Chapter 8 - Macro trends at EU scale

ESPON

TOWN

Small and medium sized towns in their functional territorial context

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This basic report exists only in an electronic version.

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Chapter 8 – Macro trends at EU scale

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1. Aim and research questions

In this chapter we analyse how the grid-based geography of polygons of urban settlements maps over the established NUTS3 geography and how they performed in time.

First we characterise the different NUTS3 according to their typology of settlements, using different factors and thresholds, highlighting their inner distribution of population between different urban settlement types as defined in Chapter 2 of this Scientific Report.

Second we cross-tabulate these typologies with traditional indicators of performance. This will allow us to identify specific territorial trends which can only be gauged when NUTS3 and their characteristics (in terms of membership to ESPON typologies) and socioeconomic performances are analysed in association with their urban settlement structure.

The identification of regions that are predominantly characterised by smaller settlements cannot depict the precise role of an individual SMST, but it indicates the general performance (measured in the timespan of the first decade of 2000s) of a regional context characterised by smaller urban settlements areas as the predominating type) as opposed to regions that are characterised by a higher degree of urbanisation).

This results in a less fine-scale analysis of what will be achieved in Chapter 9 through the analysis of polygons as associated to LAU2 characteristics. Nevertheless, it captures general territorial trends in Europe and within national contexts, and highlights the role of macro regional and/or national-context factors, offering various other advantages:

- It includes the whole ESPON space in this analysis;
- It uses a number of established regional typologies which are only available at NUTS3 level
- By enlarging the scale of the territorial analysis, it achieves a broader insight over main territorial trends in the ESPON space.

Thus, this chapter will be able to address the following research questions:

- How are NUTS3 regions characterized according to the dominating type of population settlements? What is their general distribution over the ESPON space?
- What are the main territorial trends related to regions characterised by SMSTs as prevailing settlements?
- What are the main performances in relation to NUTS3 ESPON typologies?

2. Population settlement classes at the scale of NUTS3 regions

This section illustrates the main results of overlapping grid-based morphologies and different urban settlement types with NUTS3 delimitations, and is primarily concerned with deriving some macro-patterns of distribution of population by settlement type at NUTS3 level. Thus, a first question that arises from the resulting geography construction of SMST polygons is the following:

Can we identify general territorial patterns regarding the presence, distribution and type of SMST throughout the ESPON space?

This question can be articulated in a number of sub-questions which are entry points for the subsequent analysis of territorial systems of SMST and their role and evolution, to be carried out in the next Chapters of this report:

1. Which share of the NUTS3 regions is occupied by urban settlements of different types? What is the composition of the rest of the NUTS3 territory? Are there evident regional variations or territorial patterns of this value?
2. Which share of the population of NUTS3 regions lives in urban settlements of different types? Are there evident regional variations or territorial patterns of this value?

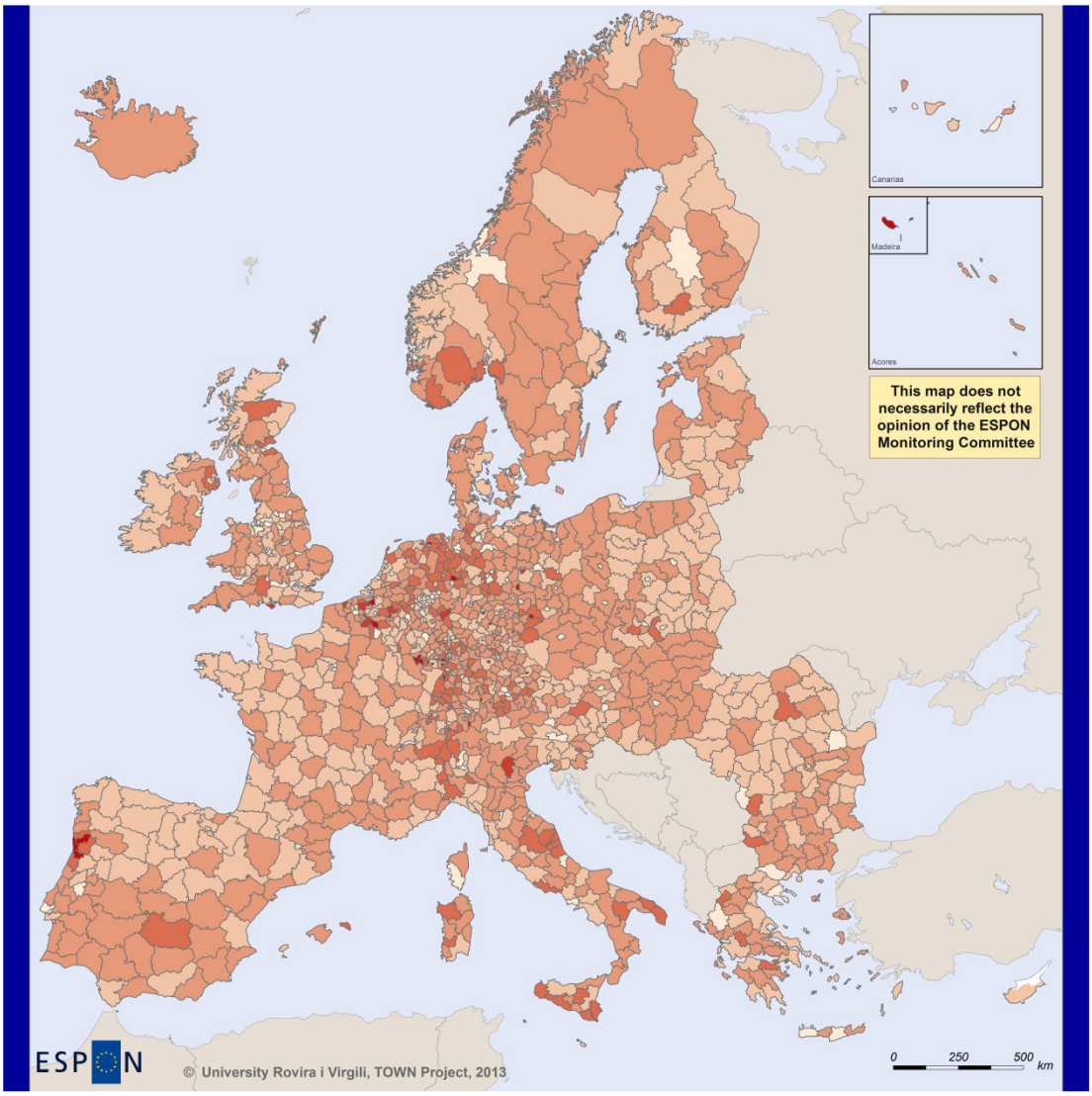
Answers to these questions provide a first step into the analysis of territorial structures, at a more general level, which have been further substantiated through the analysis of governance and functional relations between SMST and between them and larger urban areas.

Thus, we have "transferred" the information regarding grid-based urban settlement polygons to the NUTS3 geography, with the inevitable elements of inaccuracy described above. The calculation of these data involved a rather complex process of estimation using GIS tools, which is subject to an inevitable margin of error. Indeed, we have verified that there is a certain difference between the estimated population of the grids included (completely or in part) in NUTS3 areas and the real population as provided by EUROSTAT. This difference is generally around 1-2% top but in some cases – especially in cases of small NUTS3 areas where there are "more borders" cutting through grid cells and thus a greater estimation error due to the approximation in attributing to bordering NUTS3 areas values of grid cells that are "split" (as in the case of Germany and the UK most notably). Thus they may take on larger values, leading to a sensible under- or over- estimation of the population and population density of polygons (and thus their attribution to one of the different classes that were created).

On these grounds we have calculated a "correction factor" per NUTS3 that is applied to all polygons falling into a given NUTS3 delimitation in order to achieve more realistic estimates of the shares of population (and surface) occupied by the various typologies of urban settlements elaborated in the previous section. We will extend this approach to the LAU2 geography in Chapter 9 of this Scientific Report; however, with a different set of problems involved due to the uneven degree of matching between morphological units and municipal delimitation.

In Maps 1 and 2 we have mapped NUTS3 regions according to the percentage of, respectively, population living in SMST and surface area occupied by SMST polygons in NUTS3 regions. As we can see in the diagrams of Figure 3a and b, the distribution of population shares in SMST is more evenly distributed than that of areas occupied by SMST (urban settlements are relatively "compact" with respect to lower-density and rural settlements but they can accommodate a large share of the population). It must be noted that regions with low values of these indicators should not be understood as relatively de-urbanised, because they may account for larger or lower shares of both HDUC and VST. Thus, high values of the indicators only return geography of regions where the role of SMSTs in urban structures is relatively prominent.

