,645679	1,0773E-39	-0,339	-0,254	-0,339	-0,254
FAC10_1	-0,168	0,0217	-7,7085769	2,5325E-14	-0,210	-0,125	-0,210	-0,125
FAC11_1	0,017	0,0217	0,78598351	0,43202194	-0,026	0,060	-0,026	0,060

Factor 3 refers to economic development of the NUTS3 areas of the EU27 space. The indicators positively correlated to this factor are the GDP per capita and the percentage of soil sealed area, while the coverage by Natura 2000 sites is negatively correlated by this factor. It can therefore be understood as a factor which expresses high degrees of development and urbanization. As expected, the regions with the highest scores on this factor are concentrated in central Europe and Scandinavia and also include the capital cities of more marginal countries (Map 7.10). This factor explains 17.57% of the total system's variance.

Map 7.10.: Spatial distribution of rotated factor scores for factor 3 representing ‘economic development’.



Majority of Pyrenees CBA have negative scores in the factor of economic development. There are some positive exceptions however, as the Soanish regions of País Vasco (average score 0.49) and Barcelona (0.28), as well as French areas Gironde (0.12) Haute-Garonne (0.24). When compared to other European

CBA, Barcelona and Vizcaya show strong positive pattern whereas the lowest economic development scores can be found from Huesca (-0.78) Languedoc-Roussillon (average score -0.91).

Table 7.19.: Factor scores for Factor 3 (economic development) of NUTS3 areas of the Pyrenees CBA.

NUTS code	NUTS name	FAC3_2						
		Scores	Country comparison (weighted NUTS 3 average)				Country /CBA country level	Percentile all NUTS 3
CS2			ES	FR	AD	All CBA countries		
All	All Countries	0,16						80
ES	Spain	-0,25				-0,41		50
FR	France	0,46				0,30		95
AD	n.a.							
ES211	Álava	0,10	0,35			-0,06	- +	80
ES212	Guipúzcoa	0,14	0,39			-0,02	- +	80
ES213	Vizcaya	0,48	0,73			0,32	+ +	95
ES220	Navarra	-0,11	0,14			-0,27	- +	80
ES241	Huesca	-0,62	-0,37			-0,78	- -	50
ES242	Teruel	-0,52	-0,26			-0,68	- -	50
ES243	Zaragoza	-0,28	-0,03			-0,45	- -	50
ES511	Barcelona	0,28	0,53			0,12	+ +	80
ES512	Girona	-0,35	-0,10			-0,52	- -	50
ES513	Lleida	-0,50	-0,25			-0,66	- -	50
ES514	Tarragona	-0,46	-0,21			-0,62	- -	50
FR611	Dordogne	-0,24		-0,70		-0,40	- -	50
FR612	Gironde	0,12		-0,35		-0,05	- -	80
FR613	Landes	-0,17		-0,64		-0,34	- -	80
FR614	Lot-et-Garonne	-0,10		-0,56		-0,26	- -	80
FR615	Pyrénées-Atlantiques	-0,60		-1,07		-0,76	- -	50
FR621	Ariège	-0,52		-0,99		-0,68	- -	50
FR622	Aveyron	-0,38		-0,85		-0,54	- -	50
FR623	Haute-Garonne	0,24		-0,22		0,08	+ -	80
FR624	Gers	-0,29		-0,75		-0,45	- -	50
FR625	Lot	-0,28		-0,74		-0,44	- -	50
FR626	Hautes-Pyrénées	-0,46		-0,92		-0,62	- -	50
FR627	Tarn	-0,25		-0,71		-0,41	- -	50
FR628	Tarn-et-Garonne	-0,21		-0,67		-0,37	- -	50
FR811	Aude	-1,00		-1,47		-1,16	- -	20
FR812	Gard	-0,67		-1,13		-0,83	- -	20
FR813	Hérault	-0,47		-0,93		-0,63	- -	50
FR814	Lozère	-0,93		-1,39		-1,09	- -	20
FR815	Pyrénées-Orientales	-0,66		-1,13		-0,83	- -	20

