ESPON

Ulysses

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

Targeted Analysis 2013/2/10

Annex VIII – Case Study 6: Extremadura-Alentejo Cross-Border Area

Report on Task 2.2 - Multi-scale performance analysis

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This report presents a more detailed overview of the analytical approach to be applied by the project. This Targeted Analysis is conducted within the framework of the ESPON 2013 Programme, partly financed by the European Regional Development Fund.

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This basic report exists only in an electronic version.

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Nomenclature

CBR: 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.

Chapter 0 – Executive summary

Portugal and, to a lesser extent, Spain are normally understood as part of the periphery of the European Union, in a geographical as well as an economic sense. Except for the northern part, the border between these two countries is, on its turn, a periphery for each one of them. In the European context, the cross border region of the Alentejo-Extremadura can therefore be understood as a "periphery of a periphery".

This peripheral location is a crucial element which shapes this regions' behaviour in many of the analysed dimensions manifesting itself in an overall low density in human settlements, infrastructures and economic activities and a poor capacity in achieving the Lisbon/Europe 2020 and Gothenburg Strategy objectives in all except the climate indicators.

Accessibility and connectivity

As stated above, this cross border region is marked by overall low densities, to which communication and transport infrastructures and services are no exception.

Regarding the few connectivity indicators that were analysed, this CBR has one of the poorest performances of the whole countries it belongs to.

Regarding accessibility, the long term choice for transport modes of this CBR seems to be the road, for which the regions' potential accessibility scores were the highest when compared to other modes of transportation (rail and air). In fact, and although the potential accessibility by road is still well below the ESPON average, the road infrastructure has been witnessing major improvements in the last two decades, especially on the Spanish side of the border. This CBR also has one of the most important road border crossings in terms of daily car and truck intensity of all Portuguese-Spanish border (the Caia-Badajoz border crossing).

The potential accessibility for rail, on the other hand, is very low and its evolution between 2001 and 2006 shows a negative tendency in the NUTS 3 where the scores were the lowest.

But although accessibility and connectivity levels are very low, this region's transport infrastructure is essentially in line with its remote position. Considering the very low densities, the regions can even be understood as having a fairly good infrastructure. .

Demography

This CBR is struggling with a major ageing challenge in the Alentejo and a force replacement challenge in the Extremadura. Several aspects are worth being analysed on this topic.

The first one is that, as these regions have been witnessing a decline in the young cohorts over extended periods, the ratio of persons aged over 65 is very high, not only in comparison to the cohorts of people under 15, but also in comparison to the working aged population.

The second, which is closely related to the previous one, is that most of the CBR seems to be experiencing a negative momentum of population growth. It is therefore very likely that most of these territories will witness an accelerating natural population decline in the next decades, even if the life-expectancy continues to grow and if effective measures to boost fertility would be put into place.

The third one is that, given the negative outlooks for natural population growth, the demographic sustainability of many of the settlement of these regions will depend on their capacity to attract population. This has been occurring to some extent in most of the regions, but it is not clear how this will progress, as the migration rates depend a lot on different variables such as the political context, accessibility levels or economic performance.

The fourth one considers the potential problems that come from relating the former aspects to one of the major trait of these regions – very low population density. Some of the predictable challenges of this situation include: the satisfaction of an increasing demand of services from an ageing population that is scattered on a large area; the maintenance of general public infrastructures (roads, water, schools, etc.) for a population that would no longer justify them from an efficiency point of view; the viability of ecosystems that rely on human activities; the struggle of economic sectors that could suffer from factors related to an increasing remoteness, such as growing distances to markets, decreasing economies of scale or scarcity of labour force.

The fifth is that the major demographic challenges, although common to all of the regions, are not experienced at the same magnitude by all of them and cannot easily be linked to the border condition on a local level. For instance, a positive effect of the border distance on population growth has only been observed on the Portuguese side, which also suffers from decreasing densities as we move towards more remote areas. On the Spanish side there are consolidated settlements very close to the border and the regions' population growth is also positively impacted by smaller border distances, even if this impact is not very significant.

The sixth is that the before mentioned growing urban agglomerations on the Spanish side of the frontier have a significant effect on the demographic potential on the neighbouring areas. This implies that a further integration might attenuate the remote position of the whole border regions, including on the Portuguese side.

Policentricity

As stated by the Territorial Agenda of the European Union 2020, polycentric territorial development is a major factor for cohesion, since a network of cooperating cities act as centres for development in the larger territories. Concerning the polycentric development of this CBR, six major conclusions have been drawn.

The first one is that the share of people living in Functional Urban Centres is very low in. Only 31,2% of the total population lives in FUA, compared to the 74,8% in the total ESPON countries, 73,5% in Portugal or 83,7% in Spain.

The second one, which is a consequence of the former, is that the amount and size of these FUA is very small. Essentially, besides the already low densities, this region is also characterized by the difficulty of agglutinating its population in urban areas of a significant any size.

The third one is that the FUA network lacks hierarchy in the upper end of the rank size distribution. When considering that the share of the prime city in the total FUA is also relatively low, this means that city system does have a polycentric layout, even if at a very low scale.

The fourth is that the FUA are, sparsely, but evenly spaced throughout the CBR. This region therefore does not follow the overall tendency of Portugal and Spain to concentrate the biggest cities at the coast, leaving much of the interior deprived of major urban agglomerations.

The fifth is that the hierarchy of the GDP per capita distribution among the FUA is very similar to the one of the population. So the CBR does not follow the pattern of the ESPON space, where wealth is distributed in a more hierarchical way among the FUA than population.

Urban-rural relationships

As stated before, the amount of urban population is very low in this region. The rurban-rural relationships are therefore marked by a spatial layout that consists of a network of small urban areas that spreads out over a large, predominantly rural, territory.

These rural areas have a large share of agricultural areas, although they have the overall tendency to diminish. But the changes in the share of agricultural areas seem to be only slightly related to the growth of artificial surfaces, and more to their abandonment or the uptake of forests or semi-natural areas.

As would be expectable, the low progress in the artificialization of the land use also extends itself to the urbanization process. There is only one NUTS 3 in this CBR in which the urban land consumption is faster than at the national levels. But even this makes sense, as it is the region of the CBR with the largest population growth in the last decade.

Besides having large shares of land dedicated to agriculture, the economic structure of this CBR is also characterized by the weight of this sector. Its share in the regions' total values is well above the national average in employment but especially in Gross Value Added. From this, it is possible to deduce that in this region the agricultural sector stands out not only for its weight, but also for its high labour productivity. This high productivity is probably linked to a highly mechanized and standardized production process which contrasts with the traditional rural lifestyles and rhythms.

Lisbon/Europe 2020

As for the Lisbon/Europe 2020, six major aspects were highlighted.

The first one is that the economic situation of these regions is fragile, especially on the Portuguese side of the border. On one hand, all of the NUTS 3 are well below the leading region in terms of GDP per capita. On the other hand many of them have been diverging, or converging very slowly, from the leading region over the last decade.

The second one is that the region has relatively high economic disparities, especially between the two sides of the border, despite sharing so many overall characteristics. This seems to imply that belonging to one country or another has in itself a much greater impact on the regions' economic performance than the more remote or central position it occupies within a country.

The third one is that most of the regions' social cohesion indicators are much worse in this CBR then the respective national averages. This is especially worrying for the Extremadura, given that Spain already tends to have high values in these kind of indicators (youth unemployment, at risk of poverty after social transfers, etc.).

The fourth is that the public sector plays a greater role in the CBR then in the rest of the countries. As can be seen in the factor analysis, a large weight of the public sector is often related to depressed territories, as the public services are more evenly distributed among the territory and therefore leads to their overrepresentation in a scenario of a dwindling private sector.

The fifth is that the regions' capacity to invest in research, development and innovation is very limited and is reflecting itself on the outputs (low amount of patent applications).

The sixth is that the regions have a relatively good performance on climate related indicators, such as soil sealed areas, ozone concentration or protected areas. The tread of the long term climate change is also limited in its potential impacts.

Overall conclusion

The overall conclusion that can be reached from this analysis is that this CBR's will face major challenges in the future. On one hand, this region's situation in many of the indicators is already poor when compared to the EU27. Not only does it have low accessibilities, small urban areas, low GDP per capita and poor social cohesion, but many of the NUTS 3 are also diverging from the leading region in the GDP growth. On the other hand, as has been revealed by the factor and regression analyses, the NUTS 3 of this CBR perform badly in the main factors that explain good economic performance in Europe. For example, all the NUTS 3 fall below the 20% percentile in the factor that is related to central location and a strong service sector, which has the biggest weight when explaining a region's GDP per capita. In the factor that expresses R&D&I, most of the Portuguese regions fall below the 50% percentile, while the Spanish ones fall below the 80%.

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. It has four overall objectives:

- 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:

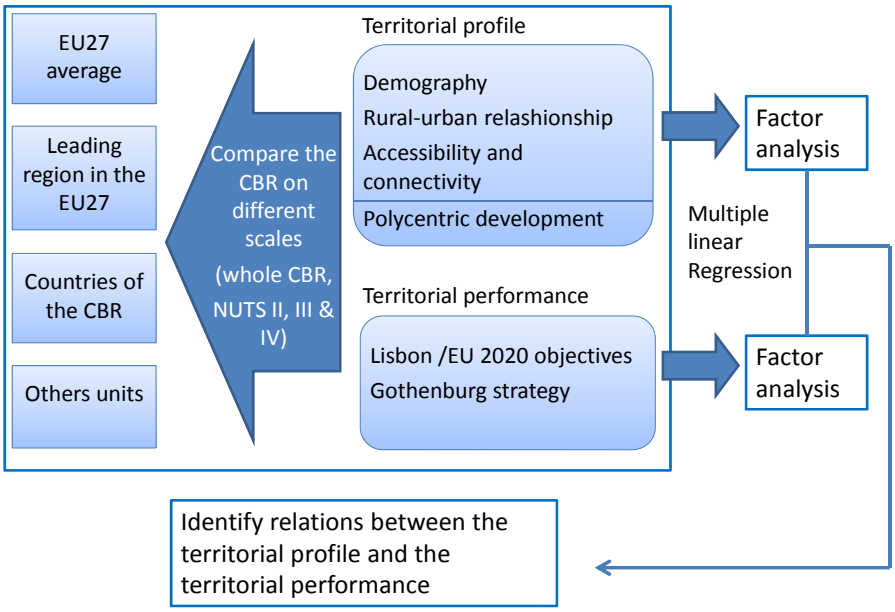
- CS 1: The Upper Rhine cross-border area along the land borders between France, Germany and Switzerland,
- CS 2: The cross-border area along the entire Spanish-French land border (Pyrenees),
- CS 3: The cross-border area along the land border between Greece and Bulgaria,
- CS 4: A cross-border area 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 the Extremadura-Alentejo cross-border regions along the land borders between Portugal and Spain 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 this CBR concerning six targeted themes under analysis.

1.2. Methods of Task 2.2

The general aim of Task 2.2 is to do a multi-thematic and multi-scale analysis of the different Cross Border Regions.

For this, the regions' behaviour regarding two major dimensions was analysed: territorial profile and territorial performance. The territorial profile refers to indicators of the four major ESPON themes (polycentric development, urban-rural relationship, accessibility & connectivity and demography). The territorial performance refers to their capacity in achieving the Lisbon/EU 2020 and Gothenburg strategy goals. Besides the individual analyses of each topic, these two dimensions were also subjected to a more detailed analysis in order two identify causal relations between them.



Multi-scale analysis

For analysing both dimensions, the indicators of each of the CBR were compared on **different scales**: (1) between different NUTS III (and in some cases NUTS II or IV) of the CBR; (2) between the CBR and the countries to which they belong to; (3) between different NUTS III (and in some cases NUTS II or IV) of the CBR regions belonging to a different country; (4) between different NUTS III (and in some cases NUTS II or IV) of the CBR and a reference index that can be established by the EU27 average, the leading region in the EU27, the individual countries of which the CRB are part or any other reference that might be useful to understanding the regions' performance for a specific indicator (for example, regarding total fertility rates, it is useful to evaluate the regions according to the renewal of their population: total fertility rate of 2,1).

The comparison between different scales had two main purposes. The first one was to understand the regions' behaviour in context, as many indicators are not easy to interpret in absolute terms. The second one was to contribute in understanding the effect of the border on the regions' behaviour. For example, a comparison of one side of the border of a CBR to the national average as well as the other side of the border might help to evaluate whether a region's performance is more influenced by its border position or by the realities of the countries it belongs to.

Factor analysis

The different themes were also be subjected to different statistical analysis in order to identify causal relations between the relative performances of each CBR and the territorial profile, as well as the main drivers behind the different performances.

For this, two different factor analyses were made: one for the territorial profile and one for the performance indicators. These factor analyses were made using data on a NUTS 3 scale for all the EU 27 countries. The polycentricity indicators were excluded, because they are not suited for the NUTS 3 level at which the analysis was performed. Also, and since the intention was to establish a causal relation between general aspects that characterize the regions and their performance, some of the indicators that are typically related to the Lisbon/Europe or the Gothenburg Strategy where included in the first set of indicators. This was the case, for example, for the ESPON climate indicators. These indicators relate the regions' sensitivity to potential climate change (e.g. the amount of flood prone areas) with elements of their spatial layout (e.g. population density, presence/absence of susceptible economic infrastructures). In this sense these indicators do not really reflect a regions capacity in reaching the Gothenburg goals, but are more related to their general exposure which is, to a high extent, a consequence of their geographical position or historic evolution.

Regression analysis

After the factor analysis, several multiple regressions were made, having as independent variables each factor of the performance indicators and as dependent variables all the factors of the territorial profile. Essentially, this analysis distinguished the influence of the regions' characteristics on its capacity to develop itself in a sustainable and cohesive way. But this does not mean that the territorial profile and the territorial performance are not relevant *per se*: the relations between different indicators are not necessarily marked by unique and clear-cut causal relations and relevant indicators of the territorial profile may have no significance to the territorial performance.

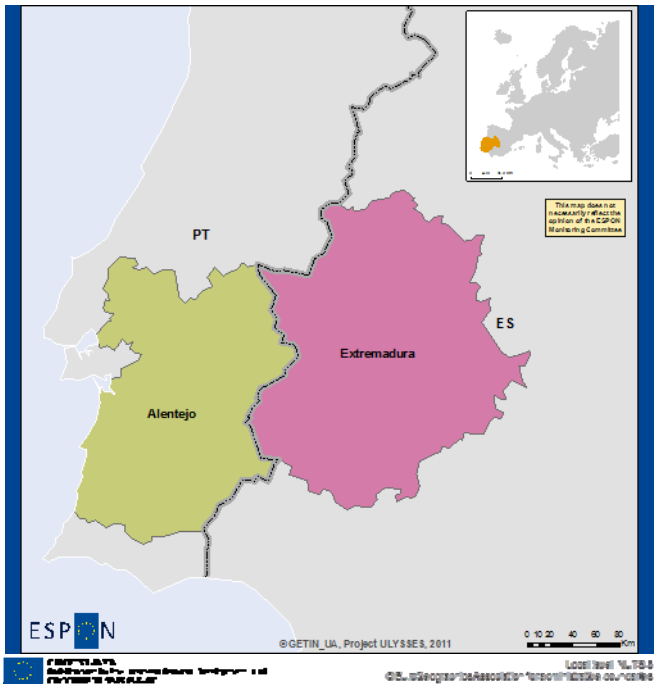
Main outputs

- A territorial profile of each CBR, based on the different themes under analysis;
- An evaluation of the territorial performance based on Lisbon/EU 2020 and Gothenburg objective indicators;
- Analysis of the relations between the territorial performance and the territorial profile;
- Analysis of the most relevant drivers that influence the regions behaviour regarding the different themes.

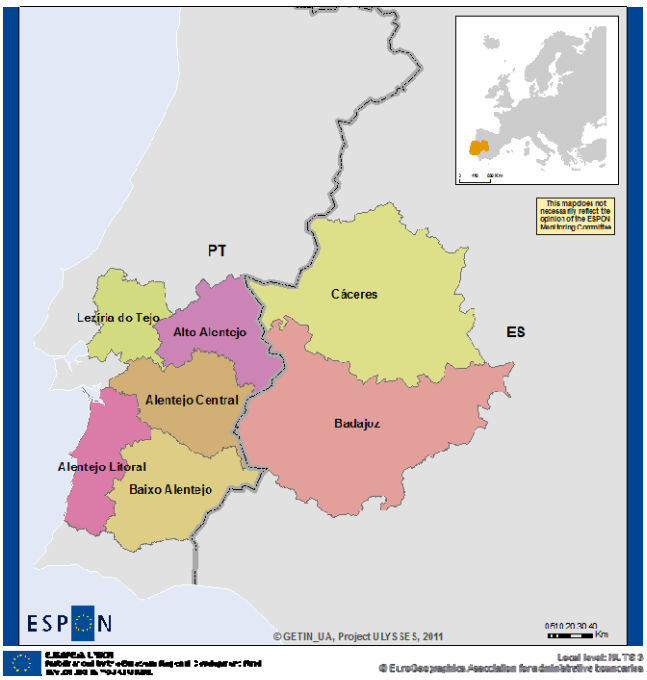
1.3. General overview of the Extremadura-Alentejo CBR

The Cross Border Area (CBA) of the Extremadura-Alentejo comprises the NUTS 2 of the Alentejo on the Portuguese side and the Extremadura on the Spanish side with their respective NUTS 3.

Map 1 & 2: Administrative units NUTS 2



NUTS Code	NUTS name	Area (km2)
ES43	Extremadura	41634,5
PT18	Alentejo	31551,1



NUTS Code	NUTS name	Area (km2)
ES431	Badajoz	21766,3
ES432	Cáceres	19868,2
PT181	Alentejo Litoral	5255,7
PT182	Alto Alentejo	6248,9
PT183	Alentejo Central	7228,8
PT184	Baixo Alentejo	8542,7
PT185	Lezíria do Tejo	4275

Chapter 2 – Demographic Analysis

2.1. Aims, Indicators and Methods

The main objective of this chapter is to identify the CBR's behaviour regarding demography. Namely, we will try to answer the questions: how is the border affecting settlement patterns? are the border regions growing faster or slower than non-border regions? is their population ageing more or less rapidly?

2.1.1. Data

The indicators that were used for this analysis were the following:

Indicator	Geographical scale	Source	Time frame
Population density	NUTS 3, Lau 1/2	EUROSTAT, National Statistical Institutes	2000-2009
Net migration, natural growth, total growth	NUTS 3	EUROSTAT, Demipher Project	2000-2009
Demographic potential	Lau 1/2	Own calculation	2008
Commuters to other countries by active population	NUTS 2	EUROSTAT	2009
Commuters to other regions by active population	NUTS 2	EUROSTAT	2009
Total fertility rate	NUTS 2	EUROSTAT	1997-2009
Young age dependency rate	NUTS 3	EUROSTAT	2009
Old age dependency rate	NUTS 3	EUROSTAT	2009
Ageing index	NUTS 3	EUROSTAT	2009
Foreigners requesting residents permit	Lau 1/2	National Statistical Institutes	2008

Given the regularity at which demographic indicators are updated (even if through estimations) and that the ESPON demographic indicators are essentially built on EUROSTAT data, the data for demography comes majorly from this source. Data from the Demipher (ESPON) project was also use in order to fulfil occasional data gaps.

2.1.2. Methods

Most of the demographic analysis is based on standard indicators. These indicators essentially refer to the evolution of the population, the cause of this evolution (natural growth, migration rates), the age structure and commuting data.

Besides the more straightforward demographic indicators, two additional analyses were performed for the CBA: population growth and demographic potential. Both of these

indicators relate population with distance. Although the distance should ideally be the actual travel time by road, here a simplified version was used based on air distance.

Demographic potential

The capacity of a region to develop itself does not only depend on its intrinsic characteristics but is also a function of its accessibility to other regions (Dentinho 2007). It is therefore important to understand how a region is positioned in the whole network of other regions, namely how far it is from other major poles or densely populate areas. For this analysis the demographic potential was calculated for all the LAU 1 in Portugal and Lau 2 in Spain.

The demographic potential of a given point i relative to j can be obtained through the following formula:

$$V_j = \sum_j \frac{P_j}{d_{ij}}$$

V_j = potential in j, P_j = population in j and d_{ij} = distance between j e i

The regions' own potential is included by dividing its population by one fourth of its perimeter (calculated through the area of the region and not its actual perimeter). In this case the population and distances between the centroids of the all the Lau 1 of the Portuguese part of CBR and Lau 2 for the Spanish part, as well as the NUTS 3 in the rest of the countries were considered.

Border effect on population growth

There is a common tendency to relate border regions with geographical, demographical and economic remoteness. At a first glance this seems certainly true for the Extremadura – Alentejo CBR. But what exactly is the border effect on the actual evolution in the settlement patterns? To answer this question a simply relation between demographic growth and border distance is not enough, as population growth it is very dependent on population density. In fact, as can be seen in the maps to follow, the highest effective growth rates tend to concentrate around the more densely populated regions.

This means that, in order to actually be able to evaluate whether the population growth is related to the border effect, a function that considers population density as well as the distance to the border was applied. This function can be described by the following formula:

$$Growth\,Rate = A + a_{db}db + a_{d}d + \varepsilon$$

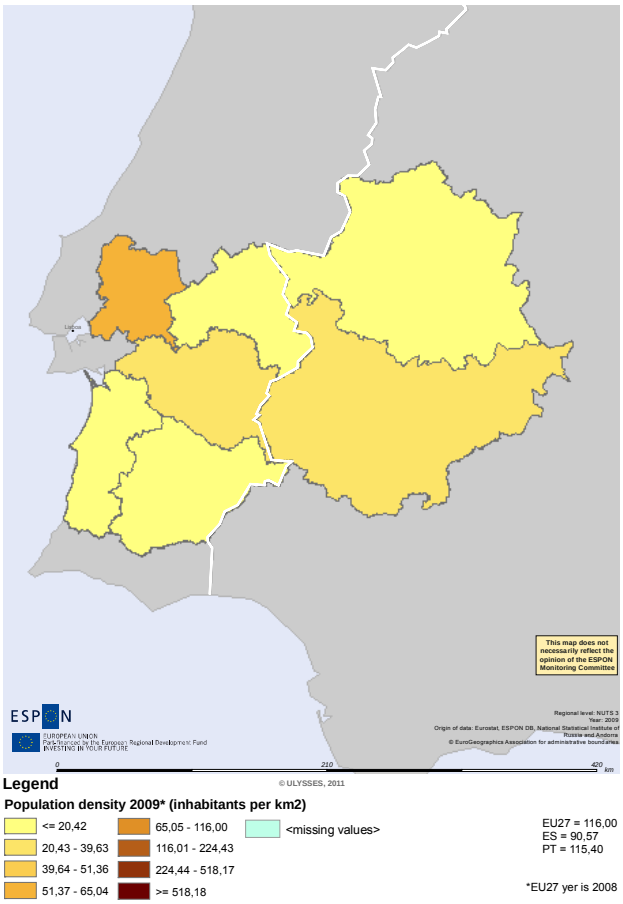
Where db is the distance to the border of the region's centroid and d is the density of a given region.