Map 1. Share of regional (NUTS3) population living in SMST polygons



EUROPEAN UNION
Part-financed by the European Regional Development Fund
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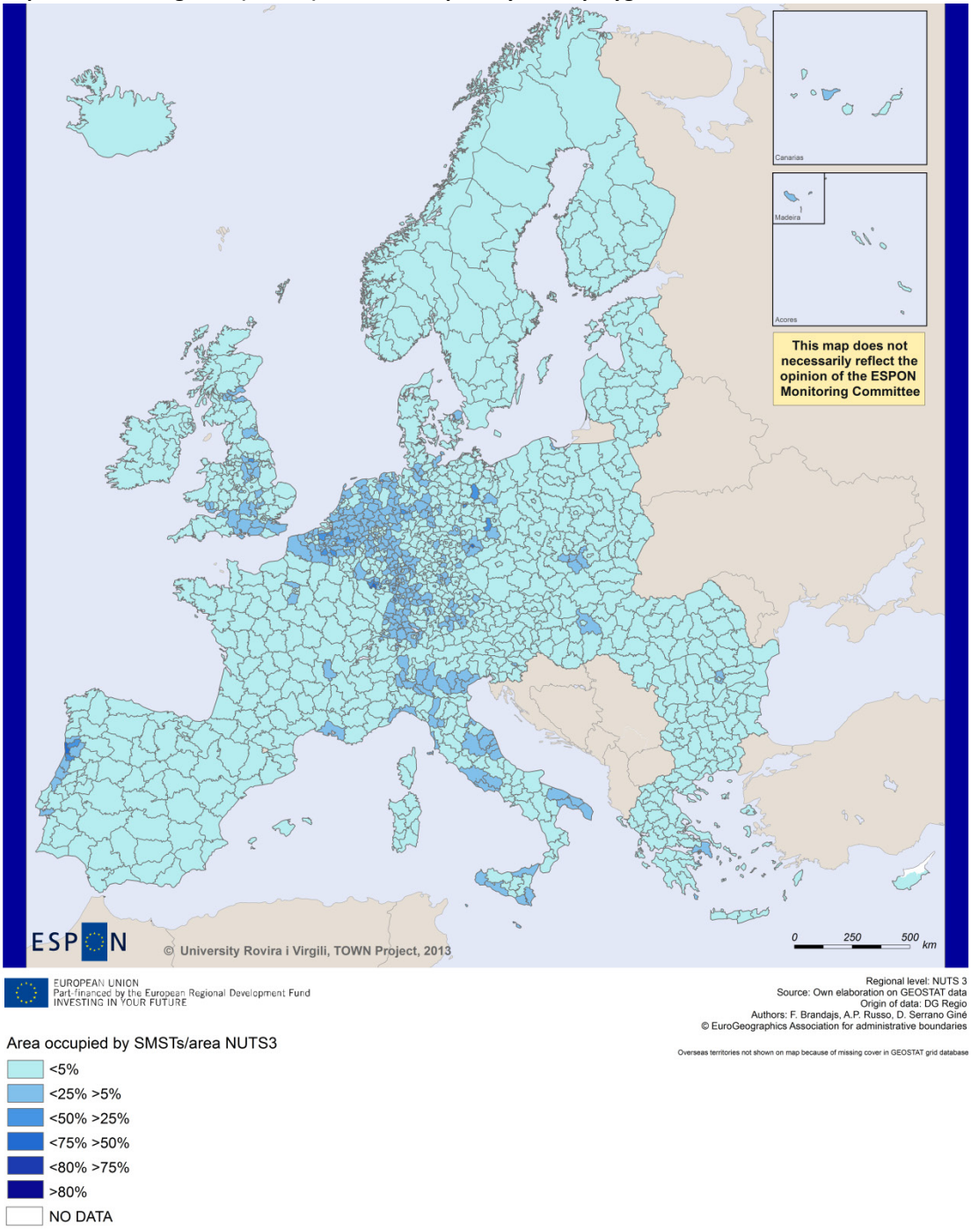
Regional level: NUTS 3
Source: Own elaboration on GEOSTAT data
Origin of data: DG Regio
Authors: F. Brandajs, A.P. Russo, D. Serrano Giné
© EuroGeographics Association for administrative boundaries

Overseas territories not shown on map because of missing cover in GEOSTAT grid database

Population living in SMSTs/population NUTS3

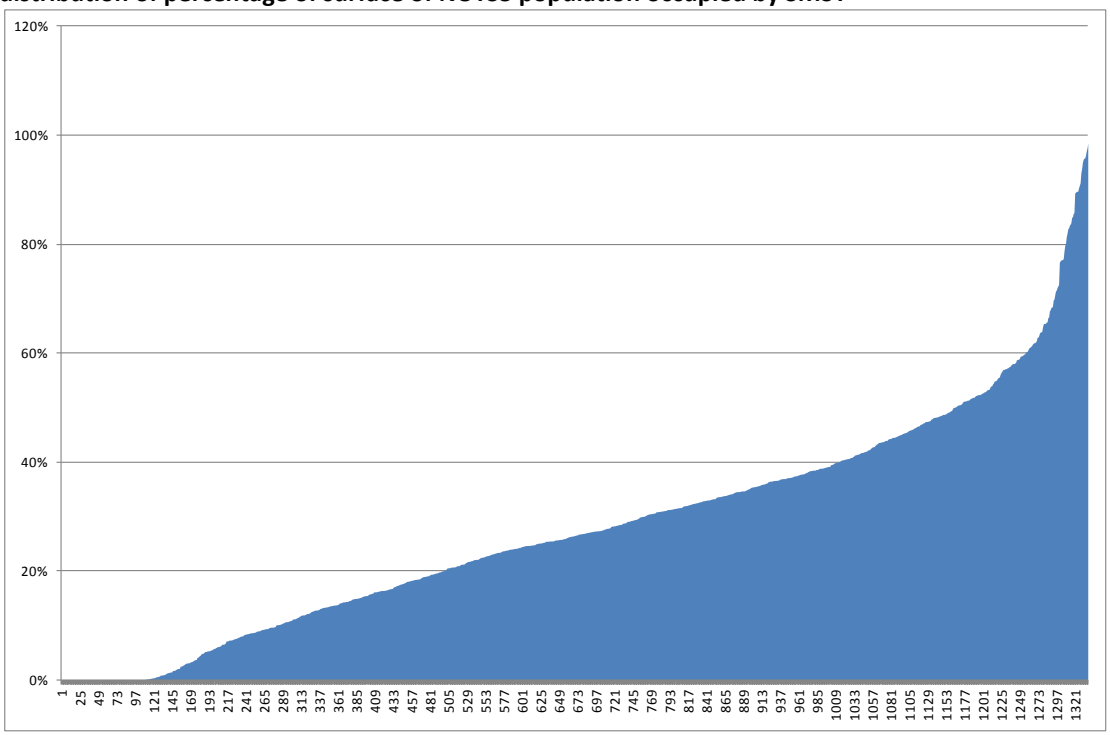
- <5%
- <25% >5%
- <50% >25%
- <75% >50%
- <80% >75%
- >80%
- NO DATA

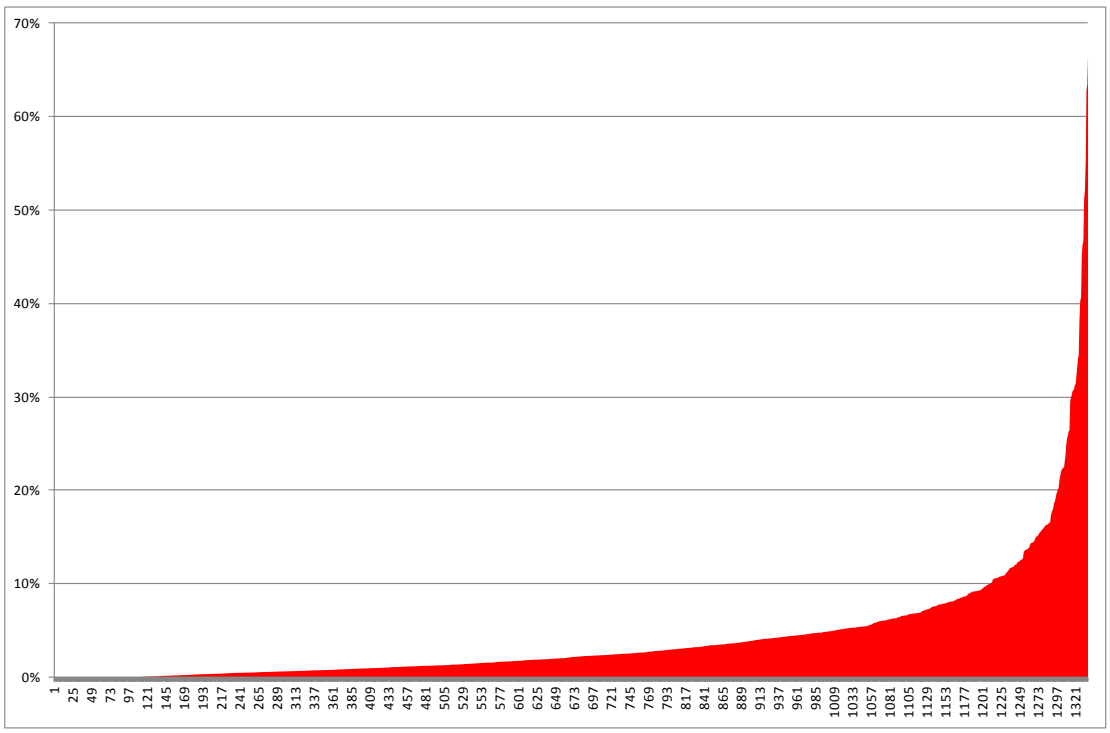
Map 2. Share of regional (NUTS3) surface occupied by SMST polygons



Charting the distribution of such indicators as in Figure 1a reveals that there are 98 NUTS3 regions in Europe that do not include any SMST, and that there are 173 of them where the population living in SMSTs is more than the 50% of the total population; conversely, as can be seen in Figure 1b, only in six of them (five German NUTS3 regions: Passau, Saarbrucken, Kaufbeuren, Wismar, and Chemnitz, as well as the larger Oporto area) the region is occupied by SMST polygons for more than the half of its surface. These cases are in a way exceptional: the SMST polygons that extensively occupy the regions are in some cases predominantly Large SMSTs (with more than 50.000 inhabitants, but with a lower density), which represent the continuum of a core urban area with the surrounding sprawled settlements (e.g. Saarbrucken and Oporto).

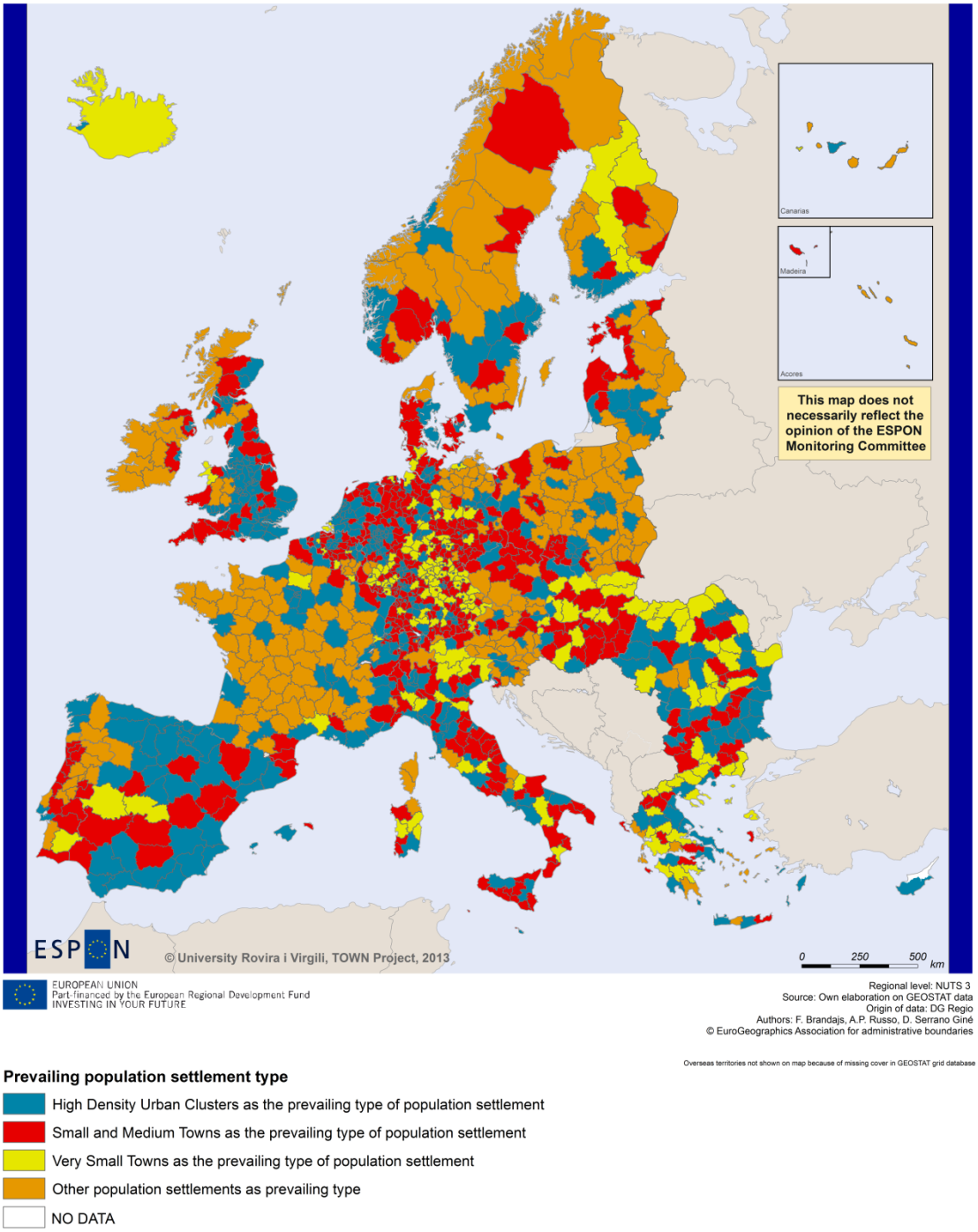
Figure 1 (a) (above): distribution of percentage of NUTS3 population living in SMST; (b) (below): distribution of percentage of surface of NUTS3 population occupied by SMST