The explanatory capacity of this regression is significantly higher than that of the previous factors expressing the territorial performance of NUTS3 areas (Table 7.20). The coefficients, once again, show a significant relation with most of the factors of the territorial profile. The overall picture from the coefficients is a positive effect from factors related to centrality and R&D investments (factor 1 and 2 of territorial profile). It is also interesting to see that the central location explains much more of different economic development levels than the investment in R&D. Similar conclusions can be drawn from the highly negative coefficient of the indicator

related to rurality (factor 9) meaning that, on themselves, density and central location seem to be more important than research and innovation. The weight of the construction sector is also considerably negative, probably meaning that, at a certain stage, high economic development is more linked to a strong service sector (factor 3) than infrastructural development (factor 8).

Table 7.20.: Regression analysis results between territorial performance factor 3 (economic development) and all territorial profile factors.

Regression Statistics	
Multiple R	0,824258
R Square	0,679401
Adjusted R Square	0,676659
Standard Error	0,568631
Observations	1298

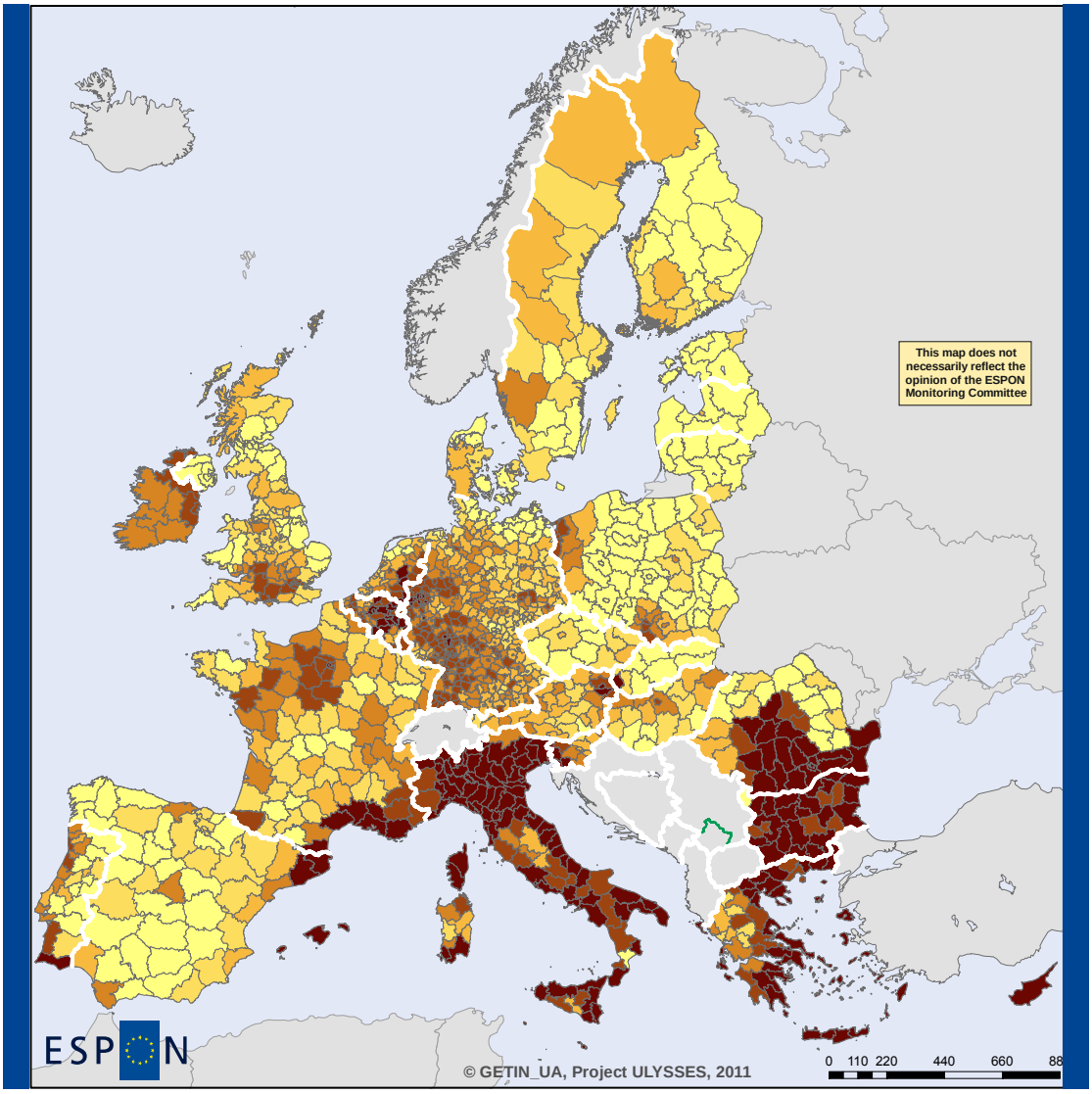
	Coefficients	*Standard*	*t Stat*	*P-value*	*Lower*	*Upper*	*Lower*	*Upper*
Intercept	-1E-07	0,01578	-7,1E-06	0,999994301	-0,0310	0,0310	-0,0310	0,0310
FAC1_1	0,4545	0,01579	28,78786	4,4844E-141	0,4236	0,4855	0,4236	0,4855
FAC2_1	0,1623	0,01579	10,27749	7,24251E-24	0,1313	0,1932	0,1313	0,1932
FAC3_1	0,0837	0,01579	5,303401	1,33687E-07	0,0528	0,1147	0,0528	0,1147
FAC4_1	0,0844	0,01579	5,348225	1,05025E-07	0,0535	0,1154	0,0535	0,1154
FAC5_1	0,1545	0,01579	9,785094	7,39012E-22	0,1235	0,1855	0,1235	0,1855
FAC6_1	0,0372	0,01579	2,356502	0,018597296	0,0062	0,0682	0,0062	0,0682
FAC7_1	0,1029	0,01579	6,518061	1,02027E-10	0,0719	0,1339	0,0719	0,1339
FAC8_1	-0,3541	0,01579	-22,4252	2,83549E-94	-0,3851	-0,3231	-0,3851	-0,3231
FAC9_1	-0,5195	0,01579	-32,9051	8,784E-173	-0,5505	-0,4886	-0,5505	-0,4886
FAC10_1	-0,0122	0,01579	-0,7752	0,438363708	-0,0432	0,0187	-0,0432	0,0187
FAC11_1	-0,0321	0,01579	-2,03075	0,042485717	-0,0630	-0,0011	-0,0630	-0,0011

