THE SOCIODEMOGRAPHIC DIMENSION OF SUSTAINABILITY AT THE LOCAL LEVEL: THE CASE OF THE OESTE REGION, PORTUGAL

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Introduction

In the area of development policy and planning, the systemic approach to sustainable development prevails among researchers and professionals. Thus, in accordance to that, sustainability is viewed as a balanced system of environmental, economic and social interacting dimensions, or subsystems, in the long run (Kenny and Meadowcroft, 1999; Voinov, 1998; Constanza, 1991; Gale and Cordray, 1994; Owens and Cowell, 2002). Yet, such definition has a shortcoming: it omits the demographic subsystem. This is related to the fact that, as a rule, the demographic dimension has been understood only as part of social sustainability and in rather limited terms (Thomson and Snadden, 2002). Consequently, demographic indicators are often included only in the social dimension of sustainability. However, population is not a narrow synonym to society. Population is the basic structural framework of a society and of an economy in a given territory. Archer and Lonsdale (2002) have a similar standpoint when they emphasize that "a sustainable population level is one which will permit a societal [and economic] system to be long enduring". In short, the demographic subsystem should be part of the sustainability system (fig. 1).

However, in most of the research on population and development, there has been a tendency to consider demographic sustainability only in terms of natural growth and of sex and age composition (Lutz et al, 2001). Some authors define demographic sustainability as a constant population level related to an optimal growth rate of the population, corresponding at least to a 2.1 fertility rate (Sleebos, 2003; Mamolo and Billari, 2003; Kapitza, 2004). Others reduce the demographic sustainability concept to

the relationship between working age and old population or to sex balance. However, as Lutz et al. (2002) pointed out, demographic sustainability should also include the social and economic characteristics of the population: "*Another way to proceed is to further subdivide the population by other dimensions such as rural/urban place of residence, education, ethnicity, labour force participation, and the like*".
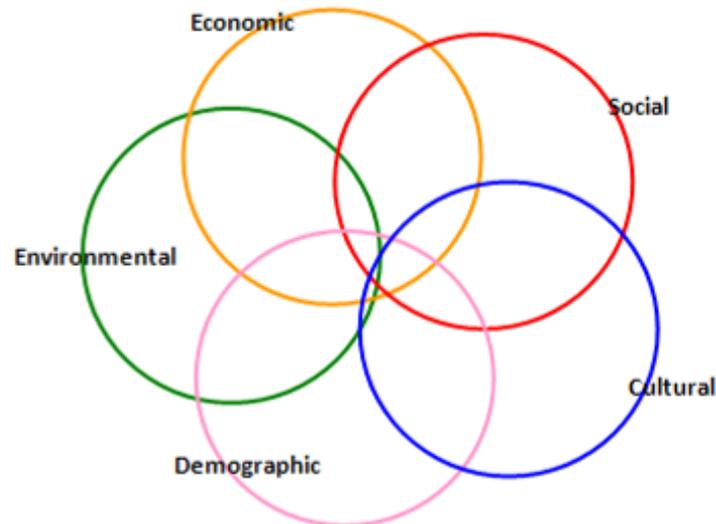

Figure 1: The sustainability system.

Furthermore, research on the sustainability of families and households, the other two units for collecting and processing data from the population censuses is still rare.

Indeed, the decision-making process involving development stakeholders, the most important endogenous resource, almost always takes place within family households and, thus it is influenced, for example, by age composition, income levels and activity of their members. So it is essential to learn more about such features because they affect development sustainability.

Therefore, a territory is socio-demographically sustainable when there is an optimal relation between sexes and age population groups in terms of their size and growth, as well as when an optimum level of education and skills, and labour force participation of the members of the family households is reached.