For this case-study the standardized value for the annual population growth between the years 2000 and 2010 and the population density for the year 2000 were used, as well as the shortest distance to the border from the LAU 1/2 centroids.

2.2. Total population

As said before, the Alentejo and the Extremadura are low density regions. In demographic terms, this applies to all of its territories, although the Lezíria do Tejo has a significantly higher value than the other NUTS 3. The biggest total population, on the other hand, belongs to Badajoz, which is easily justified by its area.

Map 3: Population density 2009 by NUTS 3



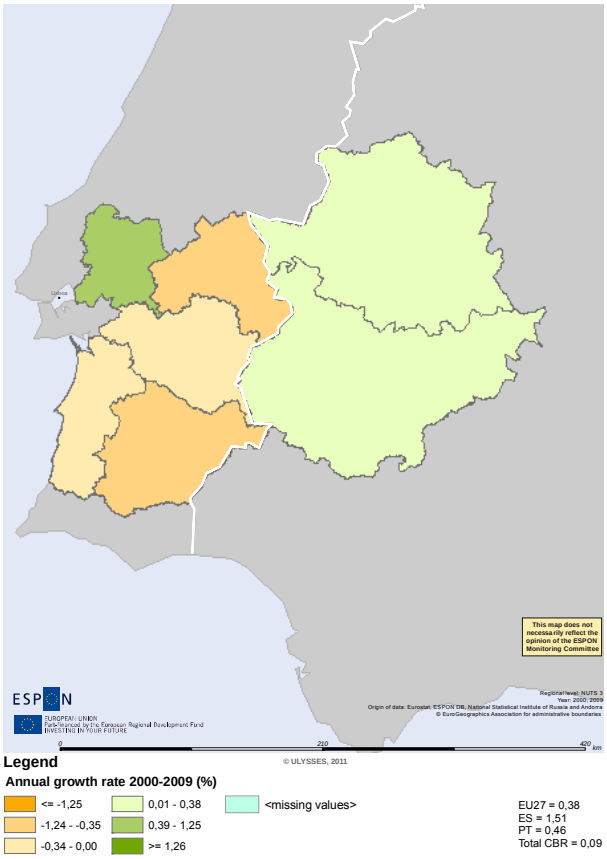
NUTS	Population 2009	% CBR	Inhabitants per km2
Portugal	10617575	-	90,57
Spain	45283259	-	115,40
Total CBR PT	757069	-	24,00
Total CBR ES	1080439	-	25,95
Total CBR	1837508	-	25,11
Badajoz	674649	36,72	31,00
Cáceres	405790	22,08	20,42
Alentejo Litoral	95524	5,20	18,18
Alto Alentejo	116744	6,35	18,68
Alentejo Central	168979	9,20	23,38
Baixo Alentejo	126234	6,87	14,78
Lezíria do Tejo	249588	13,58	58,38

2.3. Population growth

According to the ESPON Demipher Project, the NUTS 2 of the Alentejo is classified as a challenge of ageing region, while the NUTS 2 of the Extremadura is a challenge of labour force region (ESPON & NIDI, 2010: 10). This typology, which is based on age structure but also on growth rates, sheds some light of some of the major challenges these regions face on a demographic level: the difficulty to induce natural population growth or to attract external population.

Beside the already low densities, this CBR also shows very low population growth rates. The Portuguese side of the border shows an outright recessive tendency, which is compensated by the relatively high growth rates of the Badajoz region leading to an overall growth rate around zero in the last 9 years.

Map 4: Annual population growth rate 2000-2009 by NUTS 3

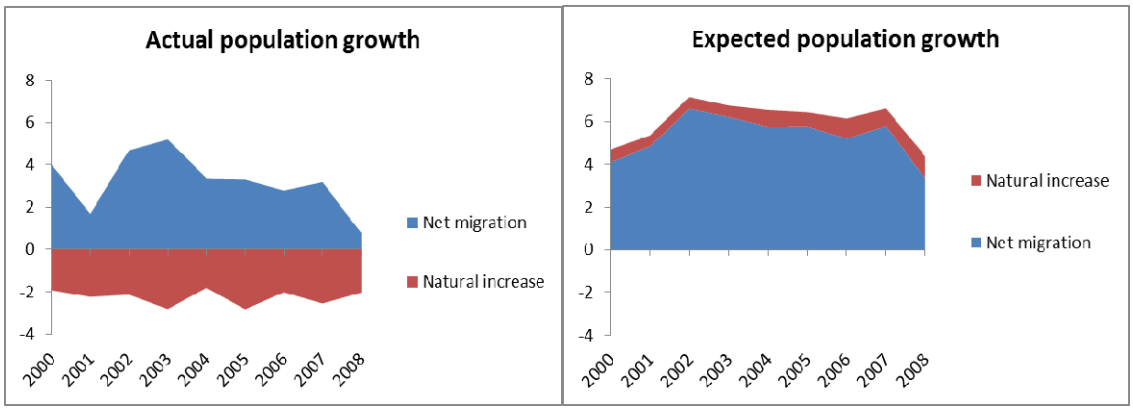


NUTS	2000-2009	
	Total growth	Annual rate (%)
Portugal	468692	0,50
Spain	5480432	1,44
Total CBR PT	-7584	-0,11
Total CBR ES	23139	0,24
Total CBR	15555	0,09
Badajoz	21649	0,36
Cáceres	1490	0,04
Alentejo Litoral	-1832	-0,21
Alto Alentejo	-8332	-0,76
Alentejo Central	-543	-0,04
Baixo Alentejo	-6536	-0,56
Lezíria do Tejo	9659	0,44

The reasons for these low growth rates can be found in the low net migration rates, but especially in the negative natural increase rates. In comparison to the expected behaviour if the CBR would have followed the patterns of the countries of which they are part, not only

would the natural increase rate be slightly positive, but the net migration rate would be twice as high in most of the years[1].

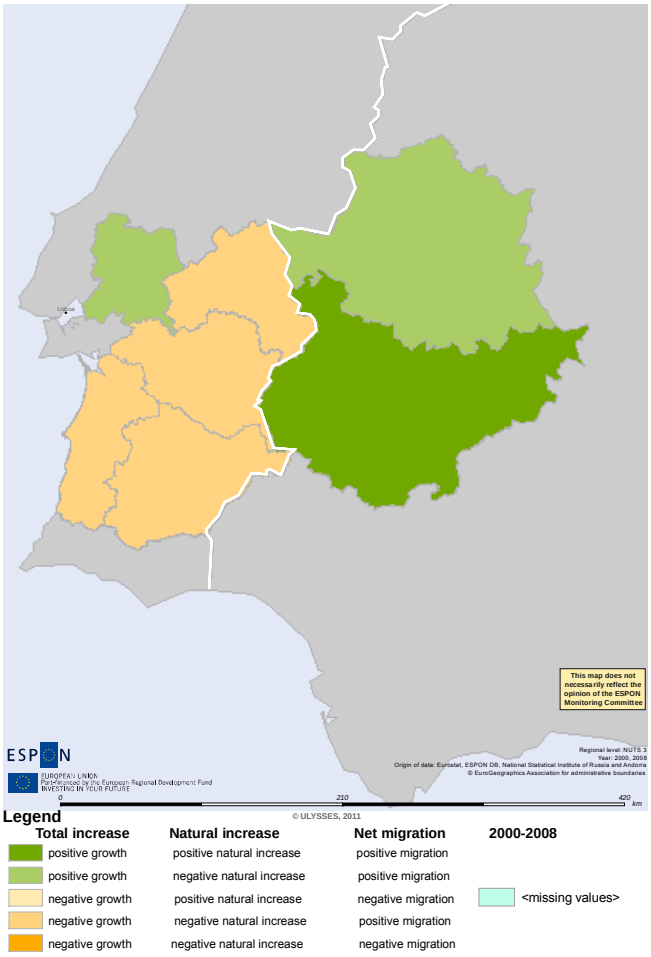
Figure 1: Actual and expected population growth in the CBR



Individually, the NUTS 3 on the spanish side as well as the Lezíria do Tejo have postive growth rates, although only the Badajoz regions manages to have positive values in all 3 indicators. The other portuguese regions, although still being abble to attract population, do not attract enough to compensate for their negative natural increase rates. Essentially, one can conclude that the increase in the average life expectancy as well as the recent positive migration rates (at least between 2000 and 2008) are no longer enough to guarantee a stable population in most of region of the CBR.

[1] For this comparison the national averages where weighted according to the proportion of the regions' population belonging to each country to reach the expected values. The actual values are of course an aggregation of the absolute values of the regions.

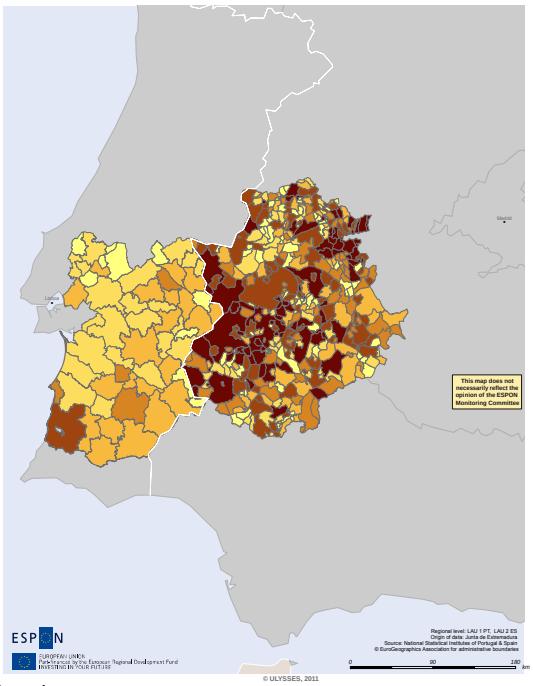
Map 5: Natural and overall population growth 2000-2008 by NUTS 3

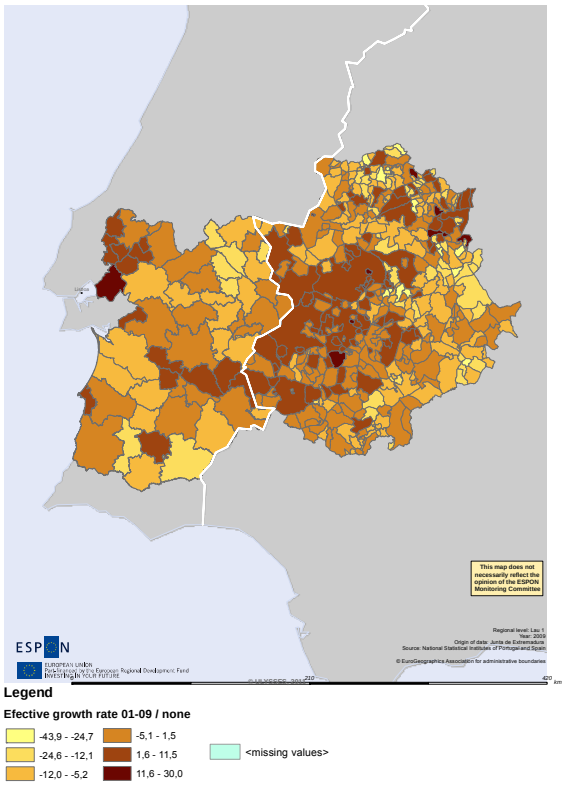


NUTS	Crude rates in 2008	
	Natural increase	Net migration
Portugal	0,03	0,88
Spain	2,93	9,03
Total CBR	-2,04	0,77
Badajoz	1,23	2,66
Cáceres	-1,31	-1,37
Alentejo Litoral	-4,99	-1,73
Alto Alentejo	-8,32	-2,98
Alentejo Central	-5,12	-0,11
Baixo Alentejo	-8,13	-2,48
Lezíria do Tejo	-2,75	4,09

On the local level, the regions' disparities in the population growth rates are even more apparent. It is also interesting to see that the fastest growing regions also tend to be the ones which attract the highest amount of foreigners requesting residence permits. Although this data should be read with some precautions (as the immigrants that seek residence permits are only a small proportion of the total immigrants), is seems to imply that foreign migrations may play a part in maintaining the demographic viability of the more depressed regions of Portugal and, particularly, Spain.

Map 6 & 7: Foreigners requesting residence permit and effective population growth rate by LAU 1/2

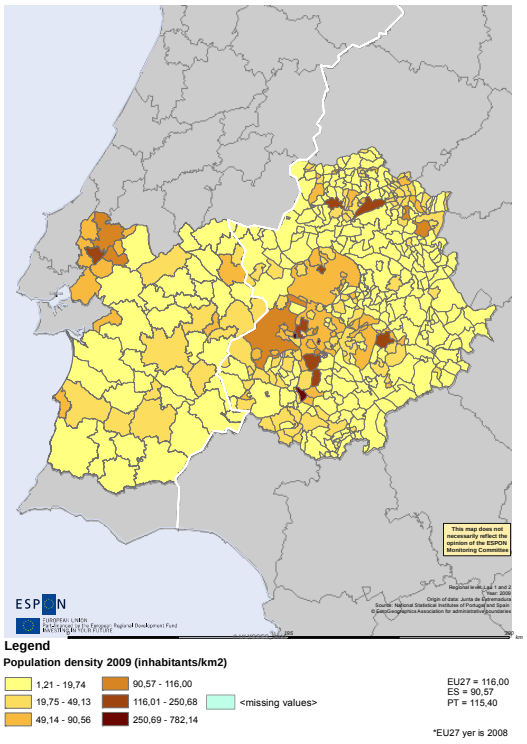


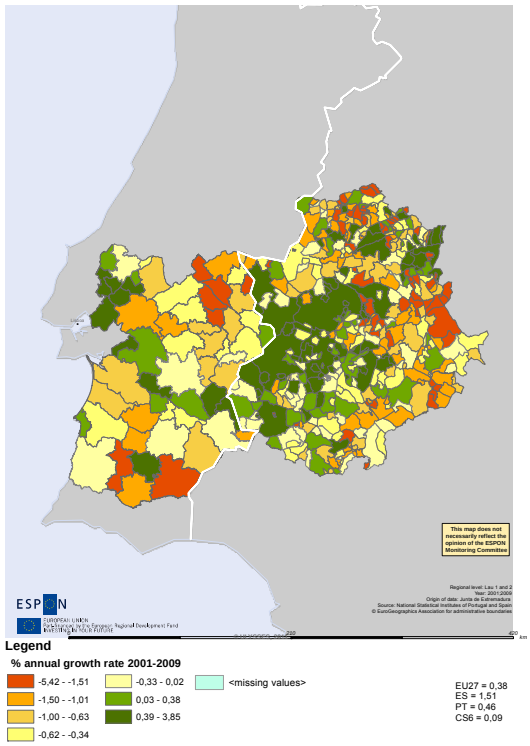


2.3.1. The border effect on population growth

The overall impression from looking at the demographic data is that, although there are some similarities, there are also major differences in the trends evidenced on each side of the border.

Map 8 & 9: Population density and annual growth rates by LAU 1/2





While the Portuguese side is essentially devoid of any significant demographic dynamism, some of the border municipalities on the Spanish side to show signs of natural growth and the capacity to attract population. It is therefore important to answer the question of what exactly is the effect of the border on population growth.

Table 1: Regression for the total CBR

Regression Statistics	
Multiple R	0,24049
R Square	0,05783
Adjusted R Square	0,05353
Standard Error	0,97287
Observations	441

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	2,25E-16	0,046327	4,85E-15	1	-0,09105	0,091051	-0,09105	0,091051
Dist km	-0,08051	0,04662	-1,72689	0,084893	-0,17214	0,011119	-0,17214	0,011119
Density 2001 (POP/km)	0,218585	0,04662	4,68861	3,68E-06	0,126957	0,310212	0,126957	0,310212

As can be seen be the output, the explanatory capacity of the model is very low. We can therefore conclude that, at least at the local scale, there is no clearly identifiably impact of the border on the actual demographic development of this region. Nonetheless, in the small variation of the population growth that is explained by the model, there is a statistically significant positive effect of the density and a (not very significant) negative effect of the

border distance. This means that, with a confidence interval of 90%, the regions which are closer to the border are likely to have slightly higher population growths.

Table 2: Regression for the Spanish CBR

Regression Statistics	
Multiple R	0,2470
R Square	0,0610
Adjusted R Square	0,0561
Standard Error	0,9990
Observations	383

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	-0,00200	0,05111	-0,03905	0,96887	-0,10250	0,09850	-0,10250	0,09850
Dist km	-0,13613	0,05195	-2,62043	0,00913	-0,23828	-0,03399	-0,23828	-0,03399
Density 2001 (POP/km)	0,18595	0,04935	3,76827	0,00019	0,08892	0,28297	0,08892	0,28297

The results for the Spanish Municipalities are essentially in line with the total CBR. There is no significant correlation between the population growth and the border distance or population densities and, while the densities are positively related, there is a not very significant negative effect from the border distance.

Table 3: Regression for the Portuguese CBR

Regression Statistics	
Multiple R	0,53358
R Square	0,28471
Adjusted R Square	0,25870
Standard Error	0,68245
Observations	58

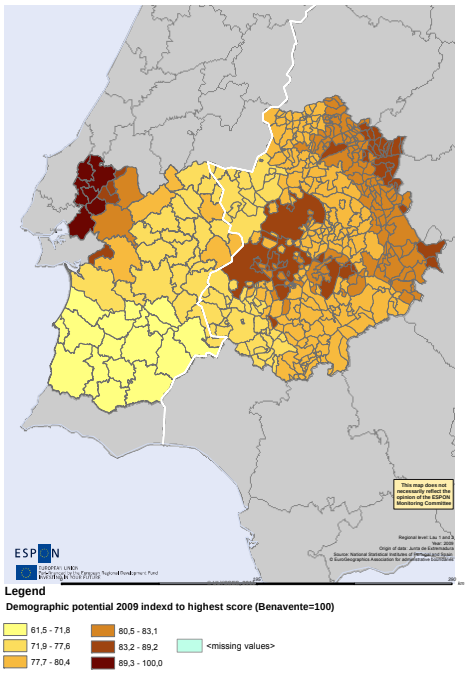
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	0,11280	0,09861	1,14388	0,25763	-0,08482	0,31042	-0,08482	0,31042
Dist km	0,20042	0,11006	1,82096	0,07405	-0,02015	0,42100	-0,02015	0,42100
Density 2001 (POP/km)	0,48090	0,18027	2,66776	0,01001	0,11964	0,84216	0,11964	0,84216

If the regression is performed only for the Portuguese side, the explanatory capacity of the model increases considerably: almost 29% of the variations of the population growth is explained by the dependent variables. Besides the expectable positive effect of the population density, the border distance also shows to have positive impact on population growth, even if only at a confidence interval of 90% and with a much smaller weight.

2.3.2. Demographic potential

Considering the distribution of the demographic potential in this region two concluions can be drawn.

Map 10: Demographic potential 2009 by LAU 1/2



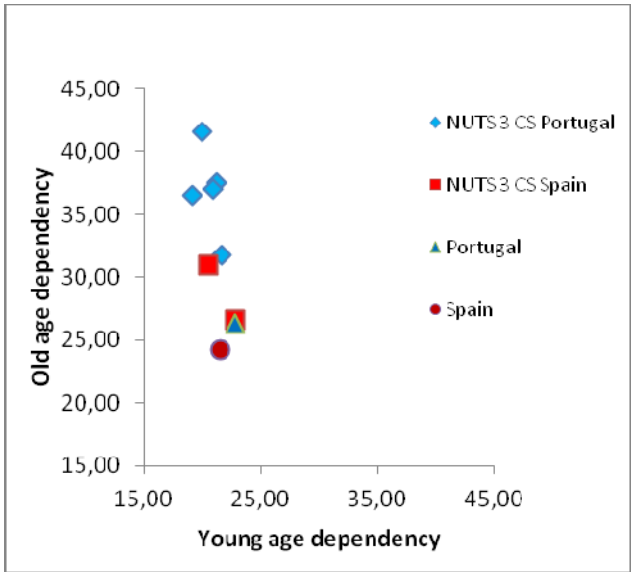
The first one, is that the demographic potential is slightly higher around the arteries that link the major urban agglomerations of the CBR to big cities in neighboring regions, specially on the spanish side (such as the A66 and specially the N430). Considering that the distance was not measured by the actual travel time, the population on the spanish side of the CBR seems to show tendency to concentrate itself around a small but overly well consolidated urban system.

The second conclusion is that the major variations in the demographic potential seem to be structured according to a wave pattern from the countries' capital cities throughout the regions. This wave pattern leads to poorer results in the more remote areas, which includes the border regions, but is by no means limited to them. The Cáceres, Mérida, Badajoz triangle even forms a sort of an island which extens itself to the Elvas and Campo Maior municipalities.

2.4. Ageing challenge

As said before, this CBR has been facing a significant ageing process. When analysing the dispersion between the old age dependency and the young age dependency, it immediately sticks out that most of the NUTS are significantly above the national averages in the old age dependency and significantly below in the young age dependency. This is especially true for the Alto Alentejo NUTS 3 which has a old age dependency rate of 40,6% and a young age dependency rate of only 20%. The Badajoz NUTS 3, on the other hand, while having an old age dependency rate above the national average, does also have a young age dependency which is above the average.