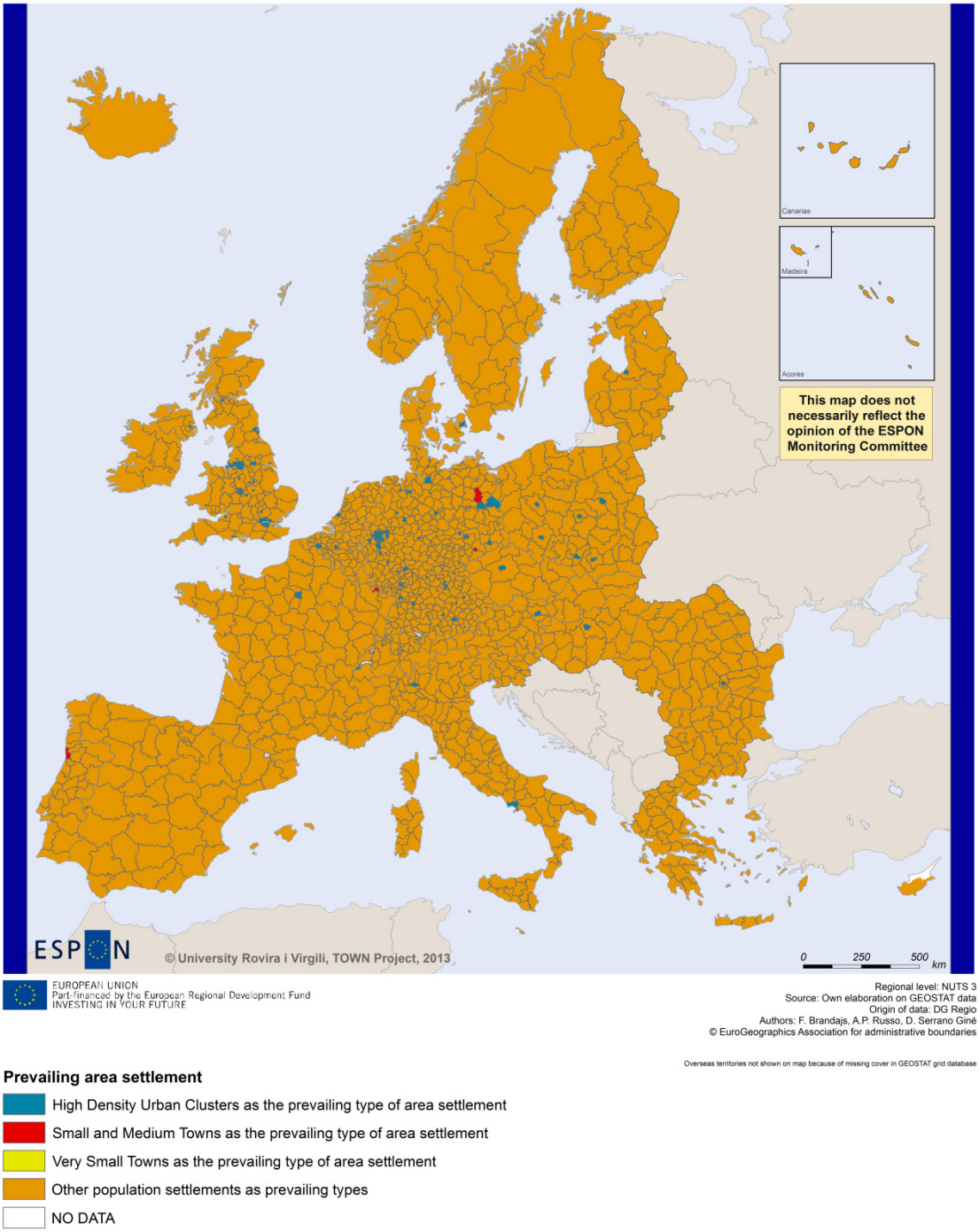
The two synthetic maps that follow chart regional typologies that classify regions according to their prevailing types of settlements distinguishing between 1: SMST; 2: HDUC; 3: VST; 4: other types of settlements. Map 3 refers to population, indicating the type of settlements where the relative majority lives, and Map 4 to surface, indicating which type of settlement occupies the larger share of the regional surface in relative terms.

Map 3. Prevailing type of settlements in terms of population shares in NUTS3 regions



Thus, in a 'representative' NUTS3 region, taking the average values of these two indicators observed across the ESPON space, the SMST, HDUC, VST and the residual 'other settlements' morphological units will respectively host the 28.0%, 31.7%, 19.5%, and 20.8% of the population, and occupy the 4.2%, 10.5%, 3.8%, and 81.4% of the regional surface; that 'average' region will therefore be classified as a region with 'HDUC as predominant population settlement type' (coloured blue) in Map 3 and one with 'Other population settlements as prevailing types' (coloured orange) in Map 4. This is a perfectly plausible situation, given the uneven population densities involved within each class and shown in Figure 1. Indeed, Table 1 below reports the observed dimension of the combinations of the two classification criteria employed in the two maps.

Map 4. Prevailing type of settlements in terms of occupied surface in NUTS3 regions



The comparison of these two maps and the data in Table 1 confirm that while the population settlements models vary considerably throughout the ESPON space, there is only a very limited number of NUTS3 regions where urban settlements (either of the SMST or of the HDUC type) occupy the larger share of the regional space. It must be highlighted that the regional scale influences these results and the degree of correspondence between the two regional typologies illustrated: a very small NUTS3 region occupied almost in its entirety by a HDUC (as it is the case with most capital-city regions) will be classified as HDUC-dominated in terms of both indicators, while if the same HDUC settlement is in a wider NUTS3 region, concentrating most of the regional population in a metropolitan area, that region is likely to be classified as HDUC-dominated in population terms but not in surface terms, as most

probably the greater share of the regional area will be taken up by areas that are outside of the metropolitan settlement.

Table 1. Observed NUTS3 regional classes in terms of settlement types hosting the relative majority of the regional population and occupying the relatively larger share of regional surface

			Predominant settlement type in terms of area covered				
			HDUC	SMST	VST	other settlements	TOTAL
Predominant settlement type in terms of population hosted	**HDUC**	Count	6	0	0	411	417
		% of Total	*.4%*	*.0%*	*.0%*	*30.7%*	*31.2%*
	SMST	Count	1	121	0	397	519
		% of Total	*.1%*	*9.0%*	*.0%*	*29.7%*	*38.8%*
	VST	Count	0	0	0	164	164
		% of Total	*.0%*	*.0%*	*.0%*	*12.3%*	*12.3%*
	other settlements	Count	0	0	0	238	238
		% of Total	*.0%*	*.0%*	*.0%*	*17.8%*	*17.8%*
TOTAL		Count	7	121	0	1210	1338
		% of Total	*.5%*	*9.0%*	*.0%*	*90.4%*	*100.0%*

Only in seven regions SMSTs are prevailing as form of occupation of the space: apart from six German regions (Passau, Kaufbeuren, Oberhavel, Wismar, Saarbrucken, Chemnitz), we find the Oporto region already seen above. As already mentioned above, these are peculiar cases.
Focusing now on the 10 case studies that have been carried out in the TOWN project, Table 2 summarises the settlement characteristics for these 10 case study areas according to these two indicators.

In terms of population shares by settlement, we identify SMST as the prevailing settlement form in

- 3 NUTS3 regions within the case study of Eastern Spain (ES512 Girona; ES522 Castellon; ES533 Menorca);
- 11 regions in Flanders (BE213 Arr. Turnhout; BE221 Arr. Hasselt; BE222 Arr. Maaseik; BE233 Arr. Eeklo; BE234 Arr. Gent; BE235 Arr. Oudenaarde; BE236 Arr. Sint-Niklaas; BE252 Arr. Diksmuide; BE253 Arr. Ieper; BE242 Arr. Leuven; BE258 Arr. Veurne);
- 10 regions in the Italian North West (ITC12 Vercelli; ITC14 Verbano-Cusio-Ossola; ITC15 Novara; ITC16 Cuneo; ITC18 Alessandria; ITC32 Savona; ITC44 Sondrio; ITC47 Brescia; ITC49 Lodi; ITC4A Cremona);
- 2 regions in Slovenia (SI015 Zasavska; SI024 Obalno- kraška);
- 6 regions in the Czech Republic (CZ020 Středočeský kraj; CZ041 Karlovarský kraj; CZ051 Liberecký kraj; CZ052 Královéhradecký kraj; CZ063 Kraj Vysočina; CZ071 Olomoucký kraj);
- 2 regions in Wales (UKL13 Conwy and Denbighshire; UKL14 South West Wales);
- 1 region in the Parisian basin (FR211 Ardennes);
- 2 regions in mid-north Sweden (SE321 Västernorrlands län; SE332 Norrbottens län);
- None in the Central Region of Poland and in Cyprus

Table 2 - Main settlement characteristics of case study regions (SMT and HDUC)