In Portugal, as in most of Southern Europe, over the last decades of the 20th century, the aggravation of sociodemographic disparities among areas with different degrees of urbanization at all spatial scales, from the local to the national, was a major trend. By the end of the 1990s, most rural areas suffered from depopulation, ageing and social marginalization, lack of social infrastructures for the elderly, bad housing conditions,

low educational level, dependence on social welfare and weak diversification of the economic base. On the other hand, urban and peri-urban areas[1] experienced population densification, thus concentrating human and social capital, but, also, growing pressures on land use for housing, on health and educational facilities, increase in the number of single-parent and unstructured families, unemployment and social marginalization. However, the employment function continued to be concentrated in the large and, at lesser extent, mid-sized urban centres, which led to the strong expansion of their commuting areas. In parallel, the central parts of larger cities experienced depopulation, ageing, house degradation, together with gentrification. Consequently, due to the abovementioned sociodemographic unbalances the sustainability of spatial development is at risk in a large part of Portugal.

This paper focuses on the sociodemographic dimension of development sustainability at the local level. It is assumed that urban, peri-urban and rural areas quite differ concerning indicators of sociodemographic sustainability. The objectives of the paper are: (i) to produce a spatial typology according to such indicators and (ii) to suggest measures for sustainable local development, taking into account its sociodemographic dimension.

METHODOLOGICAL FRAMEWORK

The area of study

The study area is the NUTS III Oeste (fig. 2), a region, North-West of the Lisbon Metropolitan Area, which has been marked by most of the spatial disparities described above and which has been subject to intense demographic, social and economic changes. According to a Report on economic restructuring and development of the Oeste region (CODES, 2002), produced for the Operational Program for the Economy, in the scope of the Common Support Framework 2000-2006, the diagnosis of the sociodemographic and economic situation of the Oeste region could be summarized as follows: (i) in the 1981-2001 period, there was considerable population growth, exclusively due to positive net migration, more intense in urban counties (Torres Vedras, Caldas da Rainha, Alcobaça and Alenquer) and less intense in agricultural counties (Cadaval, Bombarral) and in fishing counties (Peniche and Nazaré); (ii) ageing, low level of education and skills of the population are the main sociodemographic

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[1] Here, a peri-urban area is considered the spatial interface between urban and rural land uses, landscapes, economic activities and lifestyles.

constraints for human capital development; (iii) in the northern and central parts of the Region, strong diffuse urbanization and industrialization have been occurring, which affects territorial cohesion (iii) in the southern counties of the Oeste region, a significant part of the population commutes to work in the Lisbon Metropolitan Area, favoured by a considerable improvement of road connections; (iv) the commuting zones of the major urban centres of the Region (Caldas da Rainha, Alcobaça and Torres Vedras), where economic activities are concentrated, have expanded significantly in the last decade; (v) the terciarization of the economy was stronger in rural counties due to the transfer of population from agriculture; however, (vi) the primary sector of the economy still has development potential, particularly in the family farming production of fruits, vegetables and wine; (vii) tourism and related activities, particularly second housing developments have been increasing quite fast and are considered a priority economic sector within the 2007-2013 National Strategic Reference Framework; (viii) in this period, the Oeste Region will continue to benefit from the EU Structural Funds for disfavoured regions.
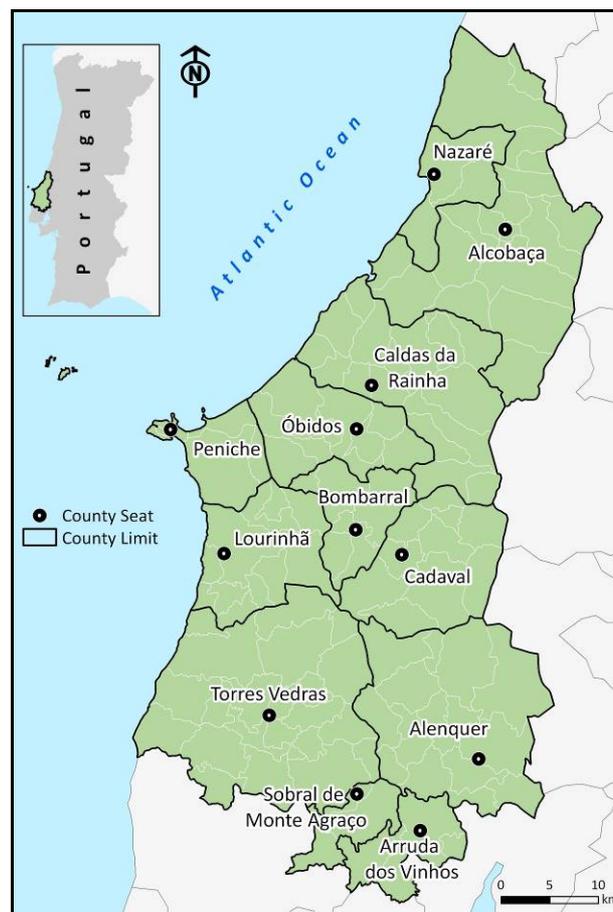