Figure 2: Young and old age dependency rates 2009 by NUTS 3

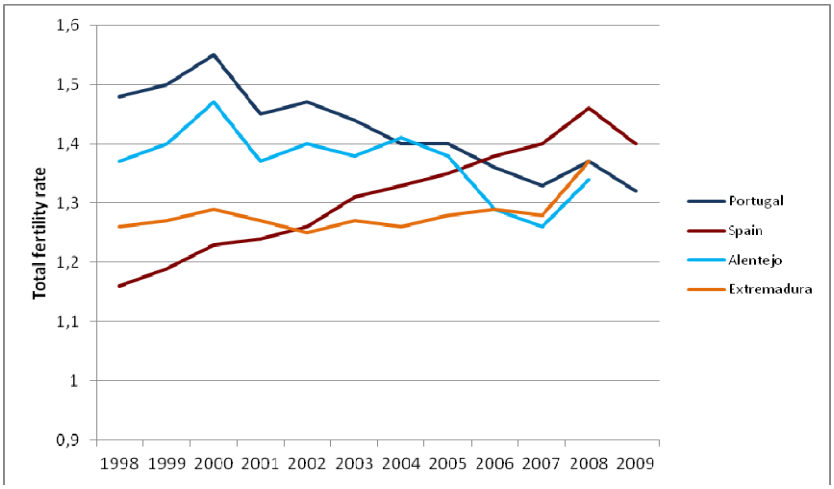


NUTS	Old age dep.	Young age dep.	Total dep.	Ageing index
EU27	25,6	23,3	48,9	1,1
Portugal	26,3	22,8	49,05	1,2
Spain	24,3	21,5	45,77	1,1
Badajoz	26,6	22,8	49,41	1,2
Cáceres	31	20,5	51,45	1,5
Alentejo Litoral	36,5	19,1	55,62	1,9
Alto Alentejo	41,6	20	61,61	2,1
Alentejo Central	37,5	21,2	58,71	1,8
Baixo Alentejo	37	20,9	57,48	1,8
Lezíria do Tejo	31,78	21,59	54,01	1,5

As would be expectable, the total fertility rate of the CBR is also very low, but with very different tendencies on each side of the border. The Extremadura, following a similar pattern as the all of Spain, started from very low rate in the late nineties, and from then on witnessed a steady increase.

The Alentejo, on its turn, started from a much higher position, but has recentely witnesses a major decrease. Some of the decrease in the Portuguese region is probably a consequence of postponement of child birth and therefore a slight rebound is expected to occur in the next few years.

Figure 3: Total fertility rate 1998-2009 by NUTS 2



Nonetheless, and considering the whole CBR, the institutional context of the two countries (characterized, for example, by difficulties in combining work and family), the high youth

unemployment rates and the age pyramids set a strong limit for a hypothetical increase in the total fertility rate. The low economic development of these regions might further constitute an obstacle. This is because, according to Luci et Thévenon (2010), total fertility rates tent to decrease with increases in the GDP until a certain level, where they experience a rebound given favourable institutional contexts.

But the low fertility rate is only one aspect in the ageing challenge of these regions. In fact, as pointed out by Lutz *et al* (2006), very low fertility, death or migration rates in a past periods of time, might lead to a reduced amount of women in reproductive ages, which will in turn lead to a shrinking population even if the fertility rate would rapidly rebound to replacement levels. This dynamic, which is known as a negative momentum of population growth, means that even if pro-fecundity policies where to be adopted, their capacity to invert the population decline would be very limited.

2.5. Chapter conclusions

Six major conclusions can be drawn from the demographic variables for this CBR.

The first one is that there is significant ageing process in most of the NUTS 3, which is likely to accentuate itself in the near future. As the young cohorts have witnessed a decline over several years, at this point the ratio of the cohorts with persons aged over 65 is very high, not only in comparison to the cohorts of people under 15, but also in comparison to the working aged population.

The second, which is closely related to the previous one, is that most of the CBR risks a negative momentum of population growth (if it is not already occurring). It is therefore very likely that most of these territories will witness an accelerating population decline in the next decades, even if the life-expectancy continues to grow and if effective measures to boost fertility would be put into place.

The third one is that, given the negative outlooks for natural population growth, the demographic sustainability of many of the settlement of these regions will depend on their capacity to attract population. This has been occurring to some extent in most of the regions, but it is not clear how this will progress, as the migration rates depend a lot on different variables such as the political context, accessibility levels or economic performance.

The fourth one refers to the potential problems that come from relating the former aspects to one of the major trait of these regions – very low population density. Some of the predictable challenges of this situation include: the satisfaction of an increasing demand of services from

an ageing population that is scattered on a large area; the maintenance of general public infrastructures (roads, water, schools, etc.) for a population that would no longer justify them from an efficiency point of view; the viability of ecosystems that rely on human activities; the struggle of economic sectors that could suffer from factors related to an increasing remoteness, such as decreasing economies of scale, growing distance to markets or labour force scarcity.

The fifth is that the major demographic challenges, although common to all of the regions, are not experienced at the same magnitude by all of them and cannot easily be linked to the border conditions on a local level. For instance, a positive effect of the border distance on population growth has only been observed on the Portuguese side, which also suffers from decreasing densities as we move towards more remote areas. On the Spanish side there are consolidated settlements very close to the border and the regions' population growth is also positively impacted by smaller border distances, even if this impact is not very significant.

The sixth is that the before mentioned growing urban agglomerations on the Spanish side of the frontier have a significant effect on the demographic potential on the neighbouring areas. This implies that a further integration might attenuate the remote position of the whole border regions, including on the Portuguese side.

General low density

Low demographic growth:

- Positive net migration
- Negative natural growth

No significant border effect on settlement patterns

Consolidated settlements on the Spanish side

Ageing population

Low fertility rates

Chapter 3 – Polycentric development

3.1. Aims, indicators and methods

The main objectives of this chapter are to identify tendencies in the structure of the city network in the CRB: is the urban network more or less dense than in non-border regions? do the amount and size of the urban centres deviate from the rank-size distribution of the ESPON space? if so, in what sense (more polycentric, less polycentric)?

Naturally, the distinction between monocentric or polycentric areas cannot be made area in a dichotomous manner, and polycentricity should be measured by scoring an area with a value ranging from more monocentric to more polycentric.

According to the ESPON 1.1.1, polycentricity has a twofold feature:

- Morphological, laying out the distribution of urban areas in a given territory;
- Relational, based on the networks of flows and cooperation between urban areas at different scales/levels.

While there is some data available regarding morphology, the dynamic aspects of the city systems are very poorly covered. Although some attempts to differentiate FUA according to their functional specialization have been made, the analysis of how the different urban agglomerations articulate themselves and interact with their surroundings cannot be soundly made on a broad scale. Most of the ESPON data therefore focuses on the morphological aspects.

3.1.1. Data

Indicator	Geographical scale	Source	Time frame
Morphological and Functional Urban Areas	CBR	ESPON DB	2006
Slope rank size distribution GDP	CBR, ES, PT ESPON	Own production, based on ESPON DB	2006
Primacy rate GDP	CBR, ES, PT ESPON	Own production, based on ESPON DB	2006
Slope rank size distribution population	CBR, ES, PT ESPON	Own production, based on ESPON DB	2006
Primacy rate population	CBR, ES, PT ESPON	Own production, based on ESPON DB	2006
% population in FUA	CBR, ES, PT ESPON	ESPON DB	2006
% effective FUA pop change	CBR, ES, PT ESPON	ESPON DB	01-06
Compactness (MUApop/FUA pop)	CBR, ES, PT ESPON	ESPON DB	2001

Gini coefficient thiessen polygons (%)	CBR	Own production, based on ESPON DB	2006

The data used here was developed by the ESPON 1.4.3 and is based on the concept of Functional Urban Area (FUA) from the ESPON 1.1.1. The ESPON 1.4.3's intention was to review the ESPON 1.1.1 and to develop a methodology for defining FUA that was independent from national classifications. Their classification is done by identifying a Morphological Urban Area (MUA), which is essentially a cities' core, to which a commuter catchment area is attached. The commuter catchment area is made up by adding further LAU 2 if they form a high density continuum. The final definition of whether to consider an agglomeration a FUA also takes into account its total size (please see the final report of the project for a more detailed description). This method has straighten out some inconsistencies in the former FUA definition, by eliminating many small FUA considered by the ESPON 1.1.1 not through a size criterion but by the importance that national experts gave to the FUA in question.

Further characterization of the FUA has also been done considering the data available for the NUTS of which the FUA are part or which they cover entirely.

While this approach guarantees data comparability throughout the ESPON the countries, it has the inconvenience that it only considers urban centres on a broad scale. Small urban centres, such as the one that characterize the Alentejo region, are simply not taken into account, which makes it difficult to evaluate the urban systems on a national or regional level. The ESPON 1.4.3 also maintains some FUA that have very small overall population in some countries, leading to confusion about the exact criterion (according to the methodology, only FUA with a population of over 50.000 inhabitants were supposed to be included, but this rule was not always followed).

3.1.2. Methods

Besides more general aspect, such as the FUA's compactness, growth or number, several more specific aspects of the city system where analysed. The first analysis was on the rank-size distribution of the FUA (1). The second one was the Gini coefficient of the FUA's thiessen polygons (2). And the third was the analysis of socio-economic characteristics (3) of the FUA.

For the **rank-size distribution (1)**, three different procedures were performed. The first one analyses the slope of the rank size distribution, which measures the overall level of hierarchy. For this indicator, the FUA of the regions are ranked according to their population and then the following equation is estimated:

$$\ln(pop\ or\ GDP) = a + b\ln(rank)$$

The latter is the so-called rank-size equation in the Lotka form (Parr, 1985). If the estimated relation holds, the size distribution of cities follows a statistical log-linear distribution. The slope of equation, given by the estimated β, indicates the level of hierarchy, and thus the level of polycentricity within a region: the lower the absolute value of estimated β, the higher the level of polycentricity.

The second is in is the comparison of the regions actual and expected FUA. For this exercise, rank-size coefficients are estimated considering the FUA at the whole ESPON countries (EU27 + CH + NO). The actual rank-size distribution of the relevant NUTS II is thereafter compared with what would be expected if the regions would follow the European distribution.

Taking the Zipf law:

$n^k P_n = A$

$\ln P_n = \ln A + k \ln n$, where A is the population of the biggest city

it is possible to adjust a regression curve to the population living in FUA in the EU-27 regions plus Switzerland and Norway:

$\ln Pn = A + k \ln n + \varepsilon$

The calculation for all the FUA produced the following parameters for the curve:

k = -1,0521, which is very close to -1, the value corresponding to the regularity known as Zipf's law.

This equation will be the pattern to which the actual FUA distribution of a given region will be compared. To perform this comparison for a given region i, first the total population of its FUA has to be estimated (PF_i). For this we assume that the weight of the region's FUA population in relation to its total population is equal to the ESPON countries average:

$$PF_i = P_i \frac{PF(UE)}{P(UE)}$$

Second, the PF_i is distributed by n FUA according to the EU pattern:

$PFn = k\ n^{1,0514}$

Where Fn is the FUA of ranking n and k is the population of the biggest FUA.Since k is unknown, it is calculated as the exact value which fits the equation $\sum PF_n = PF_i$.

It is thereafter possible to estimate the amount and size of FUA a CBR should have if it would follow the overall distribution to the actual amount and size of its FUA.

The third one is the primacy rate. Primacy rates measure the degree to which the size of the largest city of the cross-border region deviates from the regression line of the rank-size distribution of the regions. 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.

The largest city is excluded in this exercise in order to avoid that its effect on the equation could influence the results. If, for example, we would have a very large prime city in a small region/country, its weight could lead to a very high coefficient in the rank-size equation and therefore the primacy rate would be small (even though there is a clear dominance of one city over the region/country).

The **Gini coefficient of the thiessen polygons (2)** is a 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 based on the ESPON 1.4.3 FUA layer (made available by the ESPON DB 2013) so that the limits of the polygons are established exactly midways between two FUA. On a national level, the Gini coefficients were produced considering the border as a limit.

The **socio-economic situation (3)** is based on the ESPON 1.4.3 indicators. These indicator were obtained by crossing the NUTS 3 values which that of the FUA that do partly or totally cover them. They are therefore broad approximations that should be read with some care. The indicators to be included where:: unemployment rates, GDP per inhabitant and value added by NACE 1.1.

3.1.3. Geographical scale

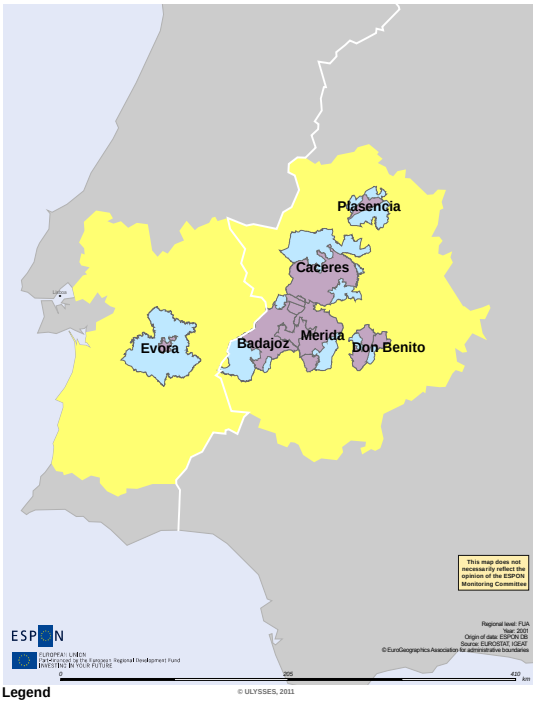
FUA in the ESPON 1.4.3 are defined by aggregating LAU 2 in a way that they can cover several broader administrative boundaries. Thus, their inclusion in one region or another poses some difficulties when the intention is to evaluate urban systems in confined regions. In this analysis, the FUA were considered to be part of the CBR (defined by NUTS2) if more than 60 % of their area is overlapping with that the CBR or if most of their Morphological Urban Area (MUA) is

within the limits of the CBR. The analysis of the urban systems is made on the whole CBR, as the concept of polycentricity is not meaningful on very low geographical scales.

3.2. Functional urban areas in the CBR

The FUA identified in the ESPON 1.4.3 are Badajoz, Cáceres, Mérida, Plasencia, Don Benito and Villanueva de la Serena for the Spanish side of the CBR and Évora for the Portuguese one. This means that, although the total densities in to two regions do not differ much, the Spanish side was able to establish much larger urban areas than the Portuguese one.

Map 11: Morphological and Functional Urban Areas



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

Taken as a whole, the FUA of this CBR have been experiencing growth rates that are well above the Portuguese and the ESPON averages, but much bellow the Spanish ones. As states in the Atlas of the Spanish Cities (Ministério del Fomento, 2006) Spain has had a long standing urbanization process, which is currently being substituted by a metropolization process, implying that growing share of the population is concentrating itself in a small number of large metropolises. Between 2001 and 2006 this urbanization process is very visible in the high growth rates of the FUA population (10,2%) which is much higher than the overall population growth. In Portugal, the urbanization process is moving at a much slower rate, which is more in line with the other ESPON countries.

The total FUA population in the CBR, on the other hand, is extremely low. It reaches only 31,2 % of the population, while Portugal and the ESPON countries have about 75% and Spain as much as 83,7%. Spain also sticks out for having the most concentrate urban areas, with 80% of the urban population living in the MUA. In the CBR the FUA are less compact, but still above the Portuguese or the ESPON averages.

Table 4: Overall FUA of the CBR

	CBR FUA	PT	ES	ESPON
Number FUA	7	22	186	1552
Average FUA population	81929,0	353104,0	193848,1	245298,6
Minimum FUA population	24932	47138	17497	3216
Maximum FUA population	177279	3167673	6185544	12972492
% population in FUA	31,2	73,5	83,7	74,8
% effective FUA pop change 01-06	5,1	3,5	10,2	3,0
Compactness 2001 (MUApop/FUA pop)	75,1	64,6	80,0	64,9

Individually, the largest of these FUA is Badajoz, with a total population of 177279. This FUA has also witnessed the second highest population increase between 2001 and 2006 (6,6%), after the Don Benito FUA.

Table 5: Individual FUA

Fua	Fua area (km2)	Fua Population 2001	Fua Population 2006	Population increase 2001_2006	Compactness 2001 (MUApop/FUApop)
Badajoz	2614,31	166324	177279	6,6	80
Caceres	3633,56	118593	125738	6	70
Merida	1503,21	80273	84067	4,7	70
Évora	2612,5	74121	74121	0	60
Plasencia	925,23	46209	49125	6,3	79
Don Benito	626,06	35847	38241	6,7	88
Villanueva de la Serena	152,56	24092	24932	3,5	100

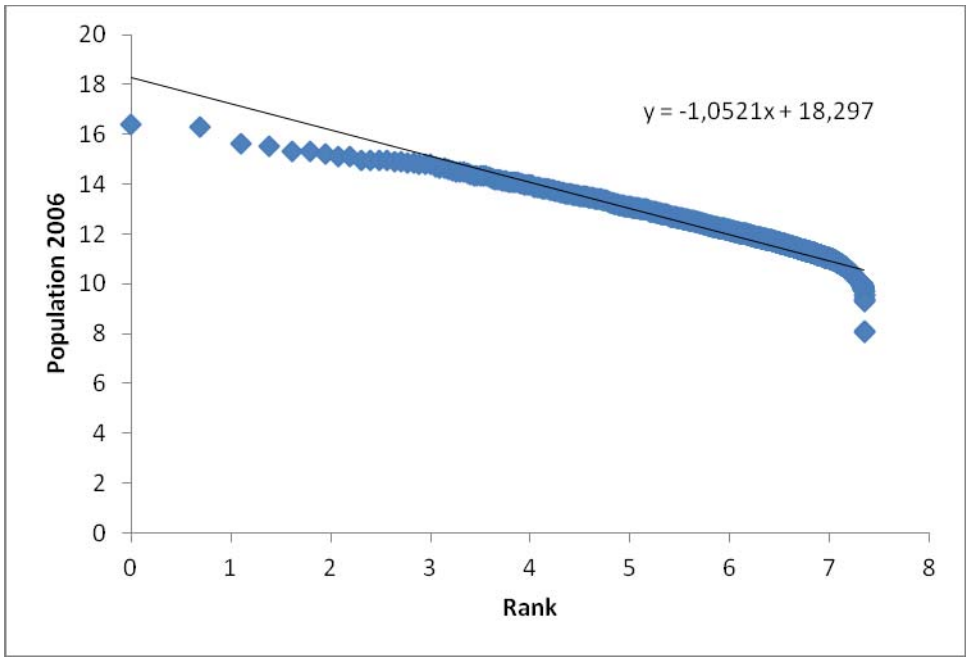
3.3. Rank size distribution

The rank size distribution is a way of understanding a city system according to the relation between size and the relative position of the cities. There are several types of indicator that can be obtained from the rank size.

3.3.1. Slope of the rank size distribution

As already stated in the methodology, for the ESPON countries' population, the slope of the regression line is β = -1,0521, which is very close to -1, the value corresponding to the regularity known as Zipf's law. Although following an expectable distribution, it is interesting to see that the city system of the ESPON countries lacks hierarchy at the upper end of the rank size distribution. The biggest city according to the regression should have A = $e^{18,297}$ = 88.366.191 a much higher value than the approximate 13 million inhabitants of the London FUA (the biggest in the ESPON space).

Figure 4: ESPON country rank-size distribution of the population



The slope of the regression line for GDP is much steeper. Although there are some FUA missing at the higher end of the line, the GDP increases much faster if we move up the rank.

Figure 5: ESPON country rank-size distribution of the GDP

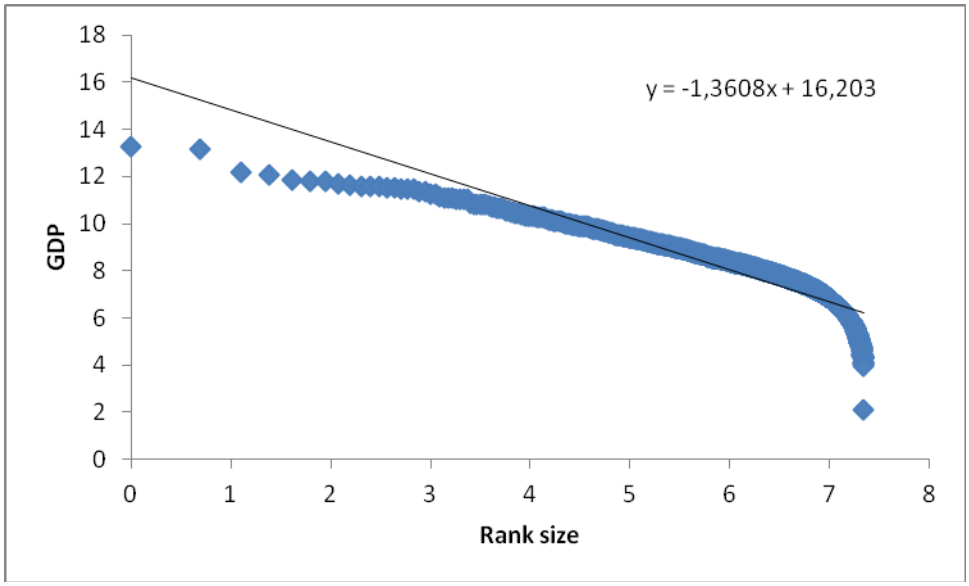
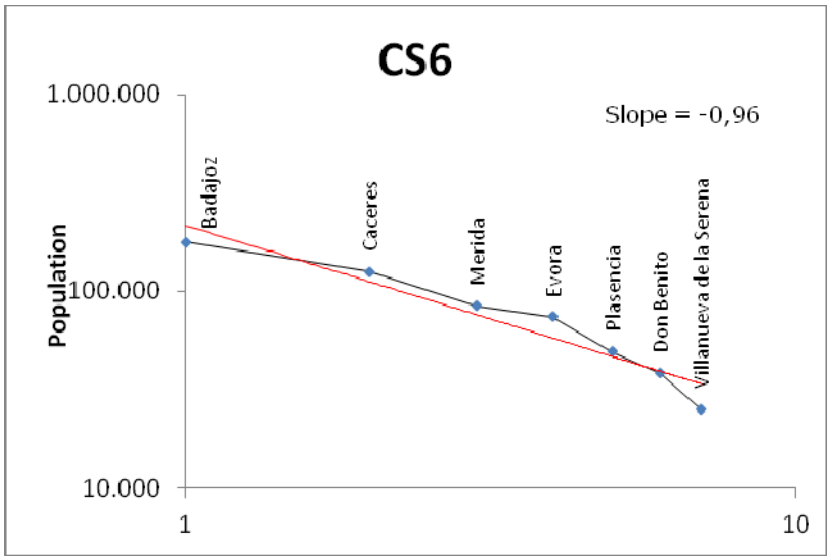


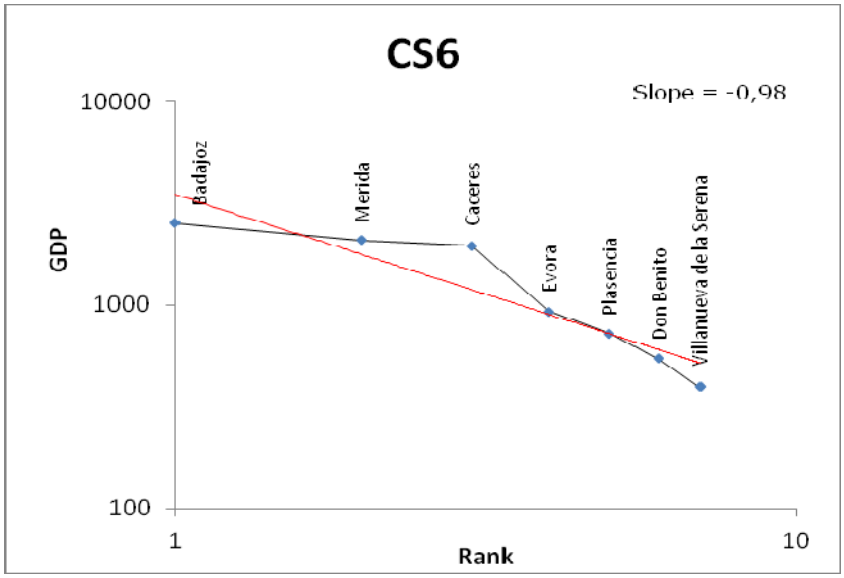
Figure 6: CBR rank-size distribution of the population



	Slope rank size distribution population
CBR	-0,96
PT	-1,23
ES	-1,11
ESPON	-1,06

For the CBR, the rank-size distribution for population has a slope of 0,96 which is essentially in line with the European value. As can be seen in the graph X, which presents the rank size distribution on a logarithmical scale with base 10, the trendline is very similar to that of the total ESPON space. Comparing to the national values, the CBR has a lower slope than Portugal and Spain. This means that, while on a national level both countries are lacking medium sized cities, and move very fast from small ones to the big metropolises such as Barcelona, Madrid or Lisbon, in the CBR there is a more balanced hierarchy.