NUTS1 case	Population (2006)	Area sq.km (2006)	n. of NUTS3	% population living in SMST (based on corrected est.)	% area occupied by SMST	n. of NUTS3 regions with SMST as prevailing population settlement	% population living in HDUC (based on corrected est.)	% area occupied by HDUC	n. of NUTS3 regions with HDUC as prevailing population settlement
Flanders (BE2)	6,098,000	13,569.5	22	38.0%	16.0%	11	41.4%	13.0%	10
Wales (UKL)	2,966,400	20,817.7	12	26.2%	2.6%	2	49.9%	3.6%	7
East (ES5)	12,711,000	60,456.8	10	19.9%	1.9%	3	63.4%	2.5%	7
Czech Republic (CZ0)	10,269,100	78,820.0	14	26.9%	2.3%	6	31.7%	1.7%	4
France Region Centre (FR2)	10,658,099	146,689.6	22	20.0%	1.0%	1	20.8%	0.5%	5
North West (ITC)	15,585,440	57,978.0	25	20.6%	4.0%	10	58.8%	6.1%	12
Northern Sweden (SE3)	1,705,200	313,436.5	7	34.1%	0.2%	2	11.1%	0.03%	0
Cyprus (CY0)	772,500	9,368.0	1	14,7%	0,8%	0	47,9%	1,7%	1
Slovenia (SI0)	1,705,200	20,331.2	12	25.6%	1.5%	2	26.6%	1.1%	2
Central Region (PL1)	7,736,600	53,804	11	14.6%	1.2%	0	49.0%	2.1%	5

Table 2 (cont.) - Main settlement characteristics of case study regions (VST and other settlements)

NUTS1 case	% population living in VST (based on corrected est.)	% area occupied by VST	n. of NUTS3 regions with VST as prevailing population settlement	% population living in OTHER SETTLEMENTS (based on corrected est.)	% area occupied by OTHER SETTLEMENTS	n. of NUTS3 regions with OTHER SETTLEMENTS as prevailing population settlement
Flanders (BE2)	9.1%	6.4%	1	11.5%	64.6%	0
Wales (UKL)	9.7%	2.0%	2	14.2%	91.8%	1
East (ES5)	7.7%	2.2%	0	9.1%	93.4%	0
Czech Republic (CZ0)	20.6%	4.4%	1	20.8%	91.6%	3
France Region Centre (FR2)	22.1%	2.6%	1	37.0%	95.9%	15
North West (ITC)	11.4%	4.3%	2	9.2%	85.6%	1
Northern Sweden (SE3)	16.7%	0.1%	0	38.1%	99.7%	5
Cyprus (CY0)	0.5%	0.1%	0	36.9%	97.4%	0
Slovenia (SI0)	16.7%	3.1%	0	31.1%	94.3%	8

Central Region (PL1)	7.0%	1.9%	0	29.3%	94.8%	6

The classification criteria used in Maps 3 and 4 provides a broad illustration of the overall territorial trends associated with the structure of population throughout the ESPON space, highlighting the diversity of degrees of concentration in population structures (and also in physical terms) in different areas.

Yet they are not useful in analytic terms for what follows in this and subsequent chapters, because they hardly allow to grasp what is the overall weight of small and medium sized towns within NUTS3 and thus to assess the performance of regions characterised in this sense compared to others, and most significantly those in which the population is mainly concentrated in High Density Urban Clusters.

Thus, we now introduce a more simplified, 'operational' classification of regions by prevailing settlement types, in line with the 'degree of urbanisation' criterion used by DG Regio and OECD (cf. Chapter 2 of this Scientific Report). This classification identifies which regions are definitely 'non urban'; we have used an arbitrary threshold in this sense, dividing regions in three classes:

- Regions where **less than the 30% of the population lives in HDUC**; thus, more that 70% of population lives in smaller population settlements, including – but not exclusively – SMST. They give us the possibility to observe some regional dynamics that characterise smaller settlements;
- Regions where **more than the 70% of the population lives in HDUC**, thus they are mostly 'urban';
- Regions where the **HDUC population is between 30% and 70%** - thus regions that do not have a well-defined population structure by type of settlement and thus we cannot make any considerations on the role of SMSTs and their performances.

This classification, in other words, allows us to focus in Section 3 of this Chapter on regions that are *more likely* to be characterised by a prevalence of smaller settlements; assess them in terms of their correspondence with established ESPON typologies, so as to gauge more insights on geographical and socioeconomic types that are more likely to be associated with this kind of population structure; and eventually assess their performance (also along ESPON typology classes) comparing it with that of regions that are characterised by a higher degree of urbanisation.

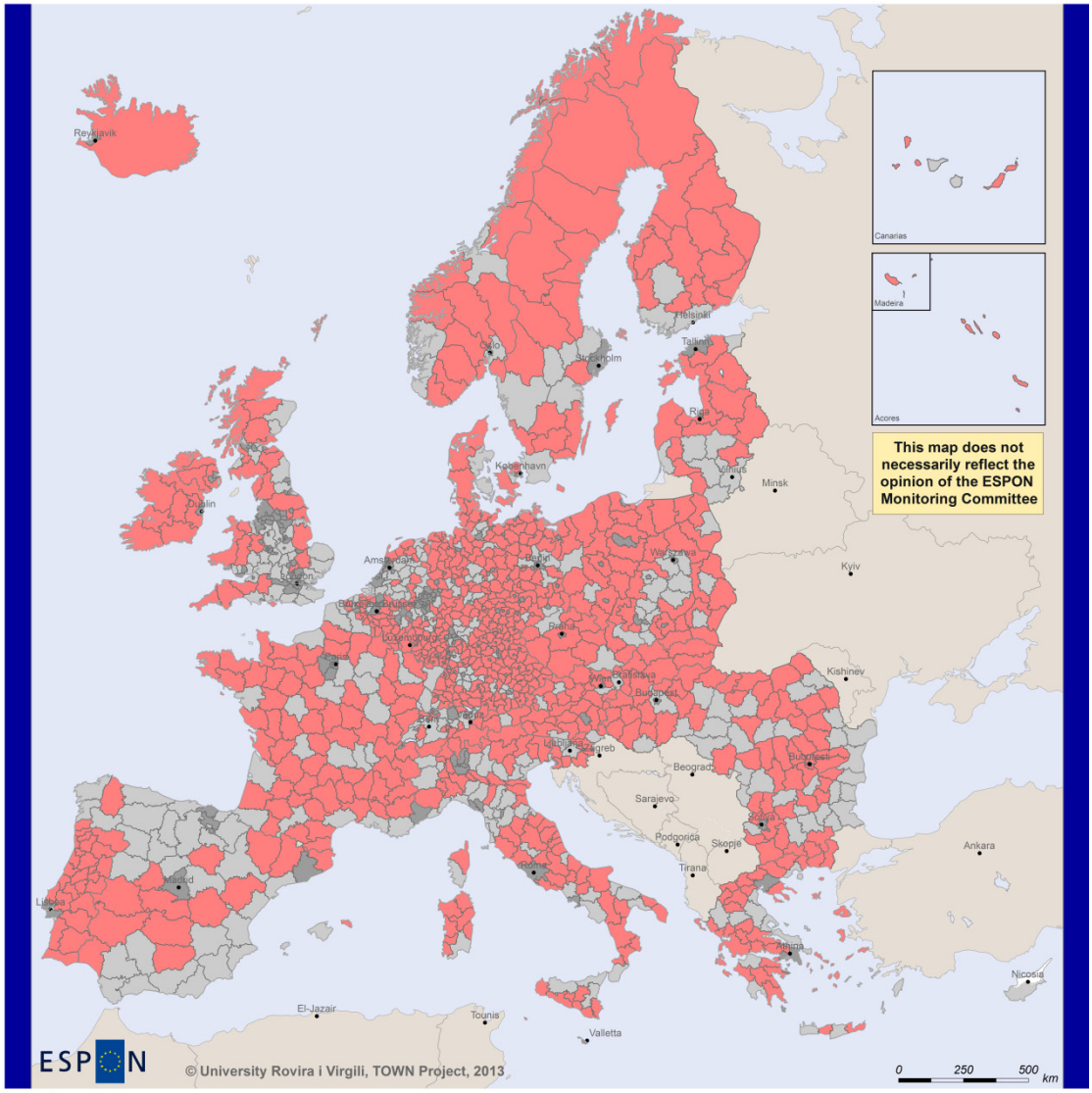
As we see in Table 3, the majority of NUTS3 regions is included in the category of having less than the 30% of the population in 2006 living in urban settlements that are not HDUC. The country data illustrate how many of the NUTS3 regions within that country have a population structure fitting the three classes introduced here; only in Cyprus, Spain, Lithuania, the Netherlands and the UK most NUTS3 regions have a higher degree of urbanisation than that of our basic 'less urban' type.

Table 3 - Degree of urbanisation at NUTS3 level

Country	Predominant settlement type in terms of population hosted						
	LOW DEGREE OF URBANISATION (Pop in HDUC 2006 < 30%)		INTERMEDIATE DEGREE OF URBANISATION (Pop 2006 in HDUC 30%-70%)		HIGH DEGREE OF URBANISATION (Pop 2006 in HDUC > 70%)		Total
	Count	*Country %*	Count	*Country %*	Count	*Country %*	Count
AT	27	*77.1%*	6	*17.1%*	2	*5.7%*	35
BE	31	*70.5%*	7	*15.9%*	6	*13.6%*	44
BG	14	*50.0%*	13	*46.4%*	1	*3.6%*	28
CH	13	*50.0%*	9	*34.6%*	4	*15.4%*	26
CY	0	*.0%*	1	*100.0%*	0	*.0%*	1
CZ	10	*71.4%*	3	*21.4%*	1	*7.1%*	14
DE	260	*63.1%*	50	*12.1%*	102	*24.8%*	412
DK	6	*54.5%*	3	*27.3%*	2	*18.2%*	11
EE	3	*60.0%*	1	*20.0%*	1	*20.0%*	5
EL	37	*72.5%*	12	*23.5%*	2	*3.9%*	51
ES	20	*33.9%*	33	*55.9%*	6	*10.2%*	59
FI	15	*78.9%*	4	*21.1%*	0	*.0%*	19
FR	63	*65.6%*	25	*26.0%*	8	*8.3%*	96
HU	15	*75.0%*	4	*20.0%*	1	*5.0%*	20
IE	7	*87.5%*	0	*.0%*	1	*12.5%*	8
IS	1	*50.0%*	0	*.0%*	1	*50.0%*	2
IT	62	*56.4%*	37	*33.6%*	11	*10.0%*	110
LI	1	*100.0%*	0	*.0%*	0	*.0%*	1
LT	4	*40.0%*	6	*60.0%*	0	*.0%*	10
LU	1	*100.0%*	0	*.0%*	0	*.0%*	1
LV	5	*83.3%*	0	*.0%*	1	*16.7%*	6
MT	1	*50.0%*	0	*.0%*	1	*50.0%*	2
NL	11	*27.5%*	18	*45.0%*	11	*27.5%*	40
NO	14	*73.7%*	4	*21.1%*	1	*5.3%*	19
PL	40	*60.6%*	16	*24.2%*	10	*15.2%*	66
PT	28	*93.3%*	0	*.0%*	2	*6.7%*	30
RO	26	*61.9%*	15	*35.7%*	1	*2.4%*	42
SE	14	*66.7%*	6	*28.6%*	1	*4.8%*	21
SI	9	*75.0%*	3	*25.0%*	0	*.0%*	12
SK	7	*87.5%*	1	*12.5%*	0	*.0%*	8
UK	33	*23.7%*	38	*27.3%*	68	*48.9%*	139
TOTAL ESPON SPACE	**778**	***58.1%***	**315**	***23.5%***	**245**	***18.3%***	**1338**

Map 5 illustrates the result of this classification. We purposefully highlight Class 1 regions characterised by a prevalence of smaller population settlements.