Figure 2: The Oeste Region.

Level of analysis

The level of analysis is the parish (in Portuguese, *freguesia*, i.e., the smallest territorial–administrative unit) since results from the analysis of the 2001 Census data have shown that there are significant intra-county disparities concerning spatial development (Roca et al., 2005; Marques, 2004). Furthermore, the 1998 Typology of Urban Areas (INE and DGOTDU, 1999) into "predominantly urban"[2]; "medially urban"[3] and "predominantly rural"[4] that was used in this paper, was designed on the basis of analyses carried out at the parish level.[5]

Variables and indicators

The variables "population distribution", "age composition" "spatial mobility", "level of education", "economic activity", "family size", "family composition", "marital status", "social welfare provision", "communal infrastructure connections to households" were chosen to represent sociodemographic sustainability.

A series of indicators that could better represent these variables were selected for 118 parishes (table 1). The data sources were the 2001 Population and Housing Censuses and the 1999 Agriculture Census.[6]

Table 1: Original Set of Indicators.

1. Population density
2. Population 0-14 years old (%), 2001
3. Population 15-64 years old (%), 2001.
4. Population 65 and more years old (%), 2001.
5. Population that lived in other parish in the county of present residence in 1995.12.31 (%), 2001.
6. Population that lived in other county in 1995.12.31 (%), 2001.
7. Population that lived abroad in 1995.12.31 (%), 2001.
8. Population that lived abroad in 1995.12.31, except in former Portuguese colonies, Venezuela, France and Germany (%), 2001
9. Population whose place of work or study is in other parish in the county of residence (%), 2001.
10. Population whose place of work or study is in other county (%), 2001.
11. Population that use private automobile in the journey to work or study (%), 2001.
12. Population that spend more than 30 minute in the journey to work or study (%), 2001.
13. Illiterate population (%), 2001.

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[2] A "predominantly urban area" includes: urban parishes (population density of at least 500 inhabitants per km^2 or a settlement with 5000 or more population); semi-urban parishes (population density more than 100 but less of 500 inhabitants per km^2 or a settlement with 2000 and less than 5000 population) that are contiguous to urban parishes, that are included in the urbanized or urbanizable areas of the County's Master Plan; parishes that are county seats and have 5000 or more population.

[3] A "medially urban area" includes: semi-urban parishes that are not included in a "predominantly urban area"; parishes that are county seats with less than 5000 population.

[4] A "predominantly rural area" includes: rural parishes (population density lower than 100 inhabitants per km^2 or with no settlement with at least 2000 inhabitants).

[5] The terms "predominantly urban", "medially urban" and "predominantly rural" correspond to the terms "urban" "peri-urban" and "rural", used in this paper.

[6] Data for some indicators is not available for three parishes of the Peniche County.

14. Ratio between population with uncompleted higher secondary education to population with completed higher secondary education (%), 2001.
15. Population with at least higher secondary education (%), 2001.
16. Unemployment rate (%), 2001.
17. Working population (%), 2001
18. Population that live out of social aid (%), 2001.
19. Family farming population (%), 2001.
20. Farmers 65 and more years old (%), 2001.
21. Farmers that spend up to 50% of their time in farm work (%), 2001.
22. Farmers whose main source of income is out of agriculture (%), 2001.
23. Families with 5 or more members (%), 2001.
24. Nuclear families (%), 2001.
25. Families with two members 15 and more years old, with other two less than 15 years old (%), 2001.
26. Families with a mother or a father and with at least one non married child less than 25 years old (%), 2001.
27. Families composed only by one or two members 65 and more years old (%), 2001.
28. Households without piped water (%), 2001.
29. Households without piped sewerage (%), 2001.
30. Households without heating (%), 2001.
31. Household with two rooms (%), 2001.
32. Households with 6 or more rooms (%), 2001.