Factor 4 of the territorial performance analysis seems related to pollution, as the positively correlated component is the ozone concentration exceedance. At the same time, this factor indicates areas with strong urban and industrial profile, as ozone concentration is related to a photo-chemical reaction of pollutants and depends on the presence/absence of heavy industries, traffic levels, sun exposure but also on wind conditions.

This means that emissions in one place can affect neighbouring regions, that high emission in southern countries will lead to higher ozone levels than in northern countries and that favourable wind conditions can lead to low levels in regions with high emissions and vice-versa. Therefore, a regression analysis of this indicator with the context factors has necessarily a very limited explanatory capacity and can lead to relations that lack any evident logic if the atmospheric conditions are not taken into account. Although the map shows as some overall tendencies (Map 7.11.), the regression analysis shouldn't be taken into account.

There also seem to be some discrepancies on the way it is measured in different countries, as it is not plausible that there are so clear cuts on some borders, such as can be seen in Ireland.

Map 7.11.: Spatial distribution of rotated factor scores for factor 4 representing ‘air pollution’.



7.4. Conclusions

The objective of the territorial analysis was to combine the various variables describing territorial characteristics and territorial performance to combined indicators or factors. As a result of the factor analysis, we looked more closely to nine factors related to territorial profile and three factors related to territorial performance.

Based on the factor analysis, the Pyrenees CBA can be described as limitedly central area with couple of "hot-spots" that are characterized with easy access by air, rail and road and with high share of employment in high tech and financial services. However, vast majority of the Pyrenees CBA is not that well connected to urban centres. Although the Pyrenees CBA as whole may not be the most urbanized area, it is performing relatively well when indicator related to research, development and innovation is considered. In fact, majority of the regions belonging to Pyrenees CBA show higher R&D&I intensity than the corresponding national averages. This shows that regions with less central location can compensate the least favourable geographical position with high level of inputs in knowledge creation.

Within the Pyrenees CBA there are also vast differences between the two countries (Spain and France) analyzed. First of all, it can be said that the majority of French Pyrenees CBA regions can be characterized as high importance of public sector employment whereas majority of Spanish regions show high importance of manufacturing industry for employment and economic output. Similarly, when demographic dynamism is considered, there are quite big differences between French and Spanish regions analyzed. French regions show relatively high levels of demographic dynamism (i.e. young age dependency rate, the crude rate of natural population increase and the total fertility rate), whereas majority of the Spanish area demonstrate much lower rate of change in demographic dynamism. In any case, when compared to other areas of Europe, the Pyrenees CBA is in general characterized by relatively high levels of immigration.

In Pyrenees CBA, the importance of tourism sector and service sector, is rather modest in general, although there are some areas of Spain (especially Cataluña, but also Vizcaya) that are concentrations of service sector businesses. Construction sector seems to have high importance in whole Pyrenees CBA – in Spanish CBA however less than in Spain in average, but in French CBA more than in France in average. The climate change exposure is an important characteristic of some of the Pyrenees CBA regions as majority of Spanish and some French CBA regions the environmental, social and cultural sensitivity to climate change is rather high.

When the territorial performance is considered, the results are two-fold. There are some Spanish regions (Barcelona and Vizcaya) that are performing rather well even in European level, when GDP per capita is considered. But on the other hand, French area Languedoc-Roussillon seems to be quite affected by unemployment. In general, the whole CBA shows rather low levels of convergence implying of slow growth of GDP with the exception of some Spanish regions (Áragon and País Vasco).

Chapter 8 – Conclusions

The Working Community of Pyrenees Cross-Border Area can be considered a limitedly central area with couple of “hot-spots” that are characterized by easy access by air, rail and road and by high share of employment in high tech and financial services. However, the vast majority of the Pyrenees CBA is relatively isolated from urban centres. This is mostly due to, the distribution pattern of the urban population in the area, which is centrifugal in respect to the Pyrenees mountain range. This fact amplifies the remoteness of the core area, while at the same time creates additional opportunities derived from the intrinsic quality of its rural, natural and cultural heritages.

The analysis undertaken in this case study reveals a number of strengths of the CBA, which is performing relatively well when variables such as those related to research, development and innovation are considered. Regions such as País Vasco and Comunidad Foral de Navarra stedily increased their GDP per capita over the last decade. Relatively high levels of immigration if compared to other areas in Europe may lead to optimistic conclusions concerning attractiveness of the CBA. However, net migration has decreased in a significant manner in the CBA and for the first time in the timeframe analysed, emigrants exceeded inmigrants in some regions such as Barcelona, Vizcaya and Guipúzcoa in 2008. This might be one of the consequences of the economic downturn which are also visible in other variables such as long term unemployment, which is increasing in a considerable way in both sides of the border. Languedoc-Rousillon is the region which shows the weakest position in social cohesion variables.

Due to data shortage in some variables at NUTS3 level, the analysis undertaken in this case study is not as complete as the authors would like it to be. More data at NUTS3 and even NUTS4 level is needed to get a more detailed picture of the cross-border area, provide more information about the reasons behind different performances across regions and suggest measures to strengthen the area and better address the Europe 2020 goals.