Map 5. NUTS3 Typology based on degree of urbanisation



The map above indicates the regions in which there is a prevalence of population living in "smaller settlements". When compared to Map 3, it reflects under this broad category almost precisely the three types of regions in which the prevailing population settlement in Map 3 was not HUDC: SMST, VST and 'Other' ones. The aggregation of these categories offers the opportunity to compare them with other ESPON types, and their relative performance in terms of basic indicators such as population growth and GDP.

Of course, it also shows the approximation of this aggregation. For instance, a region with prevailing smaller settlements of about 500,000 inhabitants may be constituted by 150.000 inhabitants living in one or two HUDCs (e.g. 1 cities of 90,000 inh. and another of 60,000 inh) integrated in a regional context in which 350,000 inhabitants may live in 7-8 SMSTs (e.g. for

a total amount of 250,000 inh.), and in about 100 VSTs or other settlements (about 100,000 inhabitants). In this case, the roles of smaller settlements - or of the two large cities (HUDCs) - within the general regional data cannot be ascertained. Still, the prevailing presence of SMSTs and VSTs offers a good approximation of the general conditions of those smaller settlements in that region.

A few broad trends in the EU territory could be highlighted. Spain and Romania are countries with a relatively high degree of concentration of population in HDUC. In general, regions along the coasts are more likely to register a higher degree of urbanisation, and in particular those on the Western Mediterranean arc, the south-east of England, and along the Black Sea; of course metropolitan regions follow the same trend, especially in large parts of England, Flanders in Belgium, the Netherlands, and Northern Italy. On the contrary, in France, most of the central and eastern regions are characterised the dominance of the smaller urban scales. The Scandinavian and Finnish regions present similar and even more radical conditions, with their sparsely populated and very large NUTS3 regions.

It is interesting to notice here the difference with the fine-grained identification of settlements in the morphological maps. There, a strong presence of SMSTs were identified in a central sector going from the south of England throughout the Benelux and the West of Germany to Italy, with other "clusters" in the industrial belt of South-Eastern Germany and Poland, and along the whole Western Mediterranean arc from Spain to Italy (see Ch. 2). Nevertheless, the NUTS3-based representation confirms the statistical outcome of Ch. 2, in which it was possible to distinguish three main types of national urban settlement structures:

- Countries with a neat prevalence of urbanised population, clustered in high-density urban centres, as Belgium, Switzerland, Greece, the Netherlands, Spain, the UK, as well as smaller island states as Malta and Cyprus;
- Countries with an overrepresentation of population living in smaller settlements, like France, Ireland, Lithuania, Luxembourg, Norway and Slovakia.
- All other countries, showing with a more balanced repartition of population between classes of high-density urban clusters and small and medium towns, like Austria, Bulgaria, the Czech Republic, Denmark, Estonia, Latvia, Poland, Portugal, Romania, Sweden and Slovenia.

In this respect, the different historical circumstances of the urbanisation process in each country in the last century – associated to each different socio-administrative institutional framework – prove to be relevant (Antrop, 2000; Jordan-Bychkov & Bychkova Jordan, 2002; Hohenberg & Lees, 1995; Pumain, 2000). It is the case of the different structures in neighbouring countries such as France, with its prevailing mono-centricity, and other countries with an historical polycentric structure such as Italy and Germany. At the same time institutional arrangements, land use policy (Newman & Thornley, 1996) and growth pressure on settlements provoke changes that can be readable also within the same country, such in the case of Belgium with a strong difference of urban patterns between Flanders and Wallonia (Antrop, 1997; Camagni & Salone, 1993; Vasanen, 2012).

3. Territorial trends

3.1 Geographical and socioeconomic specificities of NUTS3 regions characterized by different structures of urban settlements

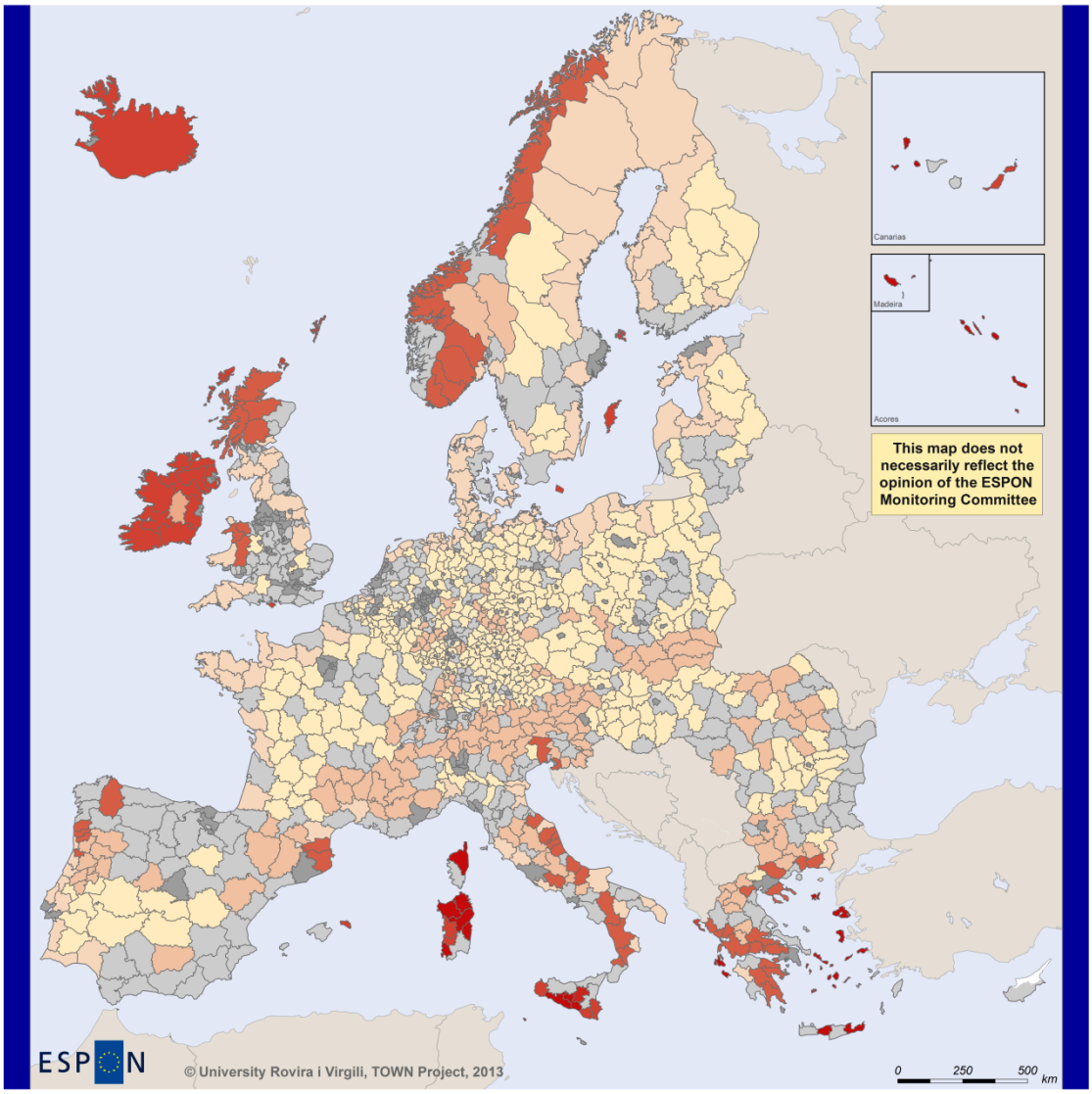
In this section, we further explore the urban settlement structure of Europe. A first question regards the degree to which the characterization of regions as "non metropolitan" as having less than 30% of the population living in HDUC is associated to ESPON typologies of geographic specificity and socioeconomic status, and the emerging territorial trends in such association.

The first aspect we take into consideration is how much low degrees of urbanization are recurrent in regions characterized as coastal, insular and mountainous. Map 6 returns the overall matching of the TOWN typology introduced in the previous section (Map 5) with these three ESPON geographical typologies, reduced to the binary of being or not being included in those (thus bundling all specificities of coastal, island and mountainous regions in single classes).

The map illustrates a high level of coincidence between the urban structure and these territorial features. As confirmed by the analytics in Tables A1-A3 in the Annex 1 to this chapter, all three geographical specificities are associated with a low degree of urbanization, though only in the case of mountain regions this association is statistically significant (χ^2 test < 0.05). Mediterranean coasts (especially the Western Mediterranean arc) are on the whole highly urbanized.

The second group of characteristics that we take into consideration regard the aspect of being a border region (internal and/or external) and an outermost region. Map 7 and the analytics of Tables A4-A5 in the Annex 1 illustrate the association of these characteristics with a low degree of urbanisation. It results that while the association with outermost regions is not statistically significant, border regions of both types do tend to be characterised by a low degree of urbanisation. The result for the regions on the external border is not that surprising as they largely coincide with sparser population regions especially on the eastern EU border, but the result for internal border regions is particularly inspiring.