The statistical models

The statistical models that were applied were the factor and the cluster analyses. The factor analysis permits to reduce the amount of information without loosing its quality. Furthermore, factors are the product of structural relations between variables that could not be noticed in the vast set of original variables (Maroco, 2003; Rummel, 1970). It was expected that factors could synthesize the relationship between the various indicators of sociodemographic sustainability.[7] The initial number of indicators (32) was reduced to 25.[8] Five factors that explained 67.7% of the total common variance were extracted (table 2).[9]

The factor scores were used as input variables for the cluster analysis, the statistical model chosen to build a typology of counties according to indicators on

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[7] The method of principal components was chosen for factors extraction. The Pearson's correlation matrix was used since the data had interval scales.

[8] The process of exclusion of indicators had the following steps: (i) indicators with the majority of the Pearson's correlation coefficients not significant at 0.05 level; (ii) indicators with communalities (i. e. , the common variance of each indicator explained by the extracted factors) less than 0.3, the maximum value being 1; (iii) indicators with loadings (the weight of an indicator in a factor, i.e. , the correlation between the original indicator and the factor) less than (-/+)0.5 in all factors, the values range being from -1 to +1

[9] The extraction was executed by means of a scree test. After that, the factors were rotated in order to obtain a solution easier to interpret without altering the communalities, the data structure or the specific variance. The varimax method of orthogonal rotation was chosen because it promotes indicators with high loading values only in one factor. The scores obtained for every parish in each factor were also generated.

sociodemographic sustainability.[10] Following the recommendations of many authors (Rencher, 2002; Maroco, 2003) that a good strategy is to try several methods, three hierarchical agglomeration methods were tested and compared – the Ward's, the nearest and the farthest neighbour methods. The results were quite similar which shows that the original data matrix contains natural clusters (Rencher, 2002; Maroco, 2003). The Ward's method was preferred taking into account the analysis of the maps of the factor scores as well as that many studies concluded that the best overall performers are Ward's method and the average linkage method (Rencher, 2002).[11]

Table 2: Factor Loadings	Fac.1	Fac.2	Fac.3	Fac.4	Fac.5
1. Population density	0.62				
2. Population 0-14 years old (%), 2001		0.84			
3. Population 15-64 years old (%), 2001	0.52	0.66			
4. Population 65 and more years old (%), 2001		-0.84			
5. Population that lived in other parish in the county of present residence in 1995.12.31 (%), 2001	0.64			-0.52	
6. Population that lived in other county in 1995.12.31 (%), 2001				0.61	
7. Population that lived abroad in 1995.12.31 (%), 2001			0.87		
8. Population that lived abroad in 1995.12.31, except in former Portuguese colonies, Venezuela, France and Germany (%), 2001			0.88		
9. Population whose place of work or study is in other parish in the county of residence (%), 2001				-0.88	
10. Population whose place of work or study is in other county (%), 2001.				0.81	
11. Population that use private automobile in the journey to work or study (%), 2001.	0.71				
12. Population that spend more than 30 minute in the journey to work or study (%), 2001.					0.72
13. Illiterate population (%), 2001.	-0.79				
15. Population with at least higher secondary education (%), 2001.	0.88				
16. Unemployment rate (%), 2001.			0.60		
17. Working population (%), 2001	0.67				
19. Family farming population (%), 2001.	-0.85				
20. Farmers 65 and more years old (%), 2001.		-0.50			
21. Farmers that spend up to 50% of their time in farm work (%), 2001.					0.83
22. Farmers whose main source of income is out of agriculture (%), 2001.					0.84
25. Families with two members 15 and more years old, with other two less than 15 years old (%), 2001.		0.81			
26. Families with a mother or a father and with at least one non married child less than 25 years old (%), 2001.	0.57				
27. Families composed only by one or two members 65 and more years old (%), 2001.		-0.74			
28. Households without piped water (%), 2001.	-0.52				
29. Households without piped sewerage (%), 2001.	-0.50				

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[10] By using this statistical model, items (parishes) are classified into various groups or types. The aim is to permit each item (parish) belonging to a specific cluster, to be: similar to other items that also belong to this cluster, and different from other items belonging to the other clusters [9].