Figure 7: CBR rank-size distribution of the GDP



	Slope rank size distribution GDP
CBR	-0,98
PT	-1,33
ES	-1,2
ESPON	-1,36

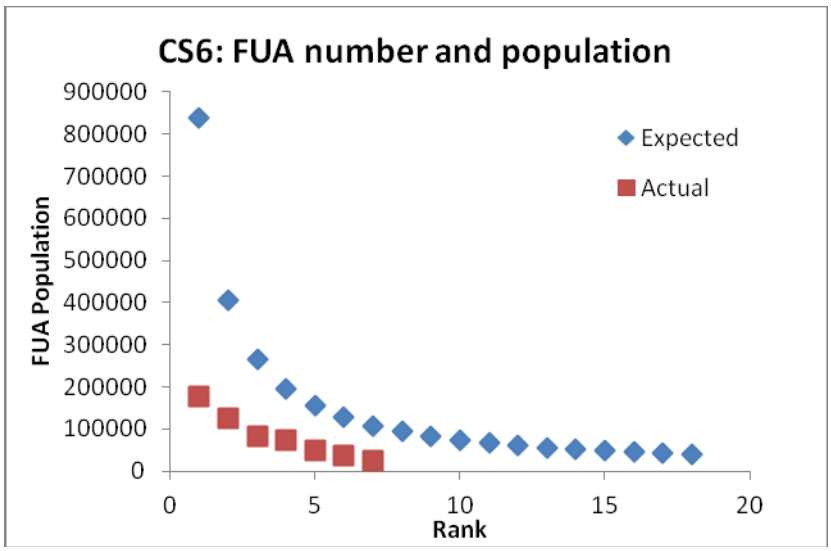
In rank size distribution of the GDP, the CBR is also more balanced than the countries as a whole or the ESPON space. While the CBR essentially maintains the same slope as for the population, the slope of the national and ESPON levels are significantly above.

We can therefore conclude that there is a strong tendency for wealth to concentrate itself above what would be expected by the concentration of population. On the ESPON level, there is a clear tendency for large metropolises in the pentagon to excel economically, while there is a lack of medium sized poles to counter-balance. Portugal also shows a very steep line, which reflects the economic dominance of its few large metropolises, such as Porto and Lisbon, over the rest of the territory. Spain, on the other hand, has a less steep slope, indicating a more polinuclear economic development in its city system.

3.3.2. Actual and expected FUA

Another interesting perspective is given by comparing the rank size distribution of the region's FUA to the overall distribution. For this exercise, rank-size coefficients are estimated considering the FUA at the whole ESPON countries. The actual rank-size distribution of the relevant NUTS II is thereafter compared with what would be expected if the regions would follow the European distribution, showing us what would be the expected amount and size of the FUA in a region according to its total population.

Figure 8: Actual and expected FUA



As can be seen by this distribution, this CBR not only lacks hierarchy (meaning FUA with considerable size), but also lacks an overall amount of FUA. Regarding hierarchy, its largest FUA, which has bellow 180.000 inhabitants, is much smaller than the 850.000 it is expected to have. Its population actually comes closer to what would be expected for the fourth FUA in the ranking. Regarding the amount of FUA, this CBR actually only has about one fifth of the FUA it is supposed to have (8 instead of 33). Since the expected FUA rank-size distribution of the FUA is based on population, and not territory, this essentially means that this region's population is either, much less urban, or distributed over a large amount of small urban agglomerations that do not count as FUA.

3.3.3. Primacy rates

The primacy rates for population and GDP are very low in this CBR. As the region does not function as an administrative unity, there is of course no capital that could concentrate much of its political, social and economic activities. The strong position of the capital city is clear in Portugal where Lisbon occupies a very dominant position terms of population, but specially GDP. Spain, on the other hand, has low primacy rates given the already mentioned polinuclear organization of its large metropolises. The greater distances and the many thriving regional capitals might also help to attenuate the global position of the biggest city.

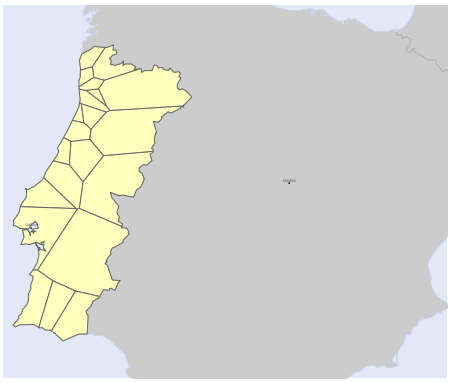
Table 6: Primacy rate of GDP per capita and population

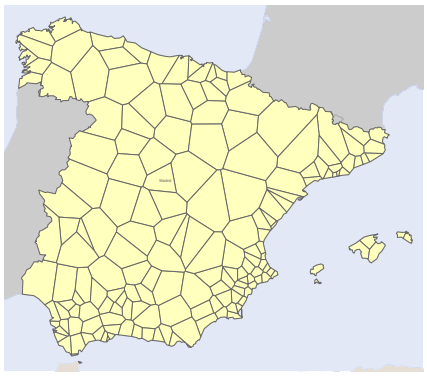
CS6	CBR FUA	PT	ES	ESPON
Primacy rate GDP per capita	0,38	2,23	0,60	0,05

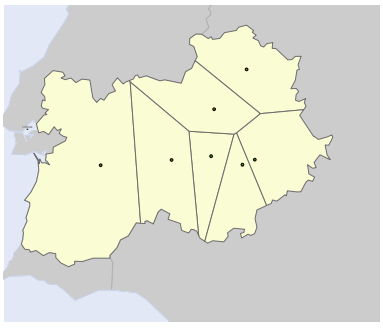
Primacy rate population	0,54	1,54	0,63	0,14

3.4. Gini coefficient of the thiessen polygons

As state above, the Gini coefficient of the FUA Thiessen polygons measures the spatial distribution of the FUA. According to the ESPON's 1.4.3 Final Report (March 2007, pp. 230) this measure implicitly evaluates the overall distribution of the population and, as the same weight is given to all the different FUA, does not reflect the actual influence of a city in the territory. Concerning density, this is of course true to some extent, as the definition of urban areas is itself based on densities. But similar densities can produce different amounts of urban areas, as is the case in the Alentejo and the Extremadura. As for the cities' influence, while a large urban centre is expected to have a greater influence on its hinterland, the distribution of a region's FUA can considered to be in itself and important aspect of city system. This of course does not mean that a fair distribution is necessarily desirable, although some negative aspects do occur if a certain level of concentration is exceeded (infrastructure congestion, difficulty in providing remote populations with the type of services that are inherent to cities, etc.).







	Gini coefficient thiessen polygons (%)
CBR	29,1
PT	51,48
ES	53,91

The Gini coefficient of this CBR is fairly low, when compared to the national averages. Although the polygon associated to the Évora FUA is much greater than all the others, the fairly equal distribution on the Spanish side of the border is enough to counterbalance this.

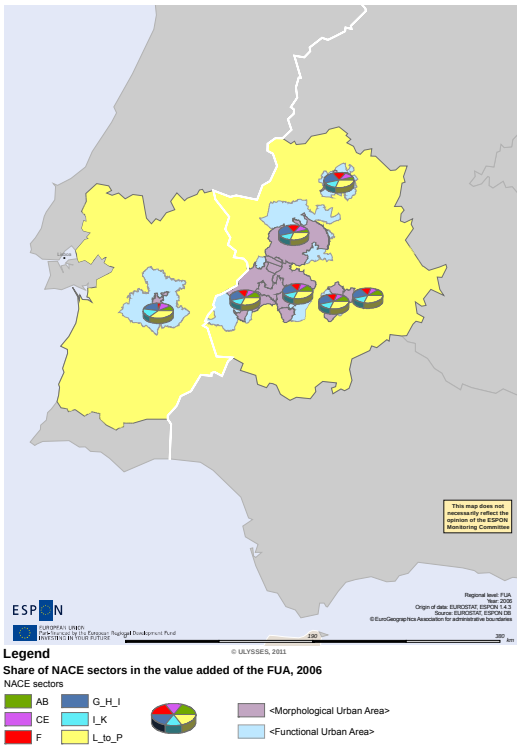
On a national level, both countries have high inequalities. As can be seen in the map, this is mainly a consequence of the very dense urban network in the coastal areas, while in the

interior this network becomes very loose. In Spain, this pattern is specially developed along the southern coast, Galicia and the Bask country and in in Portugal in the north of the Cabo Mondego.

3.5. Socio economic situation

The socio economic indicators for this region's FUA are very similar. In terms of unemployment, all the FUA on the Spanish side have very high values, while the only FUA on the Portuguese side has much lower values, which follows the overall tendencies of these two countries.

Map 12 & 13: Share of NACE in the GVA and unemployment of the FUA 2006



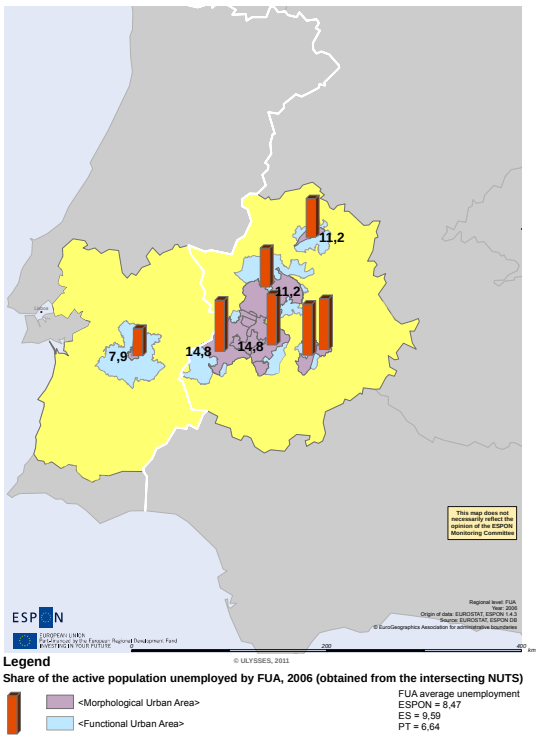


Table 7: Gross Value Added by NACE 2006 by FUA of the CBR

Fua	Gross Value Added							Unemployment rate 2006
	Agriculture, forestry and fishing (AB)	Mining, manufacturing and energy (CDE)	Construction (F)	Trade and tansport (GHI)	Finance and business services (J-K)	Other services (L-P)	GDP by Inhabinant	
Badajoz	11	9,4	15,2	18,9	14,9	30,7	14	14,8
Caceres	5,2	10,6	18,7	20,1	15,6	29,8	16	11,2
Merida	11	9,4	15,2	18,9	14,9	30,7	25	14,8

Evora	8,2	13,2	4,8	21,2	15,3	37,3	13	7,9
Plasencia	5,2	10,6	18,7	20,1	15,6	29,8	15	11,2
Don Benito	11	9,4	15,2	18,9	14,9	30,7	14	14,8
Villanueva de la Serena	11	9,4	15,2	18,9	14,9	30,7	16	14,8

On the GDP per capita most of the FUA are around 14 to 16 thousand euros, except for Merida which has much higher values than the other FUA (€25.000) and Plasencia, which has a much lower value.

As for the distribution of the GVA the patterns is also very similar between the FUA (which of course is also related to the fact that these values are estimations based on NUTS 3 values). Most of them show a strong service sector and have low values in the primary sector, specially Cáceres and Plasencia. The construction sector also plays an important part in the Spanish FUA, but not so in the Portuguese one.

3.6. Chapter conclusions

Six major conclusions have been drawn from the analysis of the policentricity indicators.

The first one is that the share of people living in Functional Urban Centres is very low in this CBR. Only 31,2% of the total population lives in FUA, compared to the 74,8% in the total ESPON countries, 73,5% in Portugal or 83,7% in Spain.

The second one, which is a consequence of the former, is that the amount and size of these FUA is very small. Essentially, besides the already low densities, this region is also characterized by the difficulty of agglutinating its population in urban areas of a significant any size.

The third one is that the FUA network lacks hierarchy in the upper end of the rank size distribution. When considering that the share of the prime city in the total FUA is also relatively low, this means that city system does have a polycentric layout, even if at a very low scale.

The fourth is that the FUA are, sparsely, but evenly spaced throughout the CBR. This region therefore does not follow the overall tendency of Portugal and Spain to concentrate the biggest cities at the coast leaving the inland fairly deprived of major urban centres.

The fifth is that the hierarchy of the GDP per capita distribution among the FUA is very similar to the one of the population. So the CBR does not follow pattern of Portugal, Spain and the

total ESPON countries, where wealth is normally distributed in a more hierarchical way among the FUA than population.

Low amount of FUA

Higher end of the hierarchy missing

Low percentage of people living in the FUA

Evenly spaced urban system

Chapter 4 – Urban-rural relationships

4.1. Aims, indicators and methods

The main objective of this chapter is to identify relations between urban centres and their rural hinterlands: how are different population densities related to land use patterns? is the urban-rural typology capable of explaining different evolutions in land consumption? how are these categories linked to the economic structures? what is the urban network like at the local level?

4.1.1. Data

Although the urban-rural relationship has been subjected to some study, namely in the ESPON program, there still is no data available on the EUROSTAT or the ESPON to actually evaluate the interaction between rural and urban areas (meaning the flow of people and goods as well as computer mediated communications).

The focus in this chapter was therefore on structural indicators, such as land use patterns and economic sectors. Although it is possible to get land cover data on a very low geographical scale from the Corine Land Cover, indicators such as employment and economical patterns are only available at a NUTS 3. The typologies established by the ESPON and by the Eurostat, are also only available at a broad scale, limiting the ability to link the indicators with rural or urban areas at any significant dimension. The focus in this chapter was therefore on the urban-rural typologies on a NUTS 3 level, highlighting some of the differences between the regions concerning the structural indicators.

A short analysis of the urban areas was also included. As was verified by the policentricity analysis, the CBR has shown a small concentration of its population in Functional Urban Areas. But according to the Territorial Agenda of the European Union 2020, small and medium sized urban areas play a crucial role in rural areas imposing questions such as: are there many minor urban agglomerations that can provide a minimum set of services and infrastructures at a local level? have they been functioning as anchors in these low density territories?

Given the high threshold for considering a settlement as a FUA in the ESPON projects, the urban network in this chapter has been analysed according to the national classifications. As the criteria for considering an urban area differ widely, this data lacks comparability between

each side of the border, and it functions as a way to understand some elements of the settlements in these regions.

The used indicators were the following.

Variable name	Geographical scale	Source	Time frame
Change urban fabric	NUTS 3	Own production, based on the CLC	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	Own production, based on the CLC	2000-2006
Gross value added in forestry and fishing	NUTS 3	Eurostat	1997-2008
Employment in forestry and fishing	NUTS 3	Eurostat	1997-2008
Urban areas	N/A	National Statistical Institute of Portugal, Ministerio del Fomento	

4.1.2. Methods

The ESPON 1.1.2 typology regarding urban and rural regions is based on tree indicators: land cover, population density and the presence/absence of a FUA. According to different combinations of these indicators, NUTS 3 have been classified as having high or low human influence (population densities) and urban intervention (land cover). Although it has been included for illustrative purposes, this typology has not been use to cross with other data. The reason for this is twofold: 1) the indicator has not been updated for NUTS 3 changes; 2) the inclusion of indicators on land cover to establish the typology, would lead to confusing when trying to cross these indicators with the typology.

The urban rural typology that was mainly used was a revision by the EUROSTAT of the OECD typology. This typology is established in tree steps:

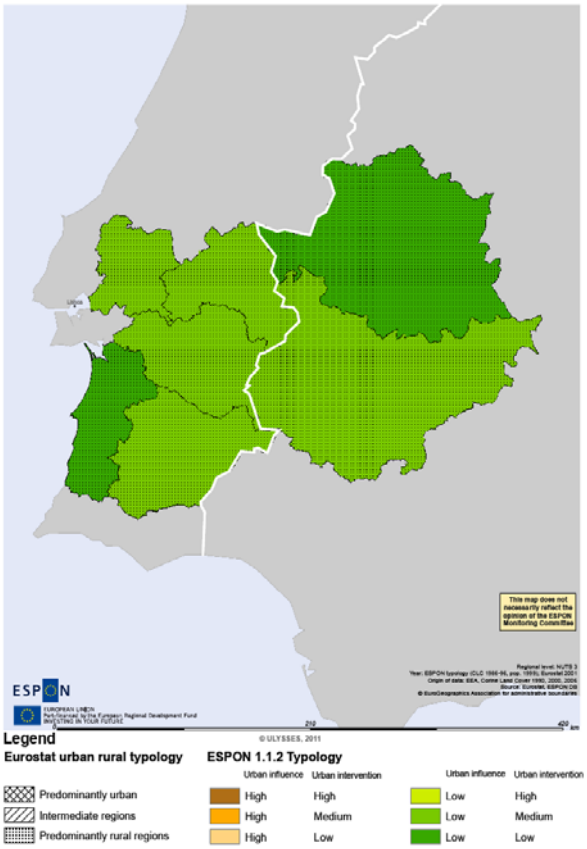
1. The first on is to clusters urban grid cells with a minimum population density of 300 inhabitants per km2 and a minimum population of 5 000. All others are considered rural.

2. The second one is to group NUTS 3 regions with less than 500 km2 with some of its neighbors solely for classification purposes, i.e. all the NUTS 3 regions in a grouping are classified in the same way.

3. The third one is to classify the NUTS 3 regions based on the share of population in rural grid cells. All that have more than 50 % of the total population in rural grid cells are considered predominantly rural. All between 20 % and 50 % in rural grid cells are considered to be intermediate. And all with less than 20 % in rural cells are considered to be predominantly urban (Eurostat 2010: 249).

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.

Map 14: ESPON 1.2.3 and Eurostat urban rural typologies by NUTS 3



As can be seen by overlapping the two typologies for this CBR, all of the NUTS 3 are considered to be predominantly rural according to the Eurostat and most of them are considered to have low urban influence and medium urban intervention according to the ESPON. Only the NUTS 3 of the Alentejo Litoral and Cáceres have low human influence and low human intervention.

Regarding the land use, the data has partly been drawn from the ESPON DB. Nonetheless, there were some inconsistencies between the ESPON DB and the data from the CLC country files for artificial surfaces. Because there was no plausible explanation for this, as data for agricultural areas for example varies only in an acceptable margin of error, the artificial surfaces were obtained from the shapefile of the land use changes of the CLC 2000-2006 which was intersected with the NUTS 3 of the region.

4.2. The urban networks

Both, Portugal and Spain, have been developing official studies on their urban systems. In Portugal, an Atlas of the Portuguese Cities was made in 2002 by the National Statistical Institute, which is still cited regularly when analysing the urban systems of different regions. This atlas based itself on an administrative classification (cities were considered to be so according to their legal status) and census 2001 data. Whenever possible, the cities' perimeter was defined by the statistical subsections and sometimes by the LAU 2. Since the political status of a city is defined rather arbitrarily and since the inclusion/exclusion of neighbouring LAU 2 and subsections in the cities' perimeter did not occur according to a uniform method, this classification has some limitations. Nonetheless, the associated indicators give a small hint on the situation of these cities.

Table 8: Portuguese cities in the CBR by national classification 2001

City name	Populatio	Main mode of transportation	% foreign citysens	% building build after 1990	% dwellings inhabited by the owner
Évora	41159	Personal car	<= 2	]12-24]	]50-60]
Santarém	28760	Personal car	<= 2	]12-24]	]50-60]
Beja	21658	Personal car	<= 2	]12-24]	]50-60]
Portalegre	15238	Personal car	<= 2	]12-24]	]40-50]
Elvas	15115	Personal car	<= 2	<= 12	]40-50]
Sines	11303	Personal car	]2-4]	]12-24]	]50-60]
Almeirim	10520	Personal car	<= 2	]12-24]	]60-70]
Cartaxo	9507	Personal car	<= 2	]12-24]	]50-60]
Vendas Novas	9485	Personal car	<= 2	]12-24]	]50-60]
Vila Nova de S. André	8745	Personal car	]2-4]	]12-24]	]60-70]
Moura	8459	By food/bycicle	<= 2	]12-24]	]50-60]
Montemor-o-novo	8298	Personal car	<= 2	]12-24]	]50-60]
Estremoz	7682	Personal car	<= 2	]12-24]	]40-50]
Rio Maior	7412	Personal car	<= 2	]12-24]	]50-60]
Ponte de Sôr	7331	Personal car	<= 2	]24-31]	]50-60]
Alcácer do Sal	6602	Personal car	<= 2	]12-24]	]50-60]
Reguengos de Monsaraz	5900	-	-	-	-
Santiago do Cacém	5240	By food/bycicle	<= 2	]12-24]	]50-60]
Serpa	5201	By food/bycicle	<= 2	]12-24]	]60-70]

Source: Instituto Nacional De Estatística (2002), "Atlas das cidades de Portugal", Instituto Nacional de Estatística, Lisboa.