Map 6. Typology based on degree of urbanisation and ESPON geographical specificities



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Regional level: NUTS 3
Source: Own elaboration on GEOSTAT data and ESPON 2013 data
Origin of data: DG Regio; ESPON 2013
Authors: F. Brandajs, A.P. Russo, D. Serrano Giné
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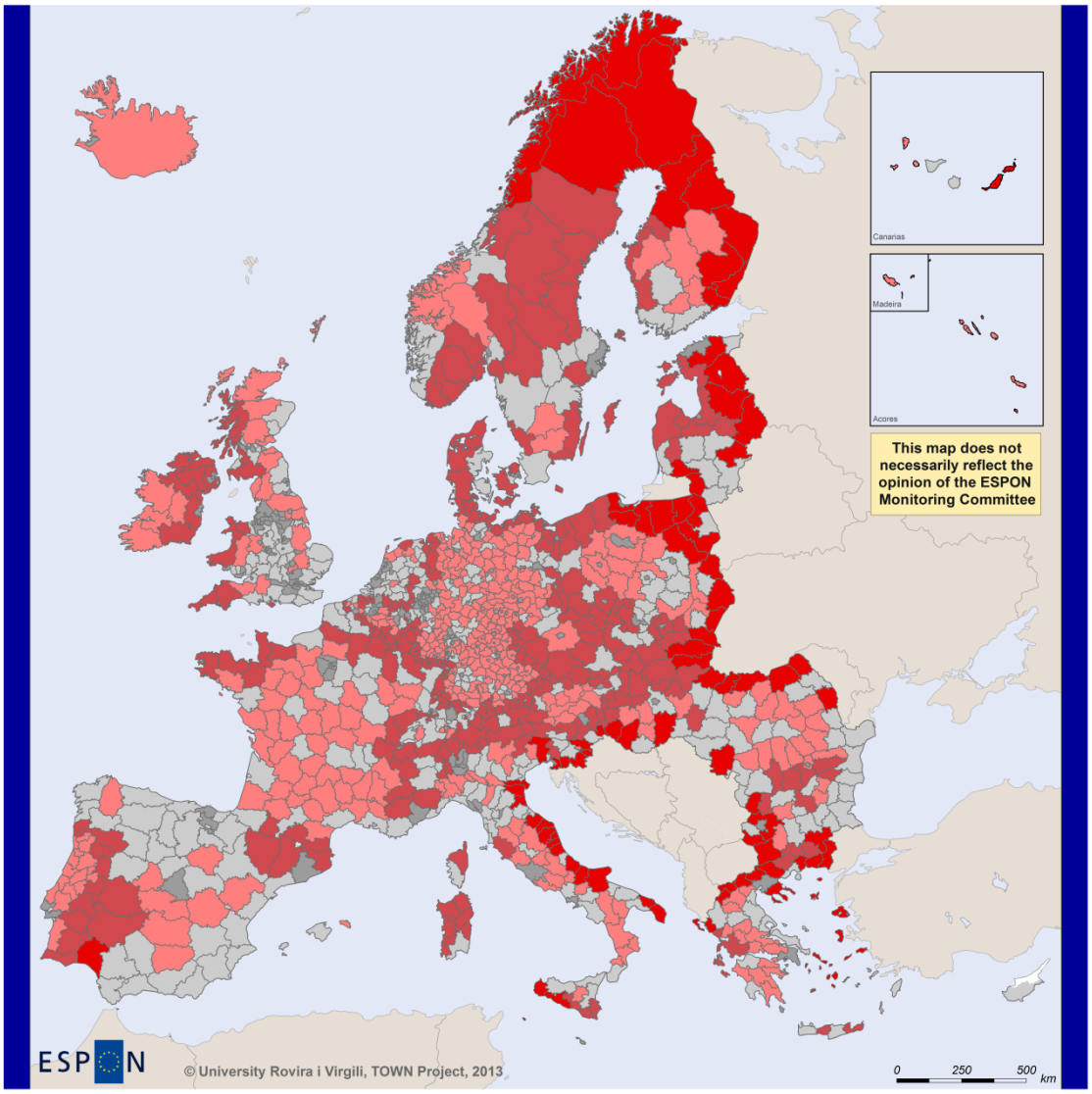
Overseas territories not shown on map because of missing cover in GEOSTAT grid database

Typology based on degree of urbanisation and ESPON geographical specificities

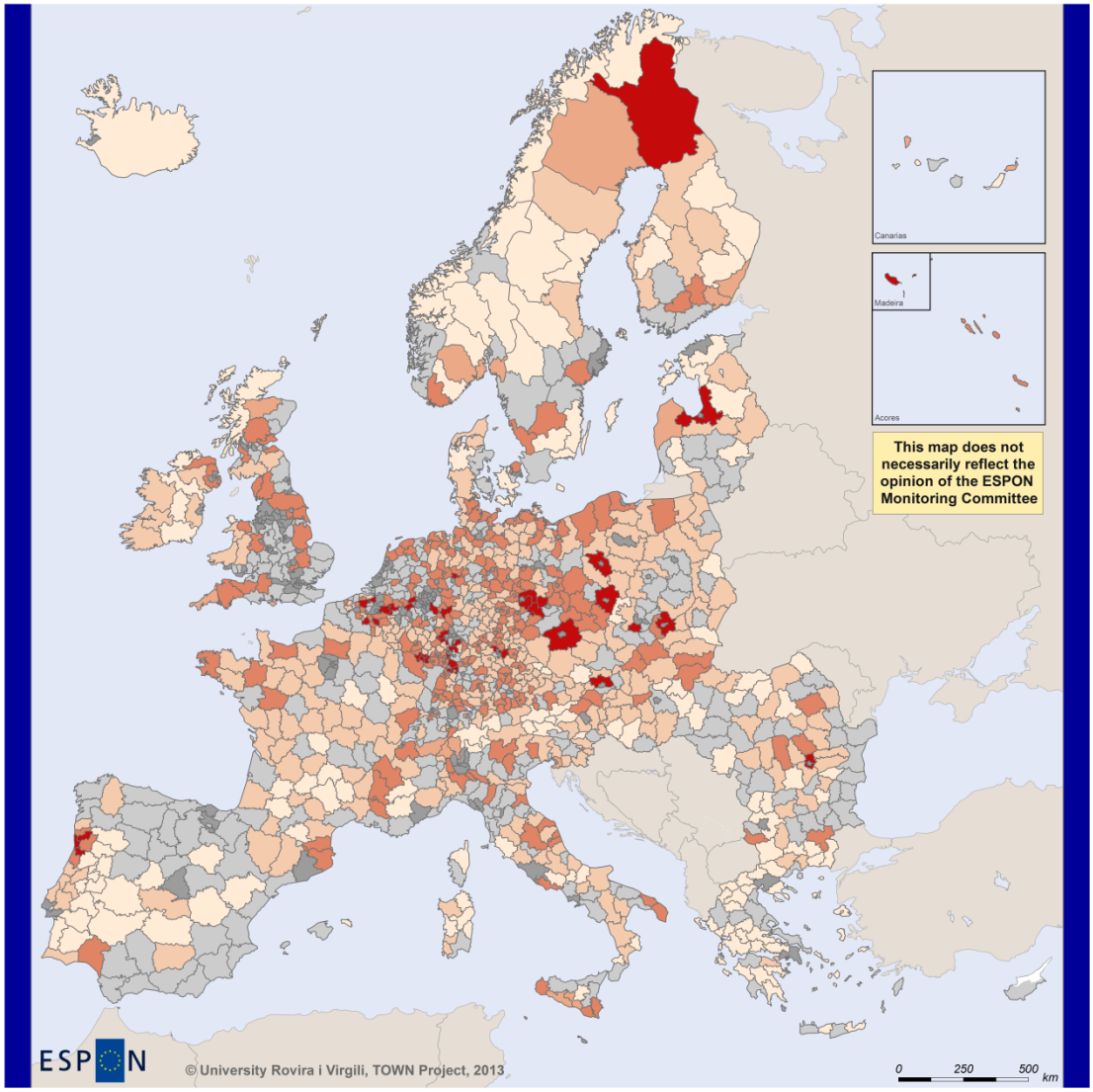
- Population (2006) living in HDUC < 30% and coastal region
- Population (2006) living in HDUC < 30% and mountanous region
- Population (2006) living in HDUC < 30% and island region
- Population (2006) living in HDUC < 30% and coastal region /mountanous region
- Population (2006) living in HDUC < 30% and coastal region/ island region
- Population (2006) living in HDUC < 30% and mountanous region / island region
- Population (2006) living in HDUC < 30% and coastal region/ mountanous region/ island region
- Other regions with Population (2006) living in HDUC < 30%
- Population (2006) living in HDUC 30%-70%
- Population (2006) living in HDUC > 70%
- NO DATA

Map 7. Typology based on degree of urbanisation and ESPON geographical specificities



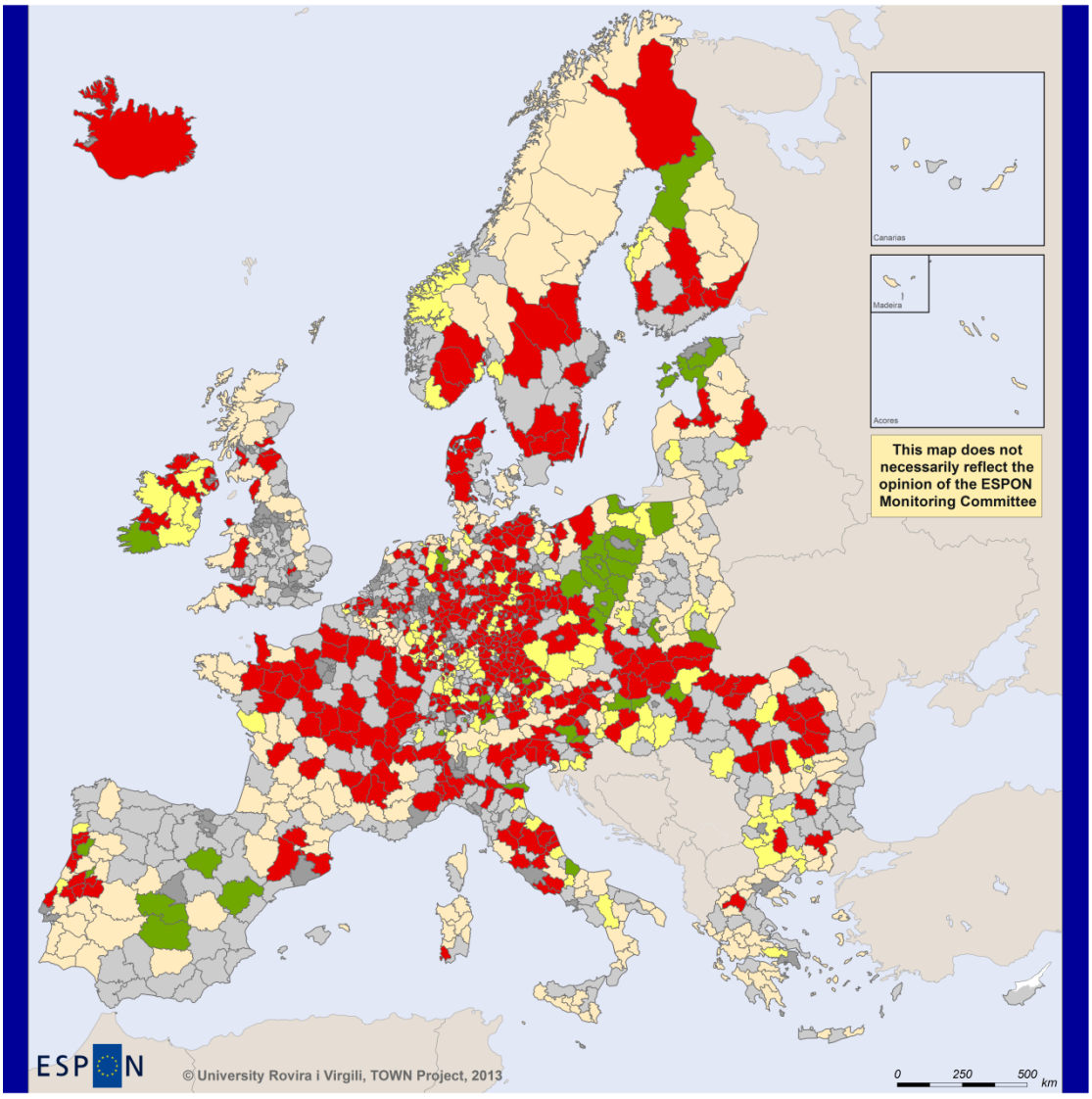
Next we look at the association of a low degree of urbanisation with the ESPON typology of urban-rural regions. While the association is to some degree built-in in the way our typology has been defined, it is still interesting to note (as in Map 8 and in the analytics of Table A6 in the Annex 1) that low degrees of urbanisation positively associate with all classes of non-urban regions except that of intermediate regions close to cities.