[11] The Ward's method includes the calculations of the mean of the variables (factors) for each cluster, the squared Euclidian distance between these means and the values of the variables (factors) for all items (counties), as well as the sum of all these distances for all items (counties). Using this procedure, the Ward's method optimizes the minimum variance within the groups. Thus, the items (parishes) are aggregated in a way that can cause a minimum increase in the value of the sum of the squared errors. In other words, the internal variance is minimized and variance between clusters is maximized. Therefore, clusters are strongly homogeneous internally and strongly heterogeneous externally.

Two methods were chosen to determine the number of clusters to be retained: (i) the coefficients of the agglomeration schedule representing the squared Euclidian distance - the proximity measure selected to agglomerate the clusters; (ii) the differences between these coefficients (fig. 3). According to the two methods, the 6 clusters option was preferred taking into account the accumulated empirical knowledge on this research topic (Maroco, 2003) (fig. 4).
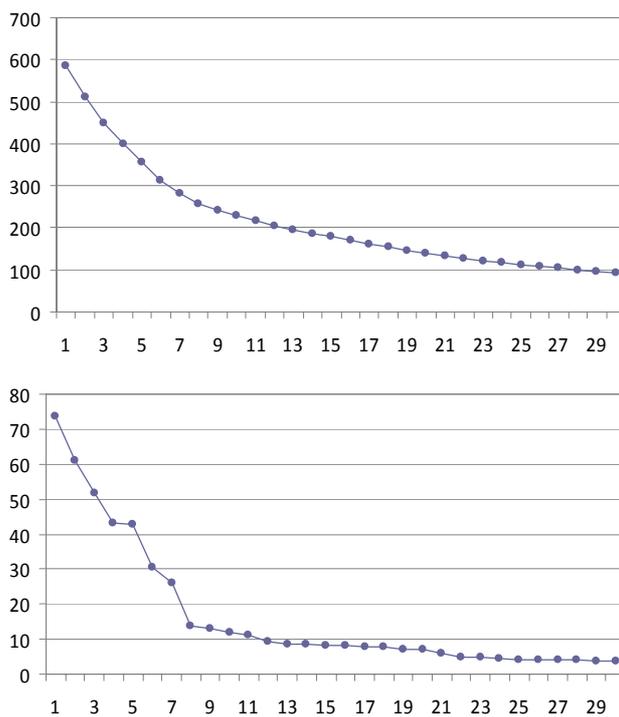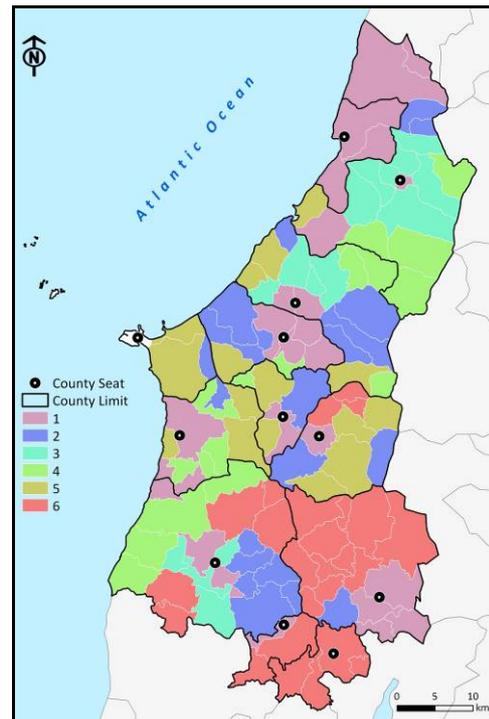

Figure 3: Fusion Graphs.