The Alentejo region has a loose network of very small urban centres, most of which do not even count as much as 10000 inhabitants and the share of the total population that live in these urban agglomeration is only 30,5%.

The main mode of transportation for most of these cities is the personal car, except for Serpa, Santiago do Cacém and Moura where people move predominantly by foot or by bicycle[2].

[2] This is a tendency in throughout the Portugal, and the only major city where public transportation is the major mode of transportation is Lisbon.

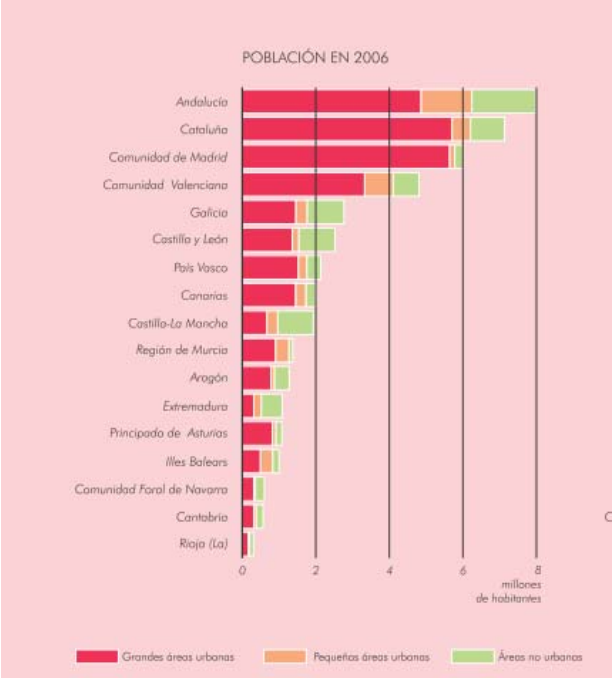
Home ownership is high throughout these cities, most of which are above the national city average of 53,5%. The share of foreigner and of new buildings is essentially in line with the national patterns.

In Spain, an important study of the urban areas was made at a similar time then the Portuguese: the Statistical Atlas of the Urban Areas of Spain, from 2000. This Atlas based its classification on the size and density of the municipalities, existing urban dynamics, infrastructures, demographic and real estate dynamics between 1960-1991 (Fidalgo and Nicolás, 2001).

This atlas has since been updated and a revised version is available for 2006. In this version, 2 types of urban areas where identified:

- Large urban areas (> 50000 inhabitants)
- Small urban areas (10000-50000 inhabitants)

The criteria where mostly based on population of the Municipalities, although population dynamics or employment by sectors where also included in some cases.



Source: Ministério del Fomento (2006), "Atlas Estadístico de las Áreas Urbans 2006"

As can be seen in the graph, in the Extremadura the amount of people living in non-urban areas is the highest of all of Spain (about half of the total population). And, despite the considerable size of this region, there are only 3 large urban areas: Badajoz, Cáceres and Mérida. The largest of these 3 is Badajoz, which has also been witnessing the highest annual

growth rate and the highest amount of foreign citizens (although still much bellow other Spanish cities Dénia-Javea - 46,84% or Torrevieja - 51,01%). As for cities' land consumption, Badajoz was in 2001 the city which had the best ratio of inhabitants per ha of urban soil (71,1%) followed by Cáceres (57,4%), with Mérida coming last (46,2%). The percent of building build after 2000 is very close to the national average of 28,6% in all three of the cities.

Table 9: Large Spanish urban areas in the CBR by national classification

	Badajoz	Mérida	Cáceres
Inhabitants 1991	130944	62792	93636
Inhabitants 2010	155855	70283	105534
Annual growth rate	0,92	0,59	0,63
Surface (km²)	1532	986	1937
Density	102	71	54
Number of dwelling	60882	29366	47453
Number of households 2001	44331	20416	31206
Urban soil 2001 (ha)	1841,9	1359,22	1630,51
Artificial soil 2006 (ha)	4985,16	1845,58	2745,01
% Foreigners 2010	4,6	2,7	2,8
% building build after 2000 (2010)	26,6	26,0	27,8

Besides the few large urban areas, there is also a considerable network of small urban areas. These range from a minimum population of almost 13000 inhabitants in Coria, to almost 40.000 in Plasencia. Their density is mostly higher than that of the large urban areas.

Table 10: Small Spanish urban areas in the CBR by national classification

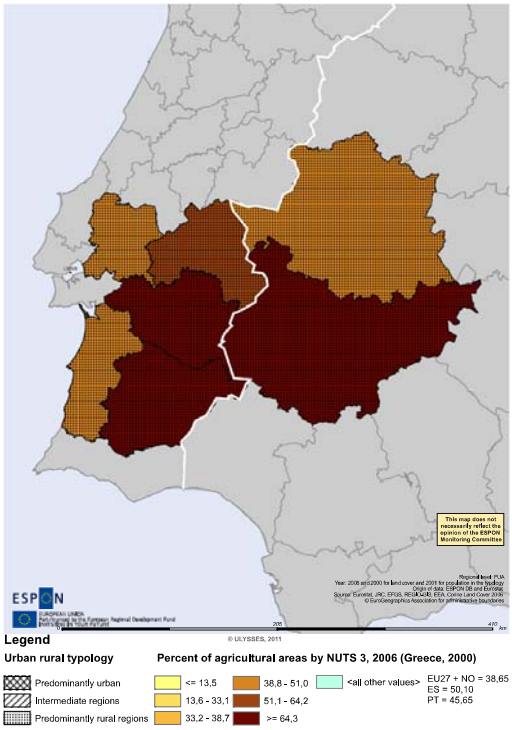
	Plasencia	Don Benito	Almendralejo	Villanueva de la Serena	Navalmoral de la Mata	Zafra	Montijo	Villafranca de los Barros	Coria
Inhabitants 2006	39785	34051	30741	24932	17099	15706	15648	13056	12901
Surface (km²)	218	562	164	153	156	63	120	104	103
Density	183	61	187	163	110	251	131	125	125

4.3. Land use

4.3.1. Agricultural areas

The agricultural areas of the CLC include: arable land, permanent crops, pastures and heterogeneous agricultural areas. For evaluating the agricultural land in this CBR, values for the three different CLC surveys where used in order to show their evolution over the last decade.

Map 15: Share of agricultural areas 2006, by NUTS 3



The share of agricultural areas in this region is relatively high. Most of them are clearly above the ESPON as well as the national average. In 2006, the NUTS 3 which has the highest value is the Baixo Alentejo (74,4%), followed by the Alentejo Central (69,59%). The regions which have the lowest share of agricultural areas are the Alentejo Litoral (38,87%) and Cáceres (43,28%).

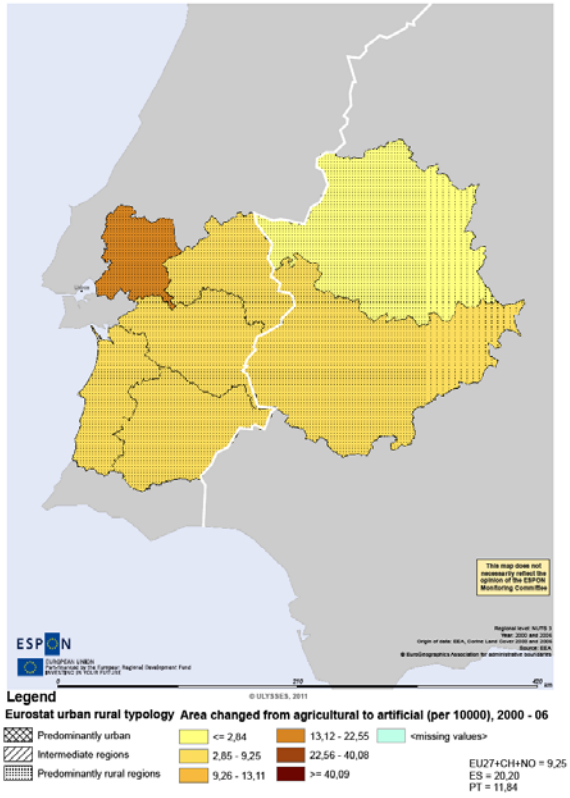
Table 11: Agricultural areas 1990-2006 by NUTS 3

	Agricultural areas (ha)						
	Total 1990	Total 2000	Total 2006	Share of total area 06 (%)	Net formation of land cover 90-06	Net formation of 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
Portugal	4346643	4265900	4199200	45,65	-147443	-160,3	-21,55
Spain	25396779	25428657	25349184	50,1	-47595	-9,41	-1,17
Badajoz	1453810	1462240	1446240	66,45	-7570	-34,78	-3,26
Cáceres	834577	853332	859899	43,28	25322	127,44	18,7
Alentejo Litoral	228019	216787	203332	38,87	-24687	-471,98	-71,36
Alto Alentejo	384013	378944	379352	60,71	-4661	-74,59	-7,63
Alentejo Central	483986	479288	503231	69,59	19245	266,13	24,4
Baixo Alentejo	665403	649669	635487	74,4	-29916	-350,24	-28,71
Lezíria do Tejo	208843	206753	202130	47,27	-6713	-156,99	-20,4

Source: ESPON DB
Methodology: Tabulate area between CLC2000 level 3 and Nuts 2006 (levels 1,2,3) and aggregation at clc2000 level1

From a diachronically point of view, the amount of agricultural areas tend to diminish in this CBR between the CLC 1990 and the CLC 2006 (the only two exceptions are the NUTS 3 of the Alentejo Central and Cáceres). The same phenomenon is also observable at the national level, although at a very different pace: Portugal is losing much more agricultural areas every year than Spain. The ESPON space as a whole, on the other hand, has been slowly increasing the share of agricultural areas.

Map 16: Land use change from agricultural to artificial 2000-2006 by NUTS 3



	Agricultural to artificial areas by total area (per 10000)
ESPON	9,25
Portugal	11,84
Spain	20,20
Badajoz	6,09
Cáceres	2,54
Alentejo Litoral	3,33
Alto Alentejo	4,52
Alentejo Central	6,10
Baixo Alentejo	4,01
Lezíria do Tejo	14,19

Of the several uses to which the agricultural land is lost, the one that is most telling is the artificial land use[3]. This is because it increases the overall human intervention on the territories, and goes hand in hand with a loss or rural traits of the territories.

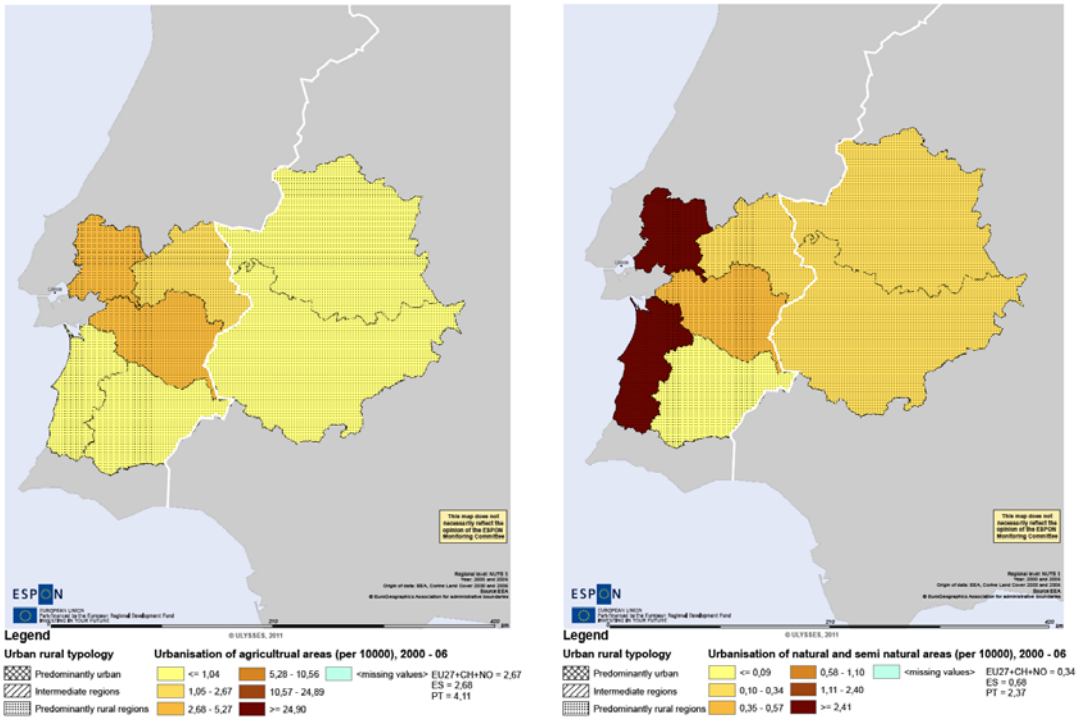
From the NUTS 3 of this CBR, the one in which the artificial uptake of agricultural areas is the Lezíria do Tejo (14,2 per 10000). All the other regions are well below the national averages as well as that of the total ESPON countries.

4.3.2. Urban areas

The urban areas, from the CLC point of view are divided into two categories: continuous urban fabric and discontinuous urban fabric. This category comprises areas that are mostly covered by buildings, roads and artificial surfaces, although some vegetated areas and bare soil are admitted.

[3] The artificial land use includes urban fabric, industrial, commercial and transport areas, mine, dump and construction sites and non-agricultural vegetated areas.

Map 17 & 18: Urbanization of agricultural and natural and semi-natural areas



The urbanization of other type of land uses has been subject to a broad discussion on the European level, namely in what constitutes the sustainable growth paradigm. In the NUTS 3 of this CBR this seems not to be a major issue. Noticeably, all of them have witnessed increases in the formation of new urban fabric which are well below the national averages of their respective countries. The regions in which the urbanization has moved fastest is the Lezíria do Tejo (with a share of land uptake of 10,68 per 10000) and the Alentejo Litoral (with a land uptake of 7,48 per 10000). These regions are also the ones which have witnessed the greatest urbanization of natural and semi-natural areas. This is especially strange for the Alentejo Litoral, which did not have an increase in the population over the last decade which could justify the continuous urbanization process.

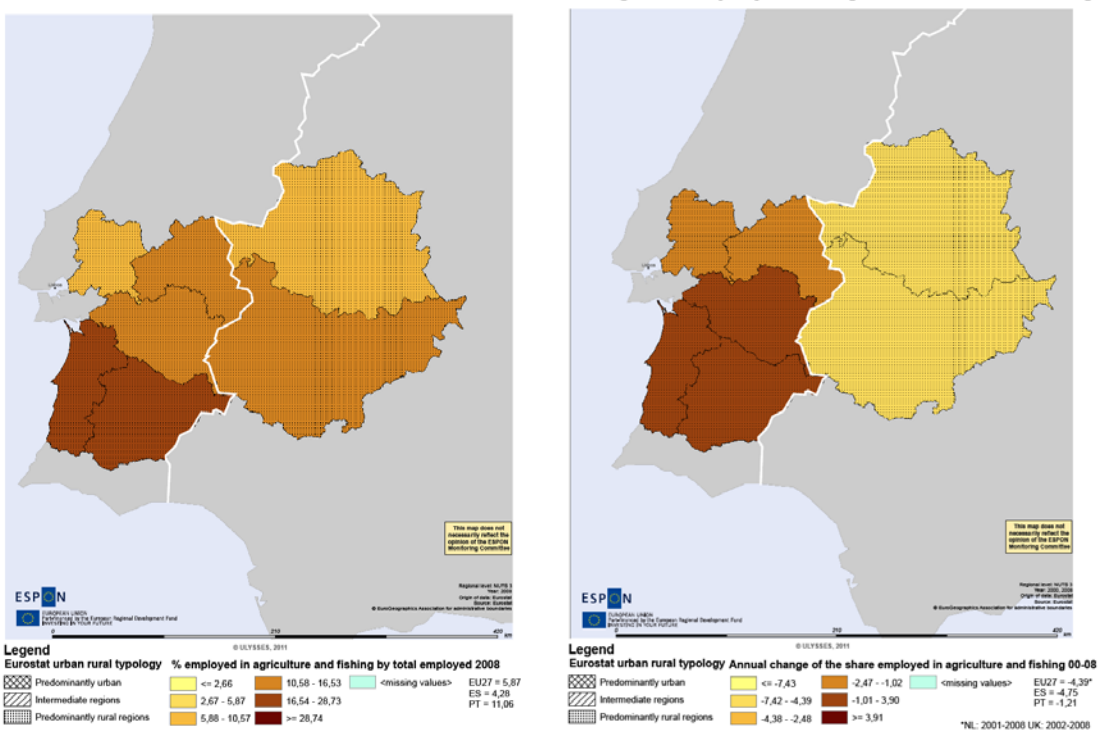
Table 12: Urban fabric areas 2000-2006 by NUTS 3

	Urban fabric (ha) (2000-2006)					
	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)
ESPON space	189842	3,97	127746	2,67	16003,73	0,34
Portugal	9097	9,89	3784	4,11	2179,84	2,37
Spain	31278	6,18	13557	2,68	3429,76	0,68
Badajoz	284	1,31	207	0,95	51,25	0,24
Cáceres	77	0,39	44	0,22	33,43	0,17
Alentejo Litoral	391	7,48	34	0,65	244,38	4,67
Alto Alentejo	181	2,90	140	2,24	8,31	0,13
Alentejo Central	272	3,76	234	3,24	30,30	0,42
Baixo Alentejo	99	1,15	72	0,84	0,00	0,00
Lezíria do Tejo	457	10,68	161	3,77	124,61	2,91

4.4. Weight of agriculture and fishing

Another aspect that is typically related to rural areas is the employment and GVA in primary sector activities, namely agriculture and fishing. In this CBR, which is considered to be predominantly rural, this association seem to be justified as most of the NUTS 3 of this region have a share of employment and GVA in these sub-sectors that is well above the national averages.

Map 19 & 20: Share & change of employment in agriculture and fishing 2000-2008 by NUTS 3



In 2008, on the Spanish side of the border, Badajoz had a share of persons employed in agriculture and fishing that is three time that of the national average, while Cáceres has almost double. But both of these regions have witnessed a major decline in this share from 2000 to 2008.

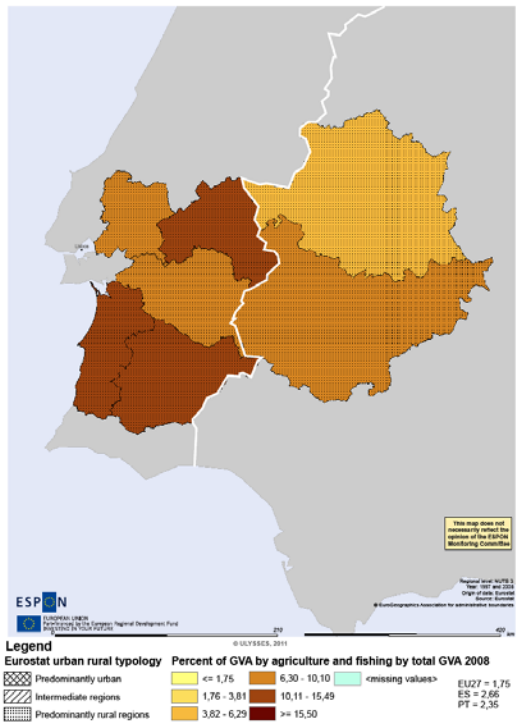
Table 13: Share & annual growth rate of employment in agriculture and fishing 2000-2008 by NUTS 3

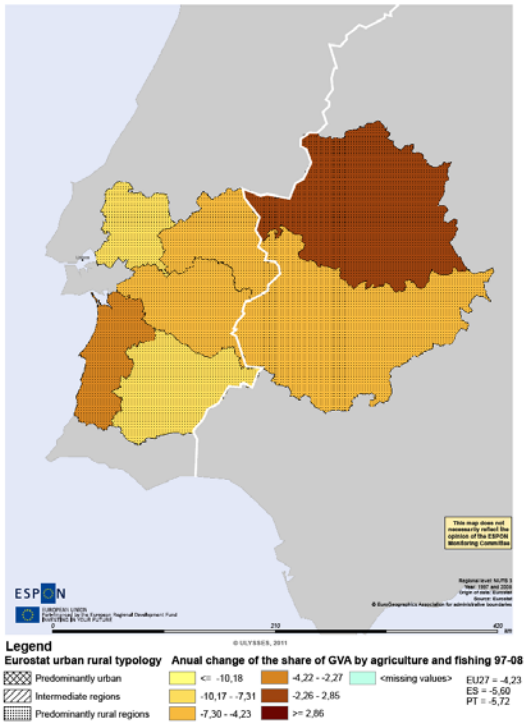
NUTS Name	Employment in agriculture and fishing (thousands of persons)		Share of employment in agriculture and fishing by total employed (%)		Annual growth rate of employment in agriculture and fishing 2000-2008	Annual growth rate of the share of employment in agriculture and fishing 2000-2008
	2000	2008	2000	2008		
Portugal	613,2	569,3	12,19	11,06	-0,92	-1,21
Spain	1037,4	879,6	6,32	4,28	-2,04	-4,75
Badajoz	45,2	35,5	20,86	13,56	-2,97	-5,24
Cáceres	13,2	11,2	10,95	7,64	-2,03	-4,39
Alentejo Litoral	6,7	7,7	19,14	19,44	1,75	0,20
Alto Alentejo	8,7	8,2	17,94	16,53	-0,74	-1,02
Alentejo Central	7,4	8,2	10,15	11,33	1,29	1,38
Baixo Alentejo	8,4	10,3	18,71	21,06	2,58	1,49
Lezíria do Tejo	12,5	10,9	12,63	10,57	-1,70	-2,19

In the Portuguese side, only 3 of the regions are well above the national averages (Baixo

Alentejo, Alentejo Litoral and Alto Alentejo), while the Lezíria do Tejo and the Alentejo central are in line with the national figures. But, contrary to the Spanish regions, there is an overall tendency for an increase of the share of employment in these subsectors.

Map 21 & 22: Share and change of GVA in agriculture and fishing 1997-2008 by NUTS 3





Considering the GVA, the relative importance of these economic subsectors is even more visible. Although they have been experiencing a major decline from 1997 to 2008, they still manage to be well above the national averages and even the regions with the lowest share (Cáceres) still doubles the national values.