Map 8. Typology based on degree of urbanisation and ESPON urban-rural typology



Finally, we checked the relation between a low degree of urbanisation and an index of economic performance such as the ESPON typology of regions in industrial transition. Map 9 illustrates the results, and Table A7 in the Annex 1 the analytics. The association proves to be significant, however while it might be expected that lower degrees of urbanisation would go inversely hand in hand with industrial strength, closer inspection of the statistical tests in Table A8 show a slight underrepresentation of regions characterised by a lower degree of urbanisation among 'regions with industrial branches losing importance', and, conversely, their overrepresentation among 'regions with industrial branches gaining importance'.

Map 9. Typology based on degree of urbanisation and ESPON typology of regions in industrial transition



This result presents a double face. On the one hand, and in absolute terms, the overall picture of EU regions (Map 9) indicates the extension of regions with smaller settlements that present industrial branches losing importance (with the caveat of using an indicator of 2006, thus even before economic crisis). In this sense, the large majority of regions characterised by negative trends provides a warring message, because regions with smaller settlements may be more vulnerable when facing changes in their industrial structure.

On the other hand, and within the general European trend, the relative comparison between region with smaller settlements and region with bigger urban areas gives more articulated

results, with interesting insight regarding the flexibility of industrial structures in the former. In spite of the fact that it is customary to associate innovation and economic change with large scale urbanisation, less urbanised regions seem to perform better than 'intermediate' regions (in terms of urbanisation structure) in relative terms. This could be interpreted as an interesting trade-off effect between economic and population factors behind the viability of industrial transformation processes. It also emerges that the positive association with industrial change regards especially lower urbanised regions in the periphery of Europe, and specifically some regions in Portugal and Spain, the whole west of Poland, some region of Hungary, Slovakia, Estonia, central Finland, and central Italy.

3.2 Performance of NUTS3 regions characterised by different structures of urban settlements

The next step in this analysis focuses on the performance in terms of population and per capita GDP growth of regions characterised by different "degrees of urbanisation" as set out in the typology of Map 5. The growth rates are generally calculated over the 2001-2011 period, and p.c. GDP is considered in current market prices[12]. Performances are expressed both in terms of deviations from the EU average (in order to capture macro-trends over the ESPON space) and in terms of deviations from the national average, in order to capture finer scale phenomena independently from the overall national scores.

This analysis complements the one that will be performed using performance data at the LAU2 scale in Chapter 9, in that it picks 'scores' of regions characterised by specific urbanisation structures, albeit at a grosser scale (urbanisation structured being 'roughed up' at the regional level as illustrated earlier, similarly to performance data which are also regional), but making it possible to cover the whole ESPON space and not just the area covered at case study level in our project.

Population growth in comparison with EU and national averages

Starting with Map 10, this nuances the dominance of a territorial trend characterized by a shift of population from the East and the North to South and the West of Europe (or high out-migration rate of the former, and high in-migration rate of the latter) that affects all types of regions. This trend, already identified in the ESPON ATTREG project (Russo et al., 2012) for the period 2000-2006, is thus confirmed, albeit a more moderate effect emerges in the last part of the decade. It is possible to imagine that the financial crisis that affected in particular some of the booming – and most attractive – regions played a role in smoothing down such strong migratory trend (cf. ESPON (2013) Evidence Brief on post crisis migration trends). In fact, the general trend of population growth in most of the EU-15 countries has few exceptions such as those areas affected by long-term economic downturns (ie. the Italian Mezzogiorno).

[12] Using Purchase Parity Standard (PPS) per capita GDP would have produced more significant and comparable results especially at the global EU level. However, the possibility of using the EUROSTAT PPS data sets (as we did in intermediate deliveries) is compromised by the existence of important data gaps in the time series 2001-2011, and the difficulty of recalculating such indicator to account for NUTS3 boundary shifts that were introduced with the 2010 NUTS3 edition.

Map 10 - NUTS3 Typology 3A. Type of predominating settlement * pop. growth (dev. from EU average)

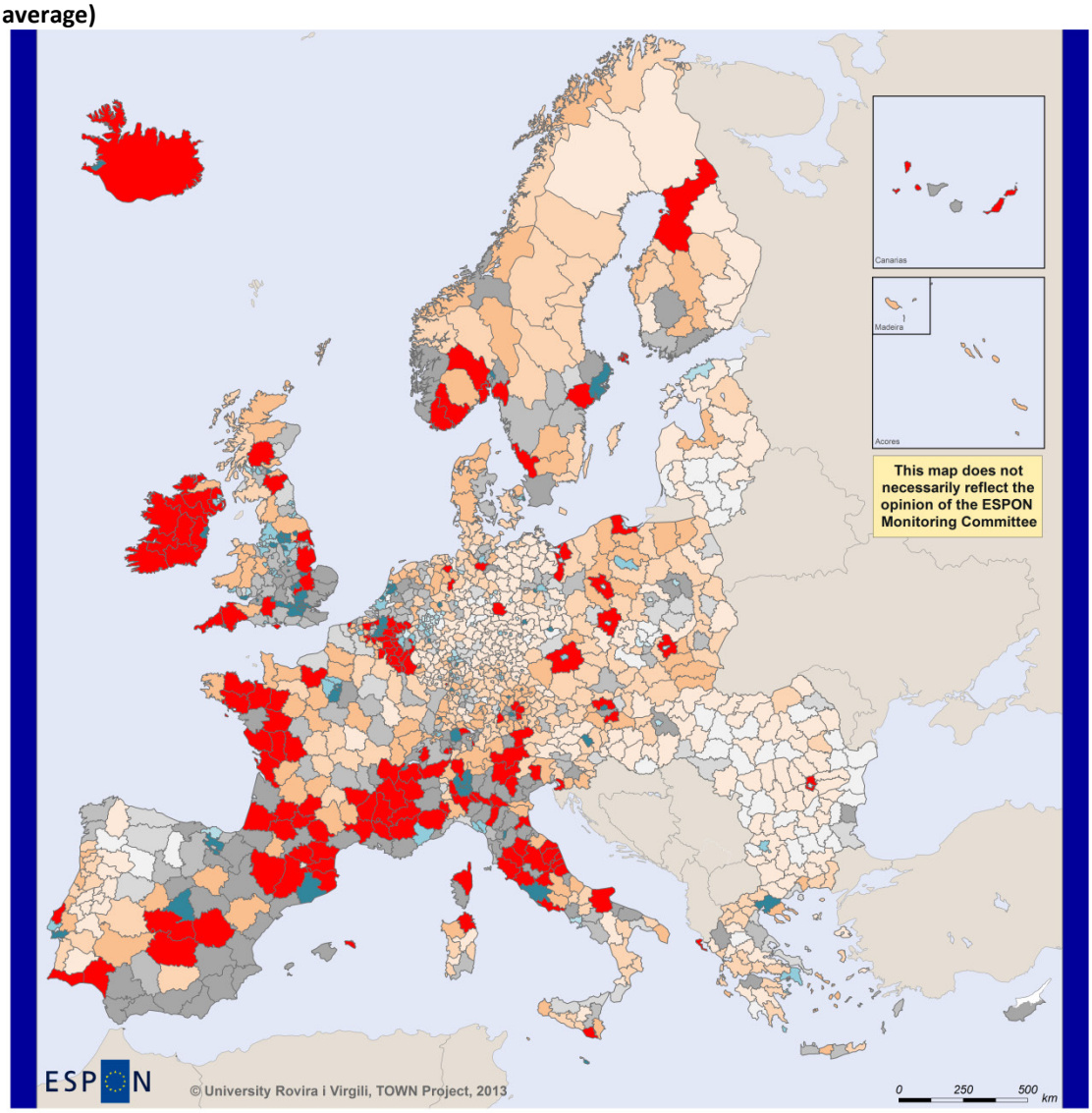


Table 4 illustrates how regions characterised by a lower degree of urbanisation grew at an average rate of 0.55%, which is a much lower rate lower than that of both highest urbanised regions (3.38%) and intermediate regions (3.84%). In terms of deviations from the EU-27 average, they grew significantly less than the two other groups, as proved through a one-way ANOVA test of differences (Table A11 in the Annex). This also got combined with the

decrease of intensity of the exceptional interregional migration within the EU that took place after the EU enlargement in 2004. Thus if counter-migration has been triggered by the crisis in some 'overheated' areas, it is a process that in most regions has not be able to invert the overall balance in the whole 2001-2011 period.

Table 4 – Average population growth of NUTS3 regions as classified by degree of urbanisation, in EU and national contexts

Typology based on degree of urbanisation	Population growth in NUTS3, 2001-2011 (mean)	Dev. of population growth rates from EU-27 average (mean)	Dev. of population growth rates from national average (mean)
Pop in HDUC 2006 < 30%	0.55%	-2.92%	-1.55%
Pop 2006 in HDUC 30%-70%	3.84%	0.40%	0.64%
Pop 2006 in HDUC > 70%	3.38%	-0.02%	0.74%
TOTAL	1.84%	-1.61%	-0.62%

A clearer picture of the macro-trends of population growth performances of regions characterised by a lower degree of urbanisation is provided by the hotspot map included as Map A1 in the Annex 2 to this chapter. This hotspot map, like the following ones, reflects the variation of performance scores over regions with a lower degree of urbanisation, 'masking' the rest.