Figure 4: The Clusters.

THE RESULTS

The main features of sociodemographic sustainability

In **factor 1**, which accounted for 28.5% of the total common variance explained by all the factors, there are seven indicators with high positive values that correspond to different elements of *urbanity* such as, population densities, population with at least upper secondary education, economically active population, daily commuting by private car, recent in-migration from other parishes of the county of residence and single-parent households. On the other side, there were four indicators with high negative values that are related to *rurality* namely, illiterate population, family farm population and households without piped water and/or sewerage.

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Factor 2 that contains 13% of the total common variance is polarized between three indicators with positive signs representing *younger population and families with small children* and three indicators with negative signs corresponding to *older population and families with elder members*, particularly, those living out of agriculture. Again, it seems that there is a distinction between rural areas with ageing population and urban areas with younger population.

Factor 3, which accounted for 10.6% of all common variance, presents two indicators on recent *immigration* of non-Portuguese descendents and the *unemployment rate*. Such relationship between immigration and unemployment shows that immigrants do not compete with nationals in the labour market because they are employed in sectors that do not attract local labour such as agriculture, fisheries and construction.

In **factor 4**, which is responsible for 9.3% of the common variance, there is a polarization between two indicators with positive signs representing *inter-county mobility* (*migration and circulation*) and two indicators with negative signs expressing *intra-county mobility*. Probably the areas where intra-county mobility is important are those with less skilled population that can find employment in the local job market, while inter-county mobility prevails in areas with skilled or highly skilled population, including recent in-migrants, which find employment in the regional urban labour market or in the near Lisbon Metropolitan Area.

At last, in **factor 5** (6.4% of common variance) three indicators with high positive values, related to *pluriactive farming and daily commuting* can be distinguished. Part-time farmers who earn their income out of agriculture, some of them travelling more than half hour to work daily, prevail in these areas.

A spatial typology of sociodemographic sustainability

The parishes that belong to **Cluster 1** present a considerable degree of sociodemographic sustainability, especially in qualitative terms since higher levels of human capital are registered, as expressed by the shares of the population with higher education and of population economically active whose numbers are increased by significant in-migration from other parishes of the county of residence and, especially from other counties. The urbanity features of the parishes are also expressed by the stronger presence of single-parent families and of the private automobile in the journey to work.

The cluster comprises almost all parishes that are county seats or the parishes contiguous to them. Almost all 25 parishes are urban (14) or peri-urban (10) (fig. 5, 6 and 7).
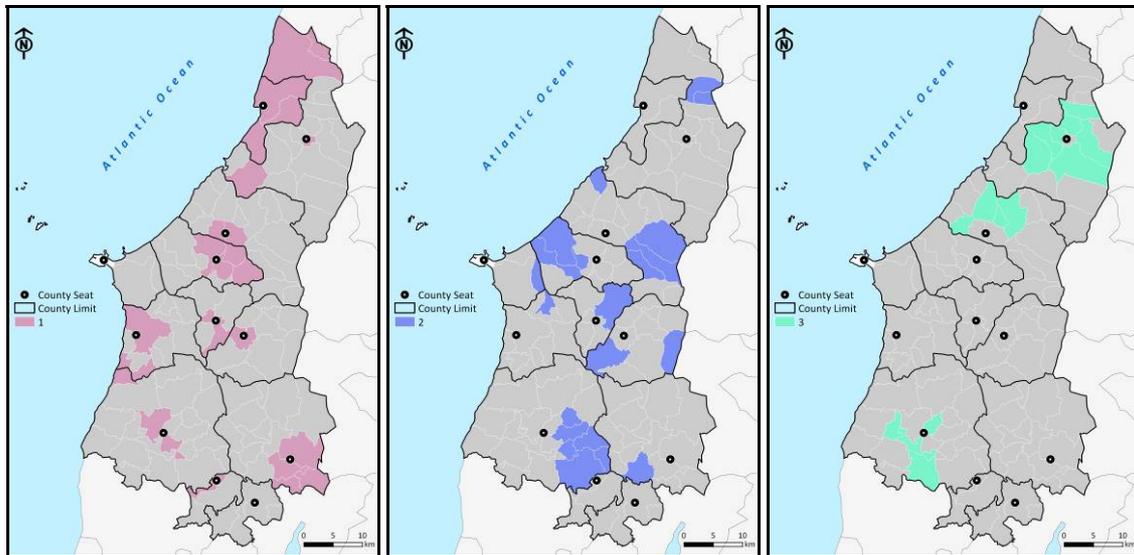