Table 14: Share & annual growth rate of GVA in agriculture and fishing 2000-2008 by NUTS3

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
Portugal	4021,1	3508,2	4,49	2,35	-1,23	-5,72
Spain	23222,7	26494	5,01	2,66	1,21	-5,60
Badajoz	820,4	1048,6	17,03	10,10	2,26	-4,64
Cáceres	204,6	357,2	6,81	5,71	5,20	-1,59
Alentejo Litoral	203,3	194,8	18,02	11,54	-0,39	-3,97
Alto Alentejo	183,7	141,5	20,08	10,55	-2,34	-5,68
Alentejo Central	180,5	151,2	14,04	7,49	-1,60	-5,55
Baixo Alentejo	262,4	192,5	25,95	11,26	-2,78	-7,31
Lezíria do Tejo	356,6	231	17,73	7,38	-3,87	-7,66

4.5. Chapter conclusions

Four major conclusions have been identified from the analysis of the urban-rural relationship in this chapter.

The first one is that the region's spatial layout is marked by a network of small urban areas that spreads out over a large, predominantly rural, territory. According to the national classifications, these urban areas account for only about half the population in the Spanish side of the CBR and one third in the Portuguese one.

The second one is that there is a large share of agricultural areas, although they have the overall tendency to diminish. The changes in the share of agricultural areas seem to be only slightly related to the growth of artificial surfaces, and more to their abandonment or the uptake of forests or semi-natural areas.

The third is that these regions have been witnessing a slow growth in the urban land use. The only NUTS 3 in which the urban areas are growing faster than at the national levels is the Lezíria do Tejo, which makes sense as it is the region with the largest population growth.

The fourth is that the economic structure of this CBR is very characterized by the weight of the agricultural sector. Its share in the regions' total values is well above the national average in employment but especially in Gross Value Added. From this, it is possible to deduce that in this region the agricultural sector excels not only by its weight, but also by its high labour productivity.

Large share of agricultural areas

Low urbanization process

Large share of employment and GVA in agriculture

High productivity in agriculture

Chapter 5 – Accessibility and connectivity

5.1. Aims, indicators and methods

The main goal of this chapter is to evaluate the accessibility and connectivity levels of the CBR. The more specific questions to be answered are how are general accessibility levels of the CBR regarding different modes of transportation? what is their communication infrastructure like?

5.1.1. Data

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, 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 (impendence function) with the population that can be reached (activity function).

As for connectivity, there is normally a great lack of information. Even straightforward indicators, such as internet connections by household, are often difficult to come by, as the Internet Service Providers are reluctant to share this type of strategic information. Another issue is that the data is often not disaggregated at the regional level, therefore allowing international comparisons. Therefore, only two indicators on connectivity were included in this report: a composite indicator on the internet infrastructure was collected from the ESPON database and the percentage of households with broadband internet connection from the 5th Cohesion Report.

Variable name	Geographical scale	Source	Time frame
Potential accessibility road, rail indexed to ESPON average	NUTS 3	ESPON DB	2001;2006
Potential accessibility road, rail indexed to CBR average	NUTS 3	ESPON DB	2001;2006
Potential accessibility road, rail index change 2001-2006	NUTS 3	ESPON DB	2001;2006
Households with broadband connection	NUTS 2	European Comission 5th Cohesion	2009
Composite indicator on the Internet infrastructure	NUTS 2	ESPON DB	2008
Daily intensitity of cars and trucks at the main border crossings	N/A	Observatorio transfronterizo	2008

5.2.1. Methods

Accessibility is forcefully a relative concept: a region's accessibility is not and inherent trait, but a consequence of its relative position in the broader territory. As Walter Hansen puts it, "accessibility is a measurement of the spatial distribution of activities about a point, adjusted for the ability and the desire of people or firms to overcome spatial separation" (Hansen,1959:73).

In the ESPON 1.2.1 Final Report, the potential accessibility is an indicator that relates the activities to be reached with the travel time it takes to reach them. Its function is as follows:

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

where A i is the accessibility of area i, Wj is the activity W to be reached in area j, and c ij 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 2006: 276)

For each NUTS 3 of the ESPON space the potential accessibility was obtained by relating the travel time between the centroids through different modes of transportation with the population (road, train and air). Regarding the travel time by air, the exact methodology wasn't available at the metadata of the ESPN DB or the ESPON project's final report, but other modes of transportation are forcefully included.

The multimodal accessibility has also been calculates as an overall indicator that synthesizes all the different modes. According to the ESPON project, multimodal accessibility is "a logsum accessibility potential aggregating over road, rail and air" Ibid: 131. This essentially means that the individual accessibilities are aggregated in a way that balanced regions will have greater multimodal accessibilities than regions with very high results in some modes and very low results in others.

As the potential accessibility was produced for two different years, it is possible to see the evolution of the infrastructure in this period. Here, the index change of accessibility was used. For this indicator, "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

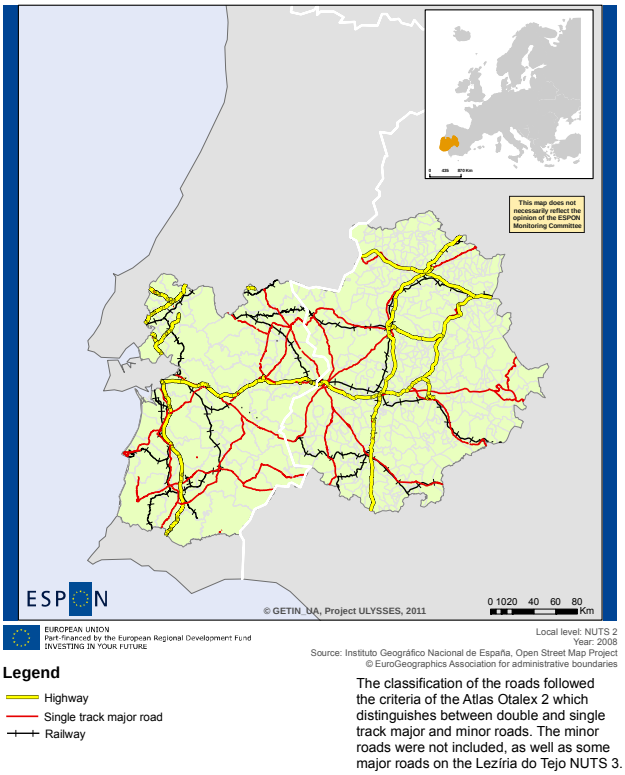
the regional values are transformed accordingly. The map then shows the differences of the index values, i.e. the change of the position of the regions relative to other regions. Positive values express an improvement of the relative locational quality, while negative values express a loss in relative locational quality" (Spiekermann & Wegener 2007: 9).

5.2. Accessibility

5.2.1. Infrastructure

The general railway development in this region is very limited, with a predominantly one line and non-electrified infrastructure and poor daily connections. There are two railway border crossing between both sides of the border in this CBR: one in the north, linking Marvão-Beirã to Valência de Alcântara and the second one linking Elvas to Badajoz. The first one is served by the Lusitânia Comboio Hotel, which is a night train going once a day from Lisbon to Madrid. The second has also one daily connection, but by a daytime regional train.

Map 23: Road and rail network in the CBR



High speed road length	1990		2009	
	km	km/km2	km	km/km2
Spain	5126	0,0101	15621	0,0309
Extremadura	17	0,0004	724	0,0174

High speed road length/districts	2009	
	Total	km/km2
Portugal (cont.)	2745,06	0,031
Beja	93	0,009
Évora	122,2	0,024
Portalegre	50	0,021
Santarém	241,33	0,046
Setúbal	209,5	0,094

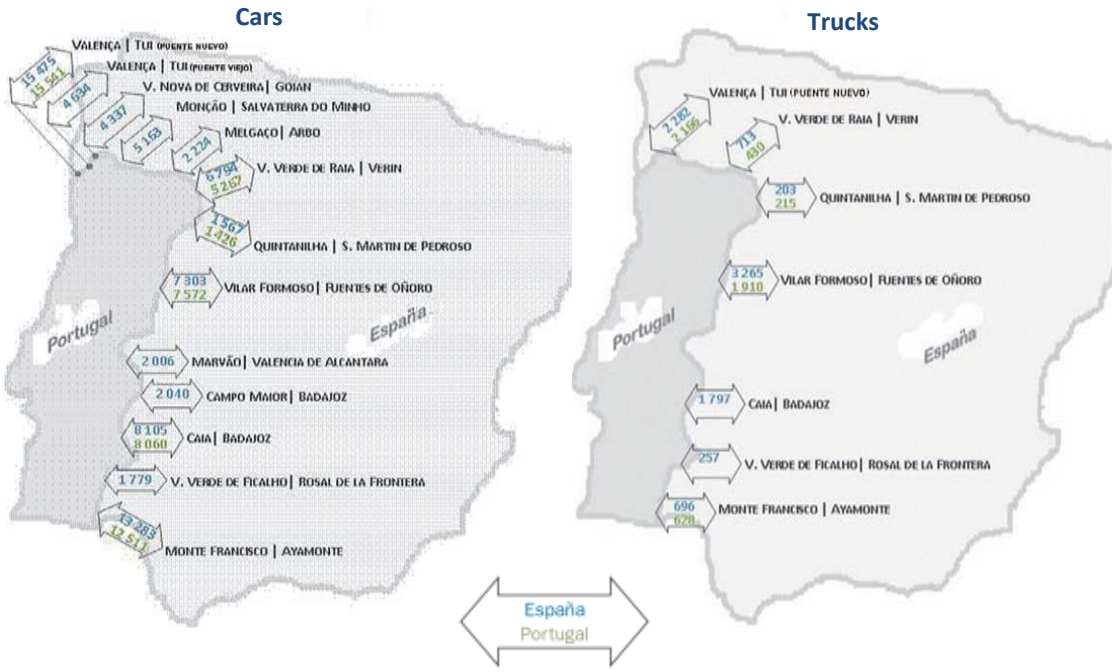
As for the road infrastructures, the network of the major roads is relatively loose, but this is only natural given the low densities. If we look at the Extremadura, for which more detailed

data is available, one can even conclude that it is fairly well served with high speed road networks. In this region, the kilometres of high speed roads per square kilometres have been increasing steadily in the last two decades, and now the region has a ratio which is more than half of the national average, while its population density is less than one forth.

In Portugal the high speed road length was only available from official sources for the district level. Although there is no exact match with the NUTS 3 areas, it is still possible to get an approximate idea on the density of the network. The main point that to retain from this data is that all the 3 border districts (Évora, Beja and Portalegre) are below the national averages, which, once again, is in line with the low population densities.

The Extremadura and the Alentejo share 3 main road border crossings: Marvão-Valencia de Alcantara, Campo Maior-Badajoz and Caia-Badajoz (located at the main axis around the A6/A5 that crosses almost the whole CBR).

Figure 9: Daily intensity of cars and trucks in the main border crossings in 2008



Source: Observatorio transfronterizo España-Portugal **Origin of data**: DG Carretera, EP Estradas de Portugal.

In terms of daily traffic, the most important of the 3 main border crossing of the CBR is Caia-Badajoz, which is estimated to have about 8105 cars crossing each day and about 1797 trucks.

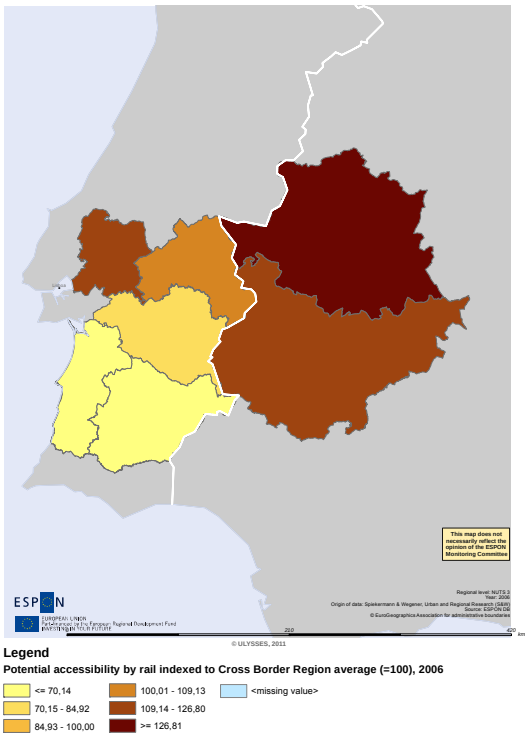
This means that this border is one of the busiest borders in all of Portugal, only surpassed by the Vilar Formoso - Fuentes de Oñoro and the Monte Francisco-Ayamonte border crossings[4].

5.2.1. Potential accessibility

Given that the potential accessibility relates travel time with population that can be reached, the low density and remoteness of this territory does in itself set a strong limit to the score they could have. It therefore comes as no surprise that the regions potential accessibility by the different modes of transportation is well below the ESPON space average.

The mode of transportation in which the CBR performs worse is the rail. Both Spanish NUTS 3, as well as the Lezíria do Tejo and the Alto Alentejo have around 20% of the average of the ESPON space and the lower Alentejo regions have values that are even lower. If one considers that the central European countries tend to have much better developed railway networks, this result is not surprising.

Map 24: Potential accessibility by rail



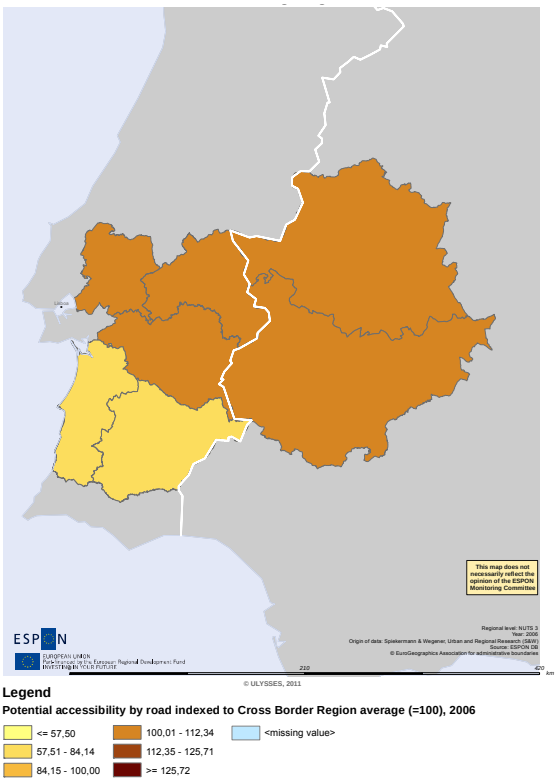
NUTS 3	Standardised potential accessibility by rail		Change of standardised potential accessibility
	ESPON=100	CBR=100	
Badajoz	22,1	123,7	2,0
Cáceres	24,3	136,0	2,4
Alentejo Litoral	11,4	63,8	-0,8
Alto Alentejo	19,3	108,0	1,1
Alentejo Central	14,7	82,3	-1,7
Baixo Alentejo	12,3	68,8	-3,7
Lezíria do Tejo	21	117,5	34,0

[4] The main infrastructure used in the passenger traffic between Portugal and Spain is the road, which is used by about 94,6% of all the passenger flow. The road is also used by about 85% of all the freight flow between these two countries (the remaining is essentially transported by sea).

The changes of the potential accessibility for this mode of transportation diverge between the different NUTS 3: the regions with the highest values are also the ones which have witnessed a positive change in their relative position, while the regions with lower values decreased their relative position. If it were to be performed in more recent years, this indicator would probably have a negative evolution in the interior Alentejo regions, which have witnessed the closure of many the regional train connections and the complete abandonment of some of its railway lines. An interesting perspective is also given by the high speed train development in this region, which has been progressing on the Spanish side, although in Portugal the political discussion of the project is ongoing.

In the potential accessibility by road, this CBR performs much better. But even the best performing region (Badajoz) has little more than one third of the ESPON space average. Internally, once again the northern regions are the ones with the highest values.

Map 25: Potential accessibility by road



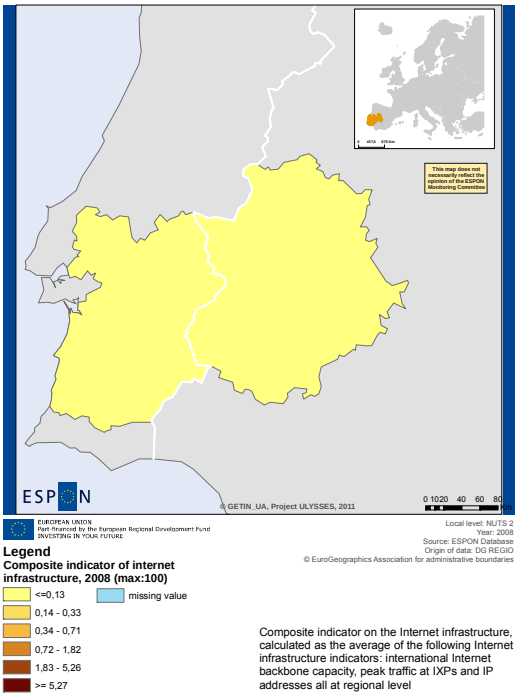
NUTS 3	Standardised potential accessibility by road		Change of standardised potential accessibility
	ESPON=100	CBR=100	
Badajoz	35,3	111,9	2,0
Cáceres	34,3	108,7	1,5
Alentejo Litoral	23,8	75,4	2,3
Alto Alentejo	33,8	107,1	1,9
Alentejo Central	31,9	101,1	1,6
Baixo Alentejo	26,5	84,0	1,7
Lezíria do Tejo	35,3	111,9	1,5

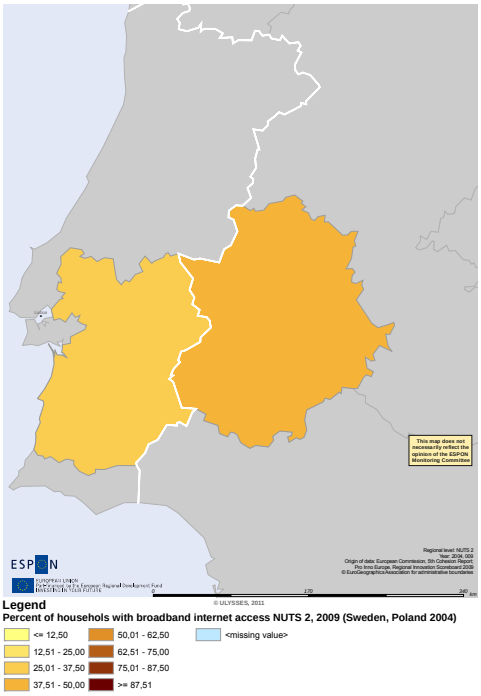
From an evolutionary perspective, all the NUTS 3 have been able to improve their relative position.

5.3. Connectivity

As stated in the methodology, there are not many indicators available to evaluate the connectivity at the regional level. Nonetheless, the two analysed indicators show that he connectivity levels of this CBR are low.

Map 26 & 27: Composite connectivity index and households with broadband internet connection





In the Alentejo only 37,14% of the households have a broadband internet connection. In the Extremadura, these values are slightly higher (39,39%) although it still is the lowest ranking NUTS 2 in all of Spain.

For the composite internet infrastructures the values of this CBR are also very low. The Alentejo has a value of 0,13 and the Extremadura of 0,01, while the Portuguese average is 1,28, the Spanish one 1,91 and the ESPON space 2,65.

5.4. Chapter conclusions

The first conclusion is that the regions transport infrastructure is essentially in line with its remote position. Indicators such as the kilometres of high speed road per area, for examples, are much smaller than the national averages. But considering the low is densities of these territories they have a fairly good coverage.

The second one is that the region has one of the most important border crossing in terms of daily car and truck intensity of all the country (Caia-Badajoz).

The third one is that the potential accessibility of these regions is very low, especially if one considers the rail as the mode of transportation. The evolution between 2001 and 2006 also show a negative tendency for this indicator in regions were the scores were already low, while the other regions had a positive evolution.

The fourth is that the long term choice for transport modes of this CBR seems to be essentially the road. When compared to the ESPON average this mode of transportation is where the regions potential accessibility is the highest.

The fifth is that this region has very poor connectivity.

Remoteness well reflected on the potential accessibility indicators as well as the actual infrastructure

One of the most important border crossings between the two countries

Focus on road as the major infrastructure

Low scores in connectivity indicators

Chapter 6 – Gothenburg and Lisbon/Europe 2020 strategy

6.1. Aims, Indicators and Methods

The main objective of this chapter is to measure the regions' performance regarding the Gothenburg and Lisbon/Europe 2020 Strategy goals.

The common framework set for the future development of the European Union is essentially based on three pillars: an economic one, a social one and an environmental one (added to the original goals of the Lisbon Strategy by the Gothenbourg Council in 2001). In the centre of this three pillar is the often cited goal of making the European Union "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" (Lisbon European Council conclusions, March 2000). The pursuit of this goal is envisaged through a broad set of reform which range from the labour market, to the Green House Gas emissions.

6.1.1. Data

In order to monitor how the different countries are adapting themselves to the goals of this strategy, a battery of indicators has been agreed to by the member states for each of these main pillars. This battery of indicators has been used as a reference in this chapter, although changes were made for two reasons. The first one was that not all the indicators that have been selected at the national level are available at the regional one (e.g. energy intensity of the economy, greenhouse gas emissions). The second, was that some other indicators are available that are helpful in shedding a light on the regions capacity for developing itself in a sustainable way.

Variable name	Geographical scale	Source	Time frame
GDP	MUTS 3	EUROSTAT, Russian Statistical Institute	1997-2009
Gross value added by NACE	NUTS 3	Eurostat	1997-2008
Employment by NACE	NUTS 3	Eurostat	2000-2008
Long term unemployment	NUTS 2	Eurostat	2009
Unemployment rate	NUTS 3	Eurostat	2010
Youth unemployment rate	NUTS 3	Eurostat	2010
Population at risk of poverty after social transfer	NUTS 3	Eurostat	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
Share of Natura 2000 areas	NUTS 3	European Commission's 5th Cohesion Report	2009
Solar energy resources	NUTS 3	EC 5th Cohesion Report	1981-1990
Wind energy potential	NUTS 3	EC 5th Cohesion Report	2000-2005
Ozone concentration exceedances	NUTS 3	EC 5th Cohesion Report	2008
Urban waste water treatment	NUTS 2	EC 5th Cohesion Report	2007
Soil sealed area	NUTS 3	EC 5th Cohesion Report	2006
Regional sensitivity to climate change (cultural, economical, environmental, cultural)	NUTS 3	ESPON DB	1961-1990; 2071-2100

For analytical purposes, these indicators were divided into four different categories: economy and employment, innovation and research, social cohesion and environment.