Given the current economic downturn, which appeared to hit significantly the regions under analysis since 2007, more recent data in certain variables and an exhaustive follow-up in the upcoming years would be required to better understand its implications across regions. Data and evidence informed policy making is more than ever an issue. As a matter of fact, the follow-up of variables such as GDP per capita may lead to some unpleasant conclusions and show a discontinuity in the positive evolution of GDP per capita acknowledged until 2008. Long term unemployment, which is already increasing since 2008, also deserves a special follow-up in the future. Member States and regions are working hard to design and put in place a set of measures to face the challenges posed by the economic downturn, while public budgets are suffering meaningful cuts.

In view of the scarcity of public and private financial resources available, identification of priorities for individual regions and forms of practical collaboration between regions is even a more critical issue. Regions within the CBA might construct a strategic vision of their future that identifies how they should position themselves in the knowledge economy. Formulating such a strategy means finding out which R&D and

innovation activities can best be developed competitively in the region and then implementing the policies necessary to pursue this vision. Such a discovery process is at the heart of a smart specialisation strategy[24].

Cultural and creative industries, which flourish at the local and regional level, are in a strategic position to link creativity and innovation. They can help to boost local economies, stimulate new activities, create new and sustainable jobs, have important spill-over effects on other industries and enhance the attractiveness of regions and cities. Creative industries are therefore catalysts for structural change in many industrial zones and rural areas with the potential to rejuvenate their economies and contribute to a change of the public image of regions[25].

Central Pyrenean regions have transferred less agricultural and natural lands to artificial uses. This fact suggests that these areas might have behaved better than other regions in preserving traditional agricultural and landscape assets and indirectly also artistic and cultural heritages found within the rural setting. This leads us to conclude that cultural and creative industries may flourish more easily in these regions than in others. But such a move calls for some support from national, regional and local authorities: integration of creative and cultural industries in regional and local development strategies, cross-border integrated strategy to manage natural and cultural resources and revitalise local economy, ensuring a better match between the supply of skills and the demands of the labour market, access and information about innovative financial instruments, etc.

[24] EUROPEAN COMMISSION COM(2010)

[25] EUROPEAN COMMISSION SEC(2010)

Bibliography - References

Auphan, E. (2001). La travesía de los Pirineos, otro problema “alpino” europeo. Tribuna Científica. Gobierno de Aragón.

Burgalassi, D. (2010). Defining and measuring polycentric regions: the case of Tuscany. Discussion Paper n. 101, September 2010. Department of Economics, University of Pisa.

Camagni, R., M. Gibelli, and P. Rigamonti (2002). Urban Mobility and Urban Form: the Social and Environmental Costs of Different Patterns of Urban Expansion. Ecological Economics 40, 199-216.

EC (1999). European Spatial Development Perspective. Towards Balanced and Sustainable Development of the Territory of the European Union. Luxembourg: Office for Official Publications of the European Communities.

EC (2007). Leipzig Charter on Sustainable European Cities by the informal meeting of the Council of Ministers in Leipzig on 24 May, under the German EU Presidency.

EC (2010). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. “A Digital Agenda for Europe”. COM(2010) 245 final/2.8.2010

EC COM(2010) 553 final: Document accompanying the Commission Communication on Regional Policy contributing to smart growth in Europe 2020 -

EC SEC(2010) 1183: Regional Policy contributing to smart growth in Europe 2020

ESPON (2003). ESPON 1.1.2 - Urban-rural relations in Europe. Final report, revised version - March 2005.

ESPON (2004). ESPON 1.2.1 - Transport services and networks: territorial trends and basic supply of infrastructure for territorial cohesion. Final report - September 2004.