Figure 5: Cluster 1   **Figure 6**: Cluster 2   **Figure 7**: Cluster 3

Cluster 2 consists of parishes with the lowest level of sociodemographic sustainability. It registers the highest share of elder people, particularly farmers, belonging to families without children and living in households without piped water and sewerage. Most of its 21 parishes are rural (16), located in the mountainous or hilly interior of the region and do not belong to any agricultural specialization area (CODES, 2002).

In **Cluster 3**, sociodemographic sustainability depends on intra-county in-migration. However, although the educational and skill levels of the parishes' population are quite significant, an important amount of such human capital does not belong to the local development resource base, since a considerable part of the in-migrants and of the local born population are commuters whose place of work is external to the parish. This type of parish is found in the three counties with the largest urban centres (Caldas da Rainha, Alcobaça and Torres Vedras), near the county seat, where most of the intra-county commuters have their workplace. These parishes are classified as urban (8) or peri-urban (5)

The parishes that belong to **Cluster 4**, register the highest degree of sociodemographic sustainability due to the highest shares of younger population and of younger families. Probably, areas designated as "urbanized" or "urbanizable" in the counties' Spatial

Master Plans are located in these parishes and thus attract young families looking for cheap and/or better housing conditions that were not available in their places of origin.

The majority of the 17 parishes in this cluster are peri-urban (11). They can be found either on the coast or in the interior (fig. 8, 9 and 10). Most of the coastal parishes are within the areas of agro-industrial specialization of horticulture and fruitculture while the larger part of the interior parishes is within the specialization area of the traditional ceramics industry that has been modernized and also of cultural tourism (CODES, 2002).
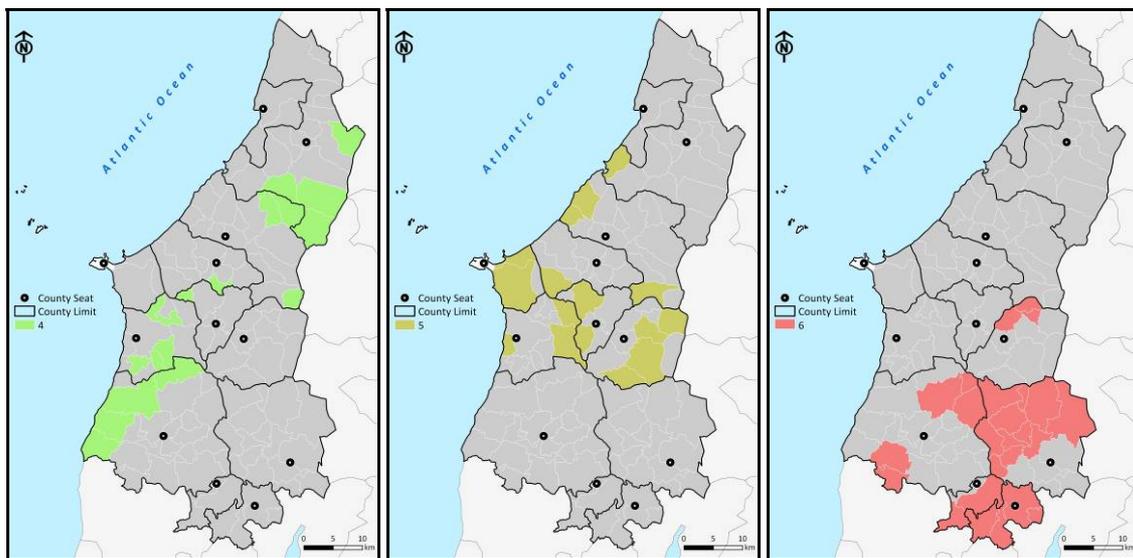

Figure 8: Cluster 4   **Figure 9**: Cluster 5   **Figure 10**: Cluster 6

Cluster 5 is distinguished from the other clusters by its highest share of immigrants who are not descendent from the Portuguese. Most of them are from Eastern Europe and can compensate for the quite weak sociodemographic sustainability of the parishes belonging to this cluster.