6.1.2. Methods

Besides the direct interpretation of the indicators, some calculations were performed to give further insights regarding economic performance and inequalities. The environmental data of the ESPON Climate project also needs some methodological clarification, as it is obtained in a rather complex way.

Economic performance and inequalities

The analysis of the regions' wealth was made from a threefold perspective: to evaluate the regional inequalities in wealth distribution; to point out the regions' actual position in the European context; to understand their relative performance over the last decade. The data used for this analysis was the GDP per for the years 1997 and 2008.

The regional disparities were evaluated by the coefficient of deviation of the GDP per capita. This indicator is obtained by calculating the ratio 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 CBR 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 3).

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

The regions' position and performance was evaluated by two procedures:

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

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

In theory, for both analyses, A1 and A2, the value of reference for GDP per capita would be the highest value among all NUTS III, pertaining to the Inner London West region. However, at this territorial level, GDP per capita can be affected by several factors, such as high population fluctuations and significant mismatches between jobs (and wealth production) and the place of residence. In fact, in economically central places (for which London is a good example), there normally is a steady flow of migrant workers, as well as commuters from other NUTS III, and so the GDP per capita of the economic centre is seriously overestimated. For that reason, instead of simply considering the GDP per capita of the Inner London West NUTS III, the whole Greater London NUTS II was used as a reference for this analysis. The results are presented bellow and the mathematical operations can be analyzed in the annexed Excel file.

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:

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

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

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 exercise the catching-up process analysis sets the relative position 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:

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

As in the former case, all regions with a performance 95% or higher when compared to the leader region where considered leading regions. 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.

Environment

While the environmental data from the 5th Cohesion Report is easily understood the data of the ESPON Climate project is obtained through a fairly complex methodology. The indicators that were used here, are the regions sensitivity to climate change.

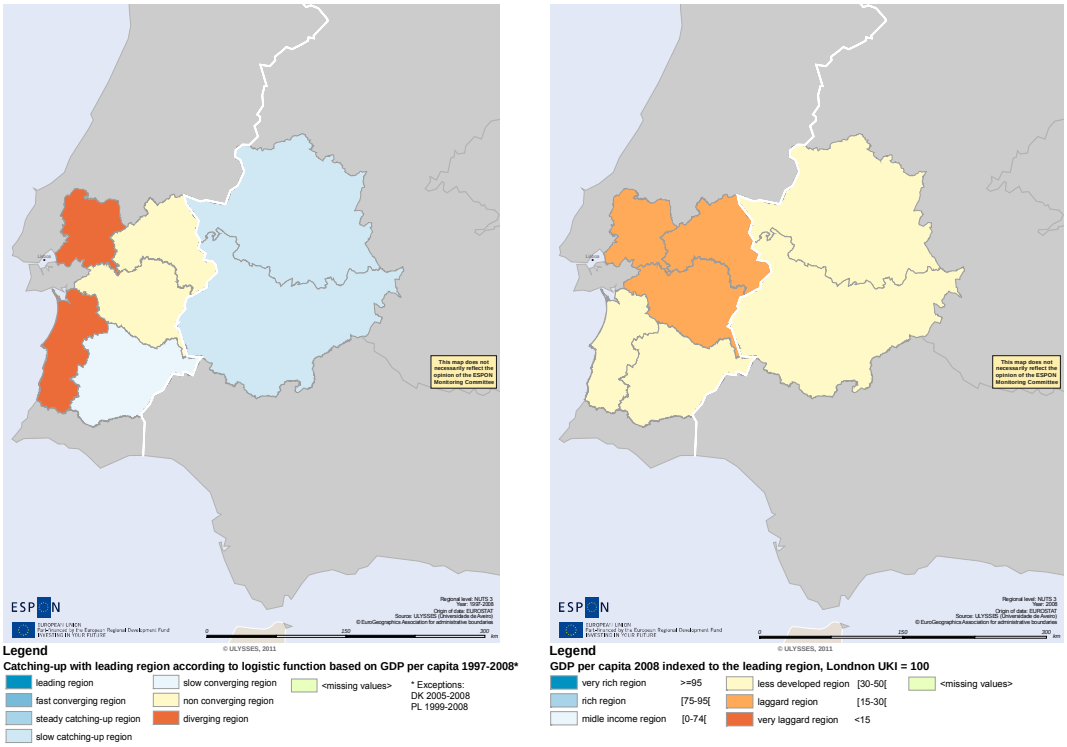
The sensitivity is defined by the project as being the "degree to which a system is affected, either adversely or beneficially, by climate related stimuli" (pp.4). The climate change data was obtained from the CCLM climate model, which compare the future period 2071-2100 to the reference period 1961-1990 for the scenario A1B.

The combination of the different impacts the climate change has on a regional level, comes from relating the impacts on characteristics of the affected areas. For physical sensitivity, the amount of buildings and infrastructures that as susceptible to extreme weather events (such as to river floods and coastal storm surges) were considered. Social sensitivity relates the positive or negative effects on human populations. The economic sensitivity considers the impact on economic activities that are strongly dependent on climate conditions (especially tourism and energy). Environmental sensitivity focuses on entities that are highly sensitive to climate changes, such as sensitive soils or protected areas. And cultural sensitivity considers the impact on assets like museums and internationally recognised historic sites.

6.2. Economy & employment

In the European context, this CBR does not perform very well. All of the NUTS 3 have a GDP per capita that is very far from the leading region. Of all the regions, the ones that are performing worst are the Lezíria do Tejo, the Alto Alentejo and the Alentejo Central, which is interesting given their greater proximity to Portugal's capital.

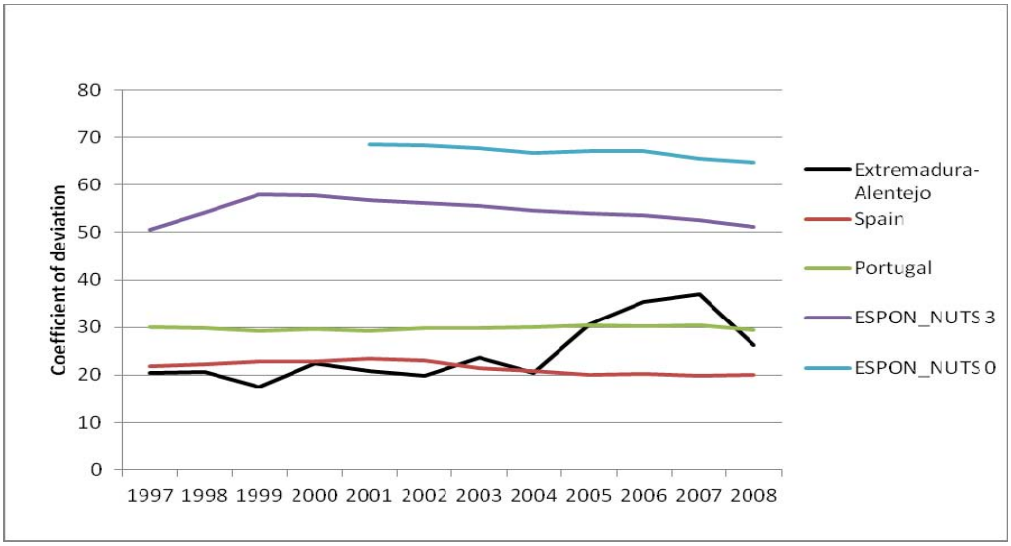
Map 28 & 29: Catching up and relative position in GDP per capita 1997-2008 by NUTS 3



Most of the regions have also had growth rates in the last decade that are equal or below that of the leading region. The noteworthy exceptions are the Spanish NUTS 3 as well as the Baixo Alentejo which have slowly been converging.

As would be expectable from the former analysis, the regional disparities in the ESPON space keep on being very high on the regional and national levels. This means that the tendency for major economic activities to concentrate themselves in central locations persists (although with a slightly decreasing tendency), despite of all the mechanisms the European Union has set up to increase the cohesion.

Figure 10: Coefficient of deviation



The CBR, on its turn, has regional disparities that are below the Portuguese national disparities, but above the Spanish ones and that have been increasing as the more developed regions have also been the ones to witness greater growth rates.

The composition of the GVA by sectors in the NUTS 3 is significantly different between the two sides of the border. Both share strong weights in agriculture and fishing and low weights in the financial and real estate sectors. But in the Spanish side of the border the construction and public administrations and community services assume a greater role (even greater than the Spanish average), while in the Portuguese regions the industry and the non-financial and real-estate related services contribute to a greater extent to the total GVA of the regions.

Table 15: Share of GVA by NACE 2008 (%) (Rev.1.1)

	Agriculture ; fishing (A_B)	Industry (except construction) (C-E)	Constr uction (F)	Wholesale retail trade; hotels restaurants; transport (G-I)	Financial intermediatio n; real estate (J_K)	Public administration and community services; activities of households (L-P)
EU27	1,75	19,61	6,48	21,08	28,27	22,8
Portugal	2,35	17,27	6,96	25,74	23,4	24,29
Spain	2,66	17,03	11,4	24,47	22,85	21,58
Badajoz	10,1	9,71	15,56	18,59	15,29	30,75
Cáceres	5,71	10,65	16,53	19,27	16,54	31,29
Alentejo Litoral	11,54	35,79	5,09	21,58	10,94	15,06
Alto Alentejo	10,55	15,55	4,95	22,35	13,76	32,85
Alentejo Central	7,49	15,12	6,09	23,13	14,34	33,84
Baixo Alentejo	11,26	26,6	6,01	19,05	12,4	24,69
Lezíria do Tejo	7,38	20,91	6,92	28,11	15,66	21,02

Table 16: Annual growth rate of the GVA by NACE 1997-2008 (%)

	All NACE	Agriculture; fishing (A_B)	Industry (except construction) (C-E)	Construction (F)	Wholesale retail; hotels & restaurants; transport (G-I)	Financial intermediation; real estate (J_K)	Public administration and community services; activities of households (L-P)
EU27	3,12	1,26	-1,48	-4,33	-2,96	4,36	3,37
Portugal	4,76	-1,23	2,31	4,67	4,9	6,59	5,97
Spain	7,21	1,21	4,68	11,9	6,49	9,37	7,48
Badajoz	7,23	2,26	6,66	12,23	6,31	7,54	8,17
Cáceres	6,89	5,2	3,73	9,83	6,15	6,81	7,77
Alentejo Litoral	3,73	-0,39	2,99	4,08	6,14	5,32	5,64
Alto Alentejo	3,54	-2,34	1,92	2,41	5,38	4,72	6,03
Alentejo Central	4,19	-1,6	2,44	1	4,73	6,06	6,89
Baixo Alentejo	4,89	-2,78	9,44	9,38	5,19	5,06	5,58
Lezíria do Tejo	4,1	-3,87	3,63	2,98	6,43	5,68	6,03

6.3. Innovation & research

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

The overall situation of this region in terms of research and innovation is not very favourable. In the Alentejo the intramural R&D expenditure is significantly below the Portuguese average in all the sectors, although the percent of employment in high and medium tech manufacturing is not far from the national average. In the Extremadura, these indicators have significantly higher scores, although it is very much impelled by the public sector (government as well as higher education, which is essentially public in both countries).

The low investment in R&D, of course has an impact in the amount of EPO patents, which is very small proportion of the national averages in both sides of the border.

Table 17: Innovation indicators 2007

	Total intramural R&D expenditure 2007				EPO patents per million of inhabitants 2007	Employed persons in high and medium tech manufacturing activities (% total workforce EU 25 = 100) 2004 *
	Total	Business enterprise sector	Government sector	Higher education sector		
EU27	2,01	1,18	0,24	0,42	-	-
Portugal	1,17	0,6	0,11	0,35	7,85	47,89
Spain	1,27	0,71	0,22	0,33	19,01	76,28
Alentejo	0,45	0,31	0,06	0,2	1,31	47,28
Extremadura	0,74	0,12	0,25	0,36	0,47	6,19

Source: Eurostat and ESPON DB (from the Regional Innovation Scoreboard)

2005

6.4. Social cohesion

The indicators for evaluating 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 18: Social cohesion indicators

	Unemployment rate, 2010	Long-term unemployment rate, 2009 (>=12 months)	Youth unemployment rate, 2010 (% of labor 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	9,6	3,0	20,9	17,0	4,3	25,9
Portugal	10,8	4,2	22,4	18,5	3,3	15,4
Spain	20,1	4,3	41,6	19,6	3,4	30,7
Alentejo	11,4	4,0	28,9	17,3	3,8	13,7
Extremadura	23,0	5,1	45,9	38,4	3,3	23,3

Source: Eurostat and European Commission's 5th Cohesion Report*

The social indicators, once again, show the underdevelopment of this CBR. The Extremadura, only performs better than the Spanish average on the infant mortality rate, and does much worse in the population that is at risk of poverty and also the share of active aged population with tertiary education. The Alentejo, although it follows the Portuguese tendency to perform much better on most social indicators than Spain, till perform much worse than the national average.

6.5. Environment

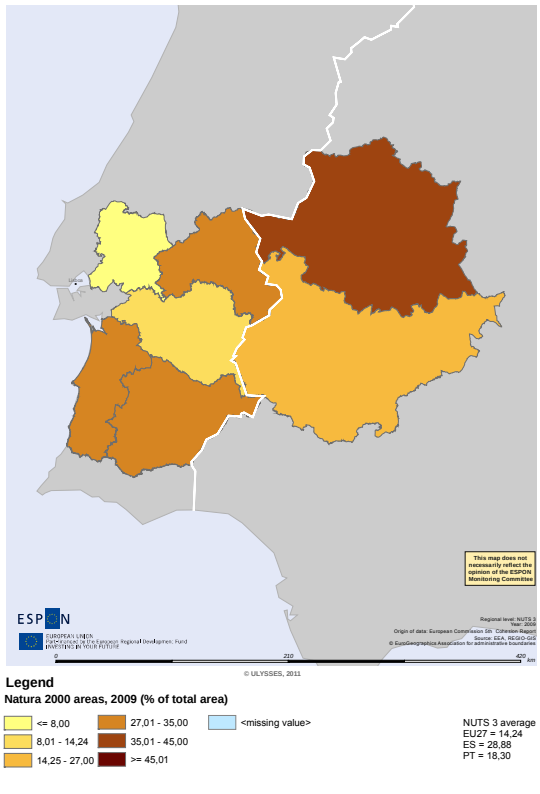
For the environmental analysis, two sets of indicators are available. On one hand, the indicators from the European Commission's 5th Cohesion Report. And on the other hand,

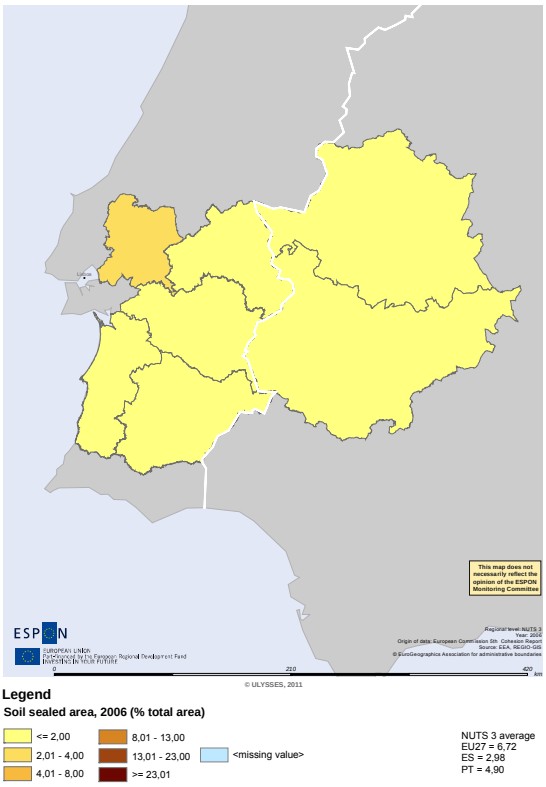
indicators from the ESPON Climate Project regarding the region's sensitivity for climate change.

European Commission's 5th Cohesion Report Data

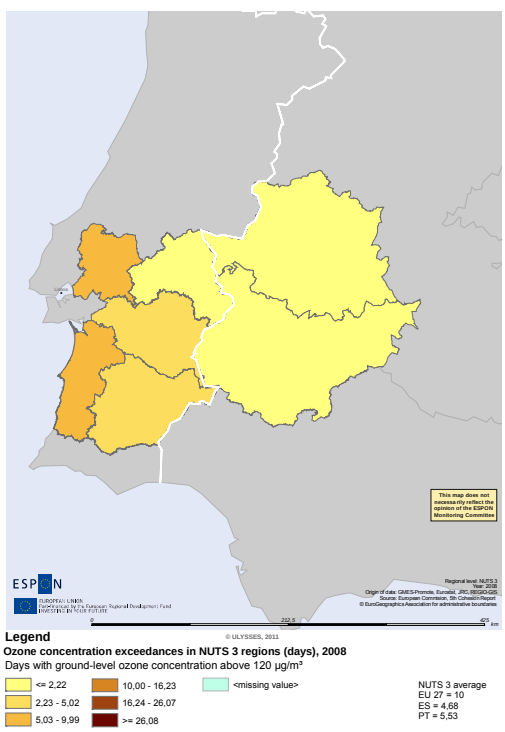
Four indicators from the 5th Cohesion Report were considered: soil sealed area, ozone exceedances, waste water treatment and Natura 2000 areas. Solar and wind energy potential were not included, as they only give a broad hint at what could be the region's capacity in exploiting alternative energy sources in an energy source transition scenario and not its actual production.

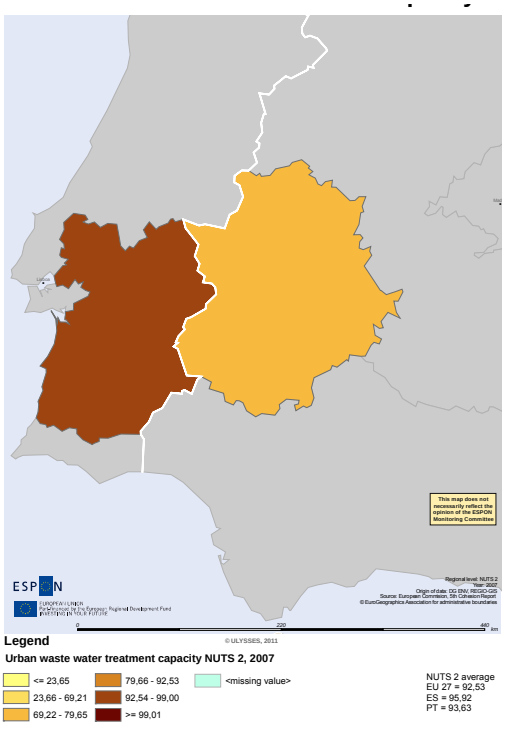
Map 30 & 31: Share of Natura 2000 and soil sealed areas by NUTS 3





Map 32 & 33: Ozone concentration exceedances and urban waste water treatment



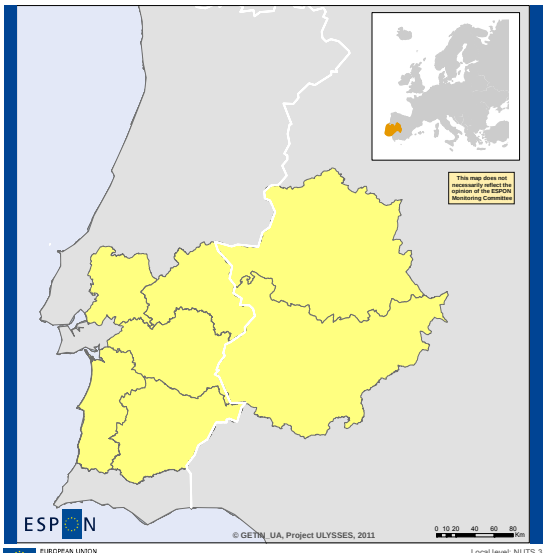


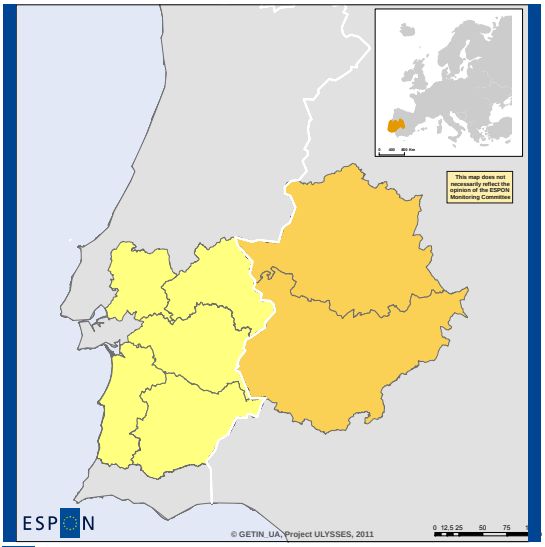
The NUTS 3 of this CBR perform well on many environmental indicators, although many of these are essentially a consequence of its low densities, such as the share of soil sealed and Natura 2000 areas.

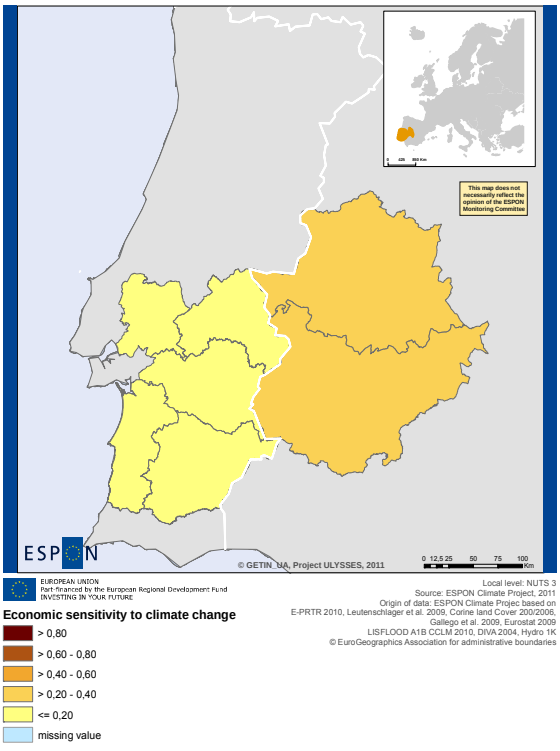
ESPON Climate

As already stated in the methodology, the ESPON climate's sensitivity, indicators measure the exposure of the different region to climate change regarding different type of infrastructures that are present.