Eurostat (2010), “A revised urban-rural typology”, in Eurostat regional yearbook 2010, pp. 239-253 http://epp.Eurostat.ec.Europa.eu/cache/ITY_OFFPUB/KS-HA-10-001-15/EN/KS-HA-10-001-15-EN.PDF

CEMAT, European Conference of Ministers Responsible for Regional Planning (2011a). Territorial Agenda of the European Union 2020. Towards an Inclusive, Smart and Sustainable Europe of Diverse Regions. Presented at the Informal Meeting of Ministers responsible for Spatial Planning and Territorial Development on 19th May 2011 Gödöllő, Hungary.

CEMAT, European Conference of Ministers Responsible for Regional Planning (2011b). The Territorial State and Perspectives of the European Union. 2011 update. Background document for the Territorial Agenda of the European Union 2020. Presented at the Informal Meeting of Ministers responsible for Spatial Planning and Territorial Development on 19th May 2011 Gödöllő, Hungary.

Davoudi, S. (2003). Polycentricity in European Spatial Planning: From an Analytical Tool to a Normative Agenda. European Planning Studies 11 (8), 979-999.

ESPON (2005). ESPON 1.1.1 - Potentials for polycentric development in Europe. Project report, revised version - March 2005.

ESPON (2006). ESPON 1.4.1 - The Role of Small and Medium-Sized Towns (SMESTO) – Final Report. August 2006.

ESPON (2007). ESPON project 1.4.3 - Study on Urban Functions. Final Report, March 2007.

ESPON (2010). FOCI - Future Orientations for Cities. Applied Research 2013/1/1 Final Scientific Report, Version 15/12/2010.

ESPON (2011). The Functional Urban Areas Database – Technical Report, March 2011.

Gabaix, X. (1999): Zipf's Law for Cities: An Explanation. Quarterly Journal of Economics, vol. 104, 739-767.

Linneker, B. (1997). Transport Infrastructure and Regional Economic Development in Europe: A Review of Theoretical and Methodological Approaches, TRP 133. Sheffield, Department of Town and Regional Planning.

Logitrans (2010). España - Francia: las infraestructuras de transporte desde una perspectiva empresarial. Intermodalidad entre Francia y España: ¿Desafío o Realidad?

Meijers, E. and Sandberg, K. (2006). Polycentric Development to Combat Regional Disparities? the Relation Between Polycentricity and Regional Disparities in European Countries. ERSA conference papers, European Regional Science Association.

Meijers, E. (2008). Measuring Polycentricity and its Premises. European Planning Studies 16 (9), 1313-1323.

Meijers, E. and Sandberg, K. (2008). Reducing Regional Disparities by Means of Polycentric Development: Panacea or Placebo? Scienze Regionali 7 (2), 71-97

Ministère des Transports, de l'Équipement, du Tourisme et de la Mer Conseil Général des Ponts et Chaussées (2006). Démarche prospective transports 2050. Éléments de reflexion. Ministère des Transports.

Observatorio hispano-francés de Tráfico en los Pirineos (2010). Suplemento al documento nº 5. Principales cifras actualizadas al año 2008 (June 2010).

Parr, J.R. (1985). A Note on the Size Distribution of Cities over the Time, Journal of Urban Economics, no. 18, 199-212.

Spiekermann & Wegener and RRG Spatial Planning and Geoinformation (2007). Update of Selected Potential Accessibility Indicators Final Report. ESPON, 2007.

Wegener, M., Spiekermann, K. and Copus, A. (2002). Review of Peripherality Indices and Identification of 'Baseline Indicator: Deliverable 1 of AsPIRE – Aspatial Peripherality, Innovation, and the Rural Economy. Dortmund/Aberdeen: S&W, IRPUD, SAC.

Zipf, G.K. (1949): Human Behavior and the Principle of Least Effort, Harvard University (Re-stamped by Hafner Publishing Co., N.Y., 1972).

www.espon.eu

The ESPON 2013 Programme is part-financed by the European Regional Development Fund, the EU Member States and the Partner States Iceland, Liechtenstein, Norway and Switzerland. It shall support policy development in relation to the aim of territorial cohesion and a harmonious development of the European territory.