Rural parishes (8) located in the interior and peri-urban (7) parishes located mostly on the Atlantic coast are almost equally represented in this cluster. The first group of parishes attracts immigrants to work in agriculture, particularly viticulture where there is lack of labour, while in the second group of parishes immigrants can find jobs in activities where labour demand is much higher than labour offer such as fisheries, in the case of Peniche or, in the case of other coastal parishes, the construction sector that has expanded due to the increasing demand for vacation homes.

Farming pluriactivity characterizes **cluster 6.** Indeed, part-time farming is still an important additional source of income for the population of this group of parishes. A considerable number of members of family farms daily commutes to work to compensate for the low degree of diversification of the local economic base where viticulture predominates (CODES, 2002).

The majority of the 25 parishes of this cluster are classified as peri-urban (16) while almost a fourth is rural. Almost all are located in the southern interior part of the Oeste region, which is within the commuting zone of the Lisbon Metropolitan Area.

CONCLUDING REMARKS

In the majority of the territory of the Oeste region (i.e., two thirds of the parishes) sociodemographic sustainability is guaranteed, at least in the short run. However, there is still a strong dichotomy between urban/peri-urban and rural parishes. Indeed, sociodemographic sustainability is satisfactory in almost all urban and in three quarters of peri-urban parishes, while it is at risk in more than two thirds of rural parishes. However, urban and peri-urban areas differ in the level and way that sociodemographic sustainability is ensured. The quite significant expansion of the daily commuting areas of Lisbon and of the small to medium-sized cities of the Oeste Region has increased the interconnection between these centres and their peri-urban areas. In other words, while employment opportunities continue to be concentrated in the urban areas, population that moved to peri-urban areas and their native population that shifted from the agricultural to the non-agricultural sectors became daily external commuters to those cities. The increase in daily commuting was enhanced by the expansion of the use of private automobiles together with road network improvements. Thus, the mutual influence of the quantitative (i.e, age composition and growth) and qualitative dimensions (i.e. education and skills, activity) could ensure demographic sustainability to this region as a whole.

Thus, the assumption that urban, peri-urban and rural areas differ significantly concerning sociodemographic sustainability was confirmed. This means that such differences have to be taken into account while designing and implementing spatial development policy measures at the local level. The following suggestions of measures could be included in such policy:

- **For urban areas**: (i) incentives to job creation in smaller urban centres that could be an alternative to job concentration in the three main cities of the Region and could aslo prevent further strengthening of diffuse urbanization and industrialization; (ii) institutional support to family households aiming at diminishing the number of single-parent families and, thus preventing social disaggregation; (iii) to expand and/or improve public transports as an alternative to the private automobile in the commuters' journey to work, reinforcing the endogenous human capital base and, in turn, promoting environmental sustainability.

- **For peri-urban areas**: (i) to create mechanisms to control real estate pressure on land use, specially second housing developments, in order to make agricultural and other land uses competitive; (ii) to give incentives to young farmers to invest in competitive agricultural sectors such as horticulture, fruitculture and viticulture; (iii) to create alternatives in the local job market to long-distance commuting to work and thus, promoting the use of the local human resource bases.

- **For rural areas**: (i) to attenuate ageing through the creation of alternative job opportunities to young farm household members, for instance, in rural tourism and in the ceramics industry; (ii) to encourage multifunctional agriculture by means of incentives to farmers to preserve cultural rural landscapes or to invest in organic farming; (iii) in attractive rural landscapes, such the Montejunto Mountain and the Aires and Candeeiros Mountain, to attract second home users in order to help rehabilitate the built heritage as well as to aiming at expanding the local consumption market for goods and services oriented towards older population.

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