Map 34, 35 & 36: Physical, social and economic sensitivity to climate change by NUTS 3







As can be seen in the maps this CBR is not particularly sensitive to climate changes. There are no major flood riks from rivers, nor from the sea, where the coastline is very steep in most parts. And, although there a some aspects that could rise concerns, such as draught or fire risk, the low densities mean that the amount of population and infrastructures that could be affected by climate change is not very high.

6.6. Chapter conclusions

Six major conclusions can be drawn from this analysis.

The first one is that the economic situation of these regions is fragile, especially on the Portuguese side of the border. On one hand, all of the NUTS 3 are well below the leading region in terms of GDP per capita. On the other hand many of them have been diverging, or converging very slowly, from the leading region over the last decade.

The second one is that the region has relatively high economic disparities, despite sharing so many overall characteristics. This seems to imply that the belonging to one country or another has in itself a major impact in the economic performance.

The third one is that most of the regions' social cohesion indicators are much worse in this CBR then the respective national averages. This is especially worrying for the Extremadura, given that Spain already tends to have high values in these kind of indicators (youth unemployment, at risk of poverty after social transfers, etc.).

The fourth is the regions capacity to invest in research, development and innovation is very limited and is reflecting itself on the outputs (low amount of patent applications).

The fifth is that the regions have a relatively good performance on climate related indicators, such as soil sealed areas, ozone concentration or protected areas. The tread of the long term climate change is also limited in its potential impacts.

Poor economic performance

Relatively economic high disparities

Very poor indicators in R&D&I

Low social cohesion

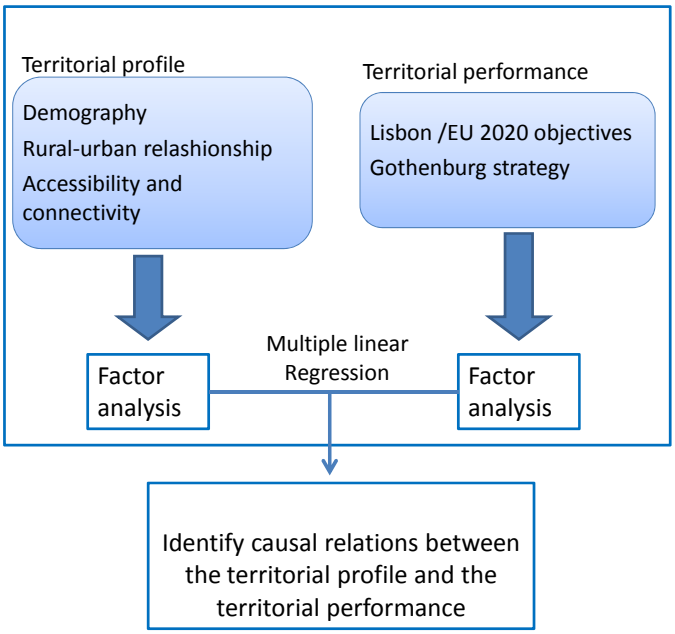
Good performance in climate related indicators

Low sensitivity to climate change

Chapter 7 – Correlation analysis

7.1. Aims, indicators and methods

As state in the inception report, the indicators were divided into two sets: regional profile indicators and territorial performance indicators.



The first set considered variables linked to overall characteristics of the different regions on the themes that where considered (accessibility, rural-urban relationship and demography). Polycentricity was excluded at this point, because it is a concept that 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 of 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.

7.1.1. Data

Data was used on a NUTS 3 scale for all the EU 27 countries. Some of the overseas areas of Portugal, France and Spain where excluded since data was missing for many of the variables.

The year of reference for most data was 2008, since this is a year for which data is available for most countries. This means that the data does not reflect the impact of the financial crisis, which is especially meaningful for volatile indicators such as migration rates or unemployment rates or the per cent of the Gross Value Added by different economic sectors.

In case of missing values, several procedures were adopted:

1) Search for data in different sources - this method was forcibly used to a very limited extend, as it is very time-consuming;
2) Use of a different time reference;
3) Use of different geographical units - this is especially relevant for the performance indicators where data is often only available for NUTS 2, leading to clustered results;
4) Estimation through SPSS' EM procedure[5].

Territorial profile

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

[5] "For the EM procedure, a distribution is assumed for the partially missing data, and inferences are based on the likelihood under that distribution. Each iteration consists of an E step and an M step. The E step finds the conditional expectation of the "missing" data, given the observed values and current estimates of the parameters. These expectations are then substituted for the "missing" data. In the M step, maximum likelihood estimates of the parameters are computed as though the missing data had been filled in. "Missing" is enclosed in quotation marks because the missing values are not being directly filled, but, rather, functions of them are used in the log-likelihood." MaryAnn Hill / SPSS Inc (1997), "SPSS Missing Value Analysis™ 7.5", pp. 41

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

Territorial performance

Indicator	UNITS	Year	Geographical unit
Unemployment rate	%	2008	NUTS 3
Long-term unemployment rate (>=12 months)	%	2009	NUTS 2
Youth unemployment rate, per labour force aged 15-24	%	2008	NUTS 3
Infant mortality rate	%	2008	NUTS 2
GDP per capita indexed EU average	%	2008	NUTS 3
Catching-up	ordinal	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

Table 19: Factor analysis output for the territorial profile

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

Extraction Method: Principal Component Analysis.

	Rotated Component Matrixa										
	1	2	3	4	5	6	7	8	9	10	11
empl_agric_fish	-0,841										
Rail_index	0,806										
GVA_agric_fish	-0,801										
Road_index	0,783										
air_index	0,752										
employ_finan_r_estate	0,649										
Commuter_region	0,594										
High_tech_employ	0,57										
GVA_finan_r_estate	0,551										
Rural_typology	-0,511										
air_index_ch											
GERD		0,898									
BERD		0,798									
GOVERD		0,687									
HERD		0,633									
Tertiary_ed_act_pop		0,533									
EPO_patents		0,509									
GVA_adm_comm_serv			0,878								
employ_adm_comm_serv			0,825								
employ_industry			-0,785								
GVA_industry			-0,736								
Young_dep				0,814							

TFR				0,747							
Nat_increase				0,687							
Old_dep				-0,653							
Rail_index_ch				-0,521							
sens_phys					0,852						
sens_soc					0,843						
sens_cult					0,774						
sens_env											
GVA_trade_transp						0,837					
employ_trade_transp						0,836					
Net_migration							0,897				
Pop_increase							0,861				
sens_econ											
employ_construction								0,851			
GVA_construction								0,791			
Formation_urban_fabric											
Pop_density									-0,751		
Growth_agric_area									0,673		
Road_index_ch										-0,672	
Percent_agric_area											0,669

FAC1_1: Central location

The first factor essentially expresses central location and has an explained variance of 14,83%. It has high positive correlations with all the indicators regarding potential accessibility and, to a lesser extent, with the share of employment in financial intermediation and real estate, 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.

This factor has its highest values in central European countries, especially in the Ruhr, Belgium and Southern England, in a pattern that clearly lines out the blue banana. In the less central region, the higher values tend to be concentrated around capitals and other major urban agglomerations.

FAC2_1: R&D&I

The explained variance of this factor is 8,04% and it mainly relates variables that are linked to innovation and scientific development such as R&D investment of different sectors and, to a lesser extent, EPO patent application and tertiary educated active population. As said in the introduction, the indicators in this factor are mostly available on a NUTS 2 level, meaning that a very high score in a specific NUTS 3 can lead to a whole cluster with high values.

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.

Although in most countries one cannot really detect a border effect, it is interesting to see that Karelia lies clearly beneath the Finnish average, while the southern border of France and Germany counts with high values on both sides.

FAC3_1: Administrative centres

The indicators with the highest coefficients of correlation of this factor are the share employment and GVA in public administration, community services and activities of household and the share of employment and GVA in industry. Its explained variance is 8,36%.

The regions with the highest scores of this factor are majorly 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 border NUTS 3 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.

FAC4_1: Demographic dynamism

This factor has an explained variance of 7,22%. The variables with the highest coefficient of correlation are young age dependency rate, the crude rate of natural population increase, the total fertility rate and the old age dependency rate (this last one has a negative correlation). The region with the lowest scores of this factor are in the Mediterranean countries, such as Portugal, Spain and Greece as well as Germany.

FAC5_1: Environmental risk

This factor relates mainly to variables linked to the regions' sensitivity to climate change. As can be seen in the map, these regions are essentially located in coastal areas and other flood prone areas, such as areas close to the Danube or the Po.

FAC6_1: Services and transport

This significant indicators of this factor are the share of GVA and employment in wholesale and retail trade, hotels and restaurants and transport (NACE G-I). It is interesting to note that many of the regions with the high scores in this factor seem to be linked to tourism (Southern Spain and Portugal, the alpine regions, Paris, Greece, Rome, etc.).

FAC7_1: Immigration

The highly correlated variables of the factor 7 are population growth and the net migration rate. While many regions in Central and Western Europe show high scores in this factor, in the eastern countries the 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.

FAC8_1: Construction

The highly correlated variables of this factor are GVA and employment in construction. The regions with the highest score in this factor belong to Ireland, Spain, the Baltic States and eastern Germany.

FAC9_1; 10_1; 11_1

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

Table 20: Factor analysis output for the territorial performance

Total Variance Explained

Comp.	Initial Eigenvalues			Extract Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	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

Extraction Method: Principal Component 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.

FAC1_2: Unemployment

The first component explains 24,19% of the variance and its highly correlated variables are unemployment, long-term unemployment and youth unemployment. The geographical distribution of this factor's scores show a concentration of the highest values in the more depressed areas of Europe and countries with a structurally high unemployment such as (e.g. Southern Italy and Spain, Eastern Germany, Slovakia and Greece). Regions with used to have a strong industrial base also evidence 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 eastern Germany

From the regression it is possible to see that, although the overall variation of the factor that is explained by the context factors is small, its relation to most of them is statistically significant. The coefficients indicate that high levels of unemployment have a strong negative relation to a high investment in R&D, demographic dynamism, central locations and high levels of immigration. As expected, the factor referring to administrative centres has a significant and positive impact on unemployment.

Table 21: Unemployment regression analysis

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

FAC2_2: Catching-up regions

The total explained variance of this factor is 18,71% and its most significant variable is catching-up. This indicator relates the GDP level and growth between 1997 and 2008 of a given region to the pattern evidenced by the leading region. Its correlated variables also include urban waste water treatment capacity and infant mortality.

As can by the scores given to the different regions, 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 in the initial decades of their transition to a market economy (some countries even had occasional double digit growth rates). The central European countries, although starting from a high initial position, witnessed relatively small growth rates. The overall pattern of the border regions seems to essentially follow the national tendency. As this is an historic contingency and does not follow a deeper causal nexus, the regression analysis was made only for the catching-up indicators.

The regression of this indictor, which has 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 (central location) and factor 3 (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 22: Catching-up regression analysis

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

FAC3_2: Economic development

The variables with the highest coefficient of correlation in this factor are GDP per capita, % of Natura 2000 and soil sealed area and its explained variance is 17,57%. It can therefore be understood as a factor which expresses high degrees of development and urbanization. As expected, the regions with the highest scores for this factor are concentrated in central Europe and Scandinavia and also include the capital cities of more marginal countries.

The explanatory capacity of this regression is significantly higher than that of the previous factors. 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 location and R&D (factor 1 and 2). 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 than infrastructural development.

Table 23: Economic development regression analysis

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 95%*	*Upper 95%*	*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

FAC4_2: Pollution

The significant variable of this factor is ozone concentration exceedance. The 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. 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. Although the scores of the regions show us some overall tendencies, the regression analysis shouldn't be regarded for this component.

7.4. Case study

The scores of the factors should also be analysed for the NUTS 3 of the case-studies. For this analysis the countries' NUTS 3 average was obtained, weighted by the NUTS 3's proportion of population, and afterwards the difference between the individual NUTS 3 and the country it belongs to, as well as the weighted average of all the involved countries was calculated. The "+" and "-" signalize whether the regions' scores are above or inferior to the national and the CBR country levels. Basically, it provides a fast overview without the need to evaluate all the scores individually. The overall position of the NUTS 3 in the European context is expressed by the percentile bellow which it falls (5%, 20%, 50%, 80%, 95%).

NUTS name	Central Location						R&D&I						Administrative centres					
	Scores	Country comparison (weighted NUTS 3 average)			CBR country level/Country (+ -)	Percentile all NUTS 3	Scores	Country comparison (weighted NUTS 3 average)			CBR country level/Country (+ -)	Percentile all NUTS 3	Scores	Country comparison (weighted NUTS 3 average)			CBR country level/Country (+ -)	Percentile all NUTS 3
		PT	ES	All CBR countries				PT	ES	All CBR countries				PT	ES	All CBR countries		
All Countries	-0,27		-0,10			50	0,09		-0,06			80	-0,17		0,01			50
Portugal	-0,72		-0,54	-0,44		50	-0,17		-0,32	-0,26		80	-0,12		0,06	0,05		50
Spain	-0,18		0,00	0,10		50	0,15		0,00	0,06		80	-0,18		0,00	-0,01		50
Badajoz	-1,19		-1,02	-0,92	- -	20	0,01		-0,14	-0,08	- -	80	1,01		1,20	1,18	+ +	95
Cáceres	-0,79		-0,61	-0,51	- -	20	-0,04		-0,19	-0,13	- -	80	1,20		1,38	1,37	+ +	95
Alentejo Litoral	-1,36	-0,64		-1,09	- -	20	-0,54	-0,37		-0,63	- -	50	-0,27	-0,15		-0,10	- -	50
Alto Alentejo	-1,45	-0,74		-1,18	- -	20	-0,74	-0,57		-0,84	- -	50	1,47	1,60		1,65	+ +	95
Alentejo Central	-1,05	-0,33		-0,77	- -	20	-0,90	-0,73		-1,00	- -	20	1,28	1,40		1,45	+ +	95
Baixo Alentejo	-1,55	-0,84		-1,28	- -	20	-0,64	-0,47		-0,73	- -	50	0,78	0,91		0,96	+ +	80
Lezíria do Tejo	-0,77	-0,05		-0,49	- -	20	-0,57	-0,39		-0,66	- -	50	-0,15	-0,03		0,02	+ -	50

NUTS name	Demographic dynamism						Environmental risk						FAC6_1: Services and transport					
	Scores	Country comparison (weighted NUTS 3 average)			CBR country level/Country (+ -)	Percentile all NUTS 3	Scores	Country comparison (weighted NUTS 3 average)			CBR country level/Country (+ -)	Percentile all NUTS 3	Scores	Country comparison (weighted NUTS 3 average)			CBR country level/Country (+ -)	Percentile all NUTS 3
		PT	ES	All CBR countries				PT	ES	All CBR countries				PT	ES	All CBR countries		
All Countries	-0,39		0,06			5	1,13		-0,22			95	0,58		0,01			80
Portugal	-0,11		0,34	0,28		5	0,12		-1,23	-1,00		80	0,64		0,08	0,06		80
Spain	-0,45		0,00	-0,06		5	1,35		0,00	0,22		95	0,56		0,00	-0,01		80
Badajoz	-0,29		0,16	0,10	+ +	5	0,18		-1,17	-0,95	- -	80	-0,16		-0,72	-0,74	- -	50
Cáceres	-0,87		-0,42	-0,48	- -	5	0,38		-0,97	-0,75	- -	80	-0,15		-0,71	-0,73	- -	50
Alentejo Litoral	-0,80	-0,69		-0,41	- -	5	-0,51	-0,63		-1,64	- -	50	0,49	-0,15		-0,09	- -	80
Alto Alentejo	-1,19	-1,09		-0,81	- -	5	-0,78	-0,90		-1,91	- -	20	0,09	-0,55		-0,49	- -	80
Alentejo Central	-0,61	-0,50		-0,22	- -	5	-1,06	-1,18		-2,19	- -	5	-0,14	-0,78		-0,72	- -	50
Baixo Alentejo	-0,74	-0,63		-0,35	- -	5	-0,49	-0,62		-1,62	- -	50	-0,20	-0,83		-0,77	- -	50
Lezíria do Tejo	-1,59	-1,48		-1,21	- -	95	-0,70	-0,83		-1,83	- -	20	0,64	0,00		0,06	+ +	80

NUTS name	FAC7_1: Immigration						FAC8_1: Construction					
	Scores	Country comparison (weighted NUTS 3 average)			CBR country level/Country (+ -)	Percentile all NUTS 3	Scores	Country comparison (weighted NUTS 3 average)			Country /CBR country level	Percentile all NUTS 3
		PT	ES	All CBR countries				PT	ES	All CBR countries		
All Countries	1,13		-0,21			95	1,39		-0,35			95
Portugal	0,18		-1,15	-0,94		80	-0,17		-1,91	-1,56		50
Spain	1,34		0,00	0,21		95	1,74		0,00	0,35		95
Badajoz	0,22		-1,12	-0,91	- -	80	2,48		0,74	1,09	+ +	> 95
Cáceres	-0,52		-1,86	-1,65	- -	50	3,37		1,63	1,98	+ +	> 95
Alentejo Litoral	-0,52	-0,70		-1,64	- -	50	-0,19	-0,03		-1,59	- -	50
Alto Alentejo	-0,81	-0,99		-1,94	- -	20	-0,89	-0,73		-2,29	- -	20
Alentejo Central	-0,12	-0,30		-1,25	- -	50	-0,60	-0,43		-1,99	- -	50
Baixo Alentejo	-0,98	-1,16		-2,11	- -	20	-0,37	-0,21		-1,77	- -	50
Lezíria do Tejo	0,89	0,71		-0,24	- +	95	0,70	0,87		-0,70	- +	95

NUTS name	FAC1_2: Unemployment						FAC2_2: Catching-up regions						FAC3_2: Economic development					
	Scores	Country comparison (weighted NUTS 3 average)			CBR country level/Country (+ -)	Percentile all NUTS 3	Scores	Country comparison (weighted NUTS 3 average)			CBR country level/Country (+ -)	Percentile all NUTS 3	Scores	Country comparison (weighted NUTS 3 average)			CBR country level/Country (+ -)	Percentile all NUTS 3
		PT	ES	All CBR countries				PT	ES	All CBR countries				PT	ES	All CBR countries		
All Countries	0,99		-0,10			95	-0,09					80	-0,21					50
Portugal	0,55		-0,54	-0,44		80	-0,31		-0,26	-0,22		80	-0,04		0,21	0,17		80
Spain	1,09		0,00	0,10		95	-0,04		0,00	0,05		80	-0,25		0,00	-0,04		50
Badajoz	2,03		0,94	1,04	+ +	95	0,53		0,57	0,62	+ +	95	-0,41		-0,16	-0,20	- -	50
Cáceres	1,59		0,50	0,60	+ +	95	0,46		0,50	0,55	+ +	80	-0,76		-0,51	-0,54	- -	20
Alentejo Litoral	0,32	-0,24		-0,68	- -	80	-0,64	-0,34		-0,55	- -	50	-0,94	-0,90		-0,73	- -	20
Alto Alentejo	0,74	0,18		-0,26	- +	80	-0,27	0,04		-0,18	- +	80	-1,15	-1,11		-0,94	- -	5
Alentejo Central	0,44	-0,12		-0,56	- -	80	-0,13	0,17		-0,04	- +	80	-0,62	-0,58		-0,41	- -	50
Baixo Alentejo	0,92	0,37		-0,07	- +	95	0,00	0,31		0,09	+ +	80	-0,83	-0,78		-0,61	- -	20
Lezíria do Tejo	0,36	-0,19		-0,63	- -	80	-0,38	-0,07		-0,29	- -	50	-0,41	-0,36		-0,19	- -	50

7.5. Chapter conclusions

The main conclusion from the factor and regression analysis is that the region has poor scores in most of the factors that have a significant impact on its development. In the factor 1, that expresses central location, all of the NUTS 3 of the CBR fall below the 20% percentile. In the factor 2, that expresses R&D&I, the most of the Portuguese regions fall below the 50% percentile, while the Spanish ones fall below the 80%. Since these two factors are the ones that relate most strongly to the economic performance, the overall outlook of the regions is not very positive.

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Annex

Catching up analysis

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

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

where, $\bar{X}$ is the performance of the leading region, X is the relative position of the NUTS III in question and k is an abstract constant. k is a parameter which defines the value of X at the year of origin.

For t=0 → $e^{-at} = 1$, and then

$$X = \frac{\bar{X}}{1 + k}$$

therefore

$$k = \frac{\bar{X} - X}{X}$$

which gives us the relative position of a NUTS III X to the leading NUTS III, $\bar{X}$.

Solving the equation (1) for t,

$$0{,}95 = \frac{1}{1 + ke^{-at}}$$

$$\frac{1}{0{,}95} = 1 + ke^{at}$$

$$\frac{0{,}05}{0{,}95} = ke^{at}$$

$$19\,k = e^{at}$$

$$\ln 19\,k = at$$

$$t = \frac{\ln 19\,k}{a}$$

Substituting k in this equation, the general expression to estimate the time needed to reach the 95% level of the leading region in 50 years is given by:

$$t = \frac{\ln\left(19x \frac{\bar{X} - X}{X}\right)}{a} \quad (2)$$

In order to solve this equation, the value of the parameter a must be obtained. That value corresponds both to the relative growth rate and to the relative position in terms of GDP per capita of each NUTS III, when compared to the leading region.

Given the definition of a logistic curve,

$$G = \frac{\frac{dx}{dt}}{X} = a\frac{\bar{X} - X}{\bar{X}}$$

$$a = G\frac{\bar{X}}{\bar{X} - X} \quad (3)$$

where G is the relative growth rate of the g NUTS III under analysis in comparison to the leading region, g^*, according to the following equation:

$$G = \frac{1 + g}{1 + g^*} - 1$$

In the analysis, the growth rates obtained refers to the evolution of GDP per capita between the years 1997 and 2008, in the form:

$$\left(\sqrt[11]{\frac{GDP_{2008}}{GDP_{1997}}}\right) - 1$$

Substituting a (equation 3) in the equation (2),

$$t = \frac{\ln\left(19x \frac{X - X}{X}\right)}{G\frac{\bar{X}}{\bar{X} - X}}$$

and then

$$t = \frac{\ln\left(19x \frac{\bar{X} - X}{X}\right)\frac{\bar{X} - X}{\bar{X}}}{G}$$

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