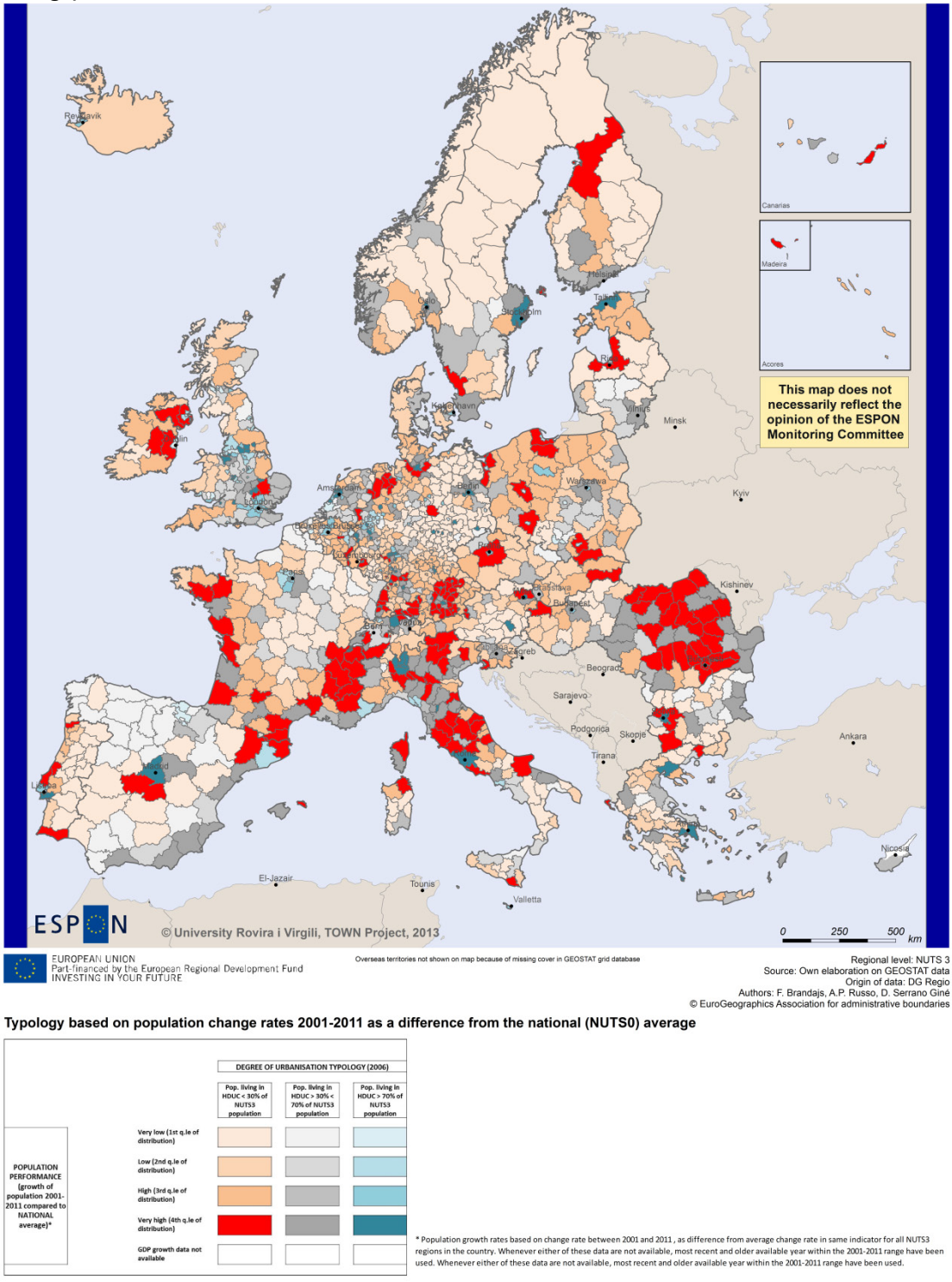
It is thus possible to recognise a large 'hot spot' ranging, north to south, from the British islands to the centre of Italy, and from southeast to northwest, from southern Portugal to south-central Europe, with appendices in southern Scandinavia and Poland; while there are three 'cold spots': the major one ranges from eastern Germany through Bulgaria cutting through the 'rust belt' of southern Poland and Slovakia, towards the eastern EU border. Then there are two local cold spot phenomena over Latvia and Lithuania, and in Northern Portugal.

Altogether, the inspection of such maps and the related statistics provide us with the following information: there has been indeed a quite large population shift from 'grey' to 'sunny' Europe in the 2000s, partly moderated and in some cases reversed in the aftermath of the crisis in the last part of the decade, and most remarkably, this has produced a partial shift of population towards non-core regions especially in the South West. In this picture, while globally the bulk of population has grown more in more urbanised regions, it cannot be argued that the shift has also been one from 'rural' to 'urban'; on the contrary, it seems that at least in a large part of the EU core, less urbanised regions had a protagonist role in retaining or attracting population, and a decidedly important one as far as the Mediterranean Arc (extending to inland regions in Spain, France and Italy) is concerned. Moreover, the regions with smaller settlements around metropolitan areas seem to perform best, indicating wide processes of suburbanisation and even sub-regionalisation. This process is predominantly evident in the surrounding of Eastern metropolitan areas, e.g. Prague, Krakow, and Bucharest, but also Madrid, Paris, London and other metropolitan areas of EU 15 show the same trend.

This overview of population performances becomes richer when the variation of the population is compared to each national average as in Map 11. This perspective takes into consideration a factor of contextualization, highlighting phenomena occurring within countries, and picking spatial differences in more detail. Again the mean values of population growth across the three urbanisation classes differ significantly (see Table A12 in the Annex). On average (third column of Table 4), regions characterised by a lower degree of

urbanisation grow less than others within countries, while more urbanised regions grown more.

Map 11 - NUTS3 Typology 3B. Type of predominating settlement * pop. growth (dev. from nat. average)



There are no great geographical variations over this general pattern: only in Ireland and Poland did population grew significantly more in regions with lower degrees of urbanisation; in Austria, Bulgaria, Denmark, Greece, Norway and Sweden the shift of population favours

more significantly more urbanised areas, while in the rest of the countries difference are not significant, and France presents a perfectly balanced trend between urbanisation types.

Looking at the broader continental trends, it thus appears the larger growth rates are achieved by the 'intermediate' class by degree of urbanisation, whereas at national level we get the more intuitive result of higher growth in more urbanised regions. Crossing this analysis with another regional typology considered in this chapter, we learn that at national level the 'predominantly urban region' variety of regions with a low degree of urbanisation registers positive growth rates, while growth rates plunge going from intermediate to remote and from urbanised to rural region. It confirms the pattern that the urban-rural breach seems to have been widening throughout the ESPON space in the study period.

Recurring again to the hotspot map (Map A2 in the Annex 2), which should be read country by country to pick this time intra-national nuances, important hot spots are found in France, where regions characterised by lower degrees of urbanisations in the south – but around the southern second-tiers cities – and west score significantly better than regions in the centre; in a vast stretch from southern Germany to Northern-Central Italy; in Eastern England; the East of Ireland around the Dublin region; northern Poland regions closer to the coast; and the central regions of Romania. Balancing this, cold spots affect particularly large parts of the West of the Iberian Peninsula, central France, Western Austria, Eastern Germany, Western Latvia, and Bulgaria.

Thus, only a few countries present the same distribution of above and under-average growth. On the contrary, Portugal, Spain and France show a polarization trend: on the one hand, the growth of their capital region and urbanised regions on the coast; on the other hand, a general depopulation of central regions. At the same time, the growth of population in regions characterised by small settlements in the French western and southern costs is substantial, which suggests that an interesting process is going on in France (possibly related to decentralization policies carried out in France in recent years and general positive trend of Southern France, also supported by tourism growth).
The core of Europe, consisting of Belgium, western Germany and the Italian north-eastern regions, shows a general growth both in the strongly urbanized regions and in those characterized by smaller settlements, with few and patchy exceptions. It can be argued that the general growth trend and suburbanisation processes have strongly affected the regions with smaller settlements. On the contrary, a strong metropolisation process has taken place in Germany's eastern regions, in Austria and in the Scandinavian countries, where an important shift of population emerges from regions with smaller settlements toward the capitals and other larger urban areas.

In this framework, the eastern European regions present a rather different picture. While we notice a general declining trend of population except for the metropolitan areas, the picture of population growth in comparison with national average shows the importance of regions with smaller settlements. Again, there is interdependency between metropolitan areas and urban regions (e.g. Riga, Warsaw, Cracow, Prague, Brno, Bratislava, Budapest, Bucharest, Sofia) and their surrounding regions characterised by smaller settlements (for an extension that goes much beyond a possible functional region).

These phenomena suggest the presence of saturation effects in the metropolitan areas that, together with the enhancement of mobility systems (mainly on road), has determined a delocalization shift of firms and population. Moreover, it is possible that the activities rooted in areas characterized by smaller settlements have been able to resist better and strengthen their autonomy in those areas in which networks with bigger urban areas have been established. It is a sort of long wave of 'borrowing-size' effects (Meijers & Burger, 2010),

according to which towns that are close to bigger urban areas manage to achieve a virtual critical mass in terms of accessibility to services and other urban characteristics.

Furthermore, it can be noted that while population growth in 2001-11 has been significantly larger in regions characterised by a higher degree of urbanisation, the only regions with a lower degree of urbanisation where population grows on average grows are regions with industrial branches gaining importance, but with a lower rate than in regions with a higher degree of urbanisation. On the contrary, population decreases at a lower rate in regions characterised by a lower degree of urbanisation than in regions characterised by a higher degree of urbanisation when they are regions undergoing structural change. Finally, regions with a lower degree of urbanisation with industrial branches losing importance register a population decrease almost three times higher than regions with a higher degree of urbanisation. This confirms the impression that regions with smaller settlements tend to be more vulnerable to structural changes brought by macro-trends.

Per capita GDP growth in comparison with EU and national averages

When taking in consideration the distribution of per capita GDP growth rates in the same way we did for population, the picture presented varies significantly. Table 5 provides the main average values across the ESPON space. It now appears that less urbanised regions have grown in 2001-2011 on average more than those with a high degree of urbanisation (though less than regions in the 'intermediate' class), and significantly so, and this is the case both in terms of deviations from the EU average (Table A.13 in the Annex) and within countries (Table A.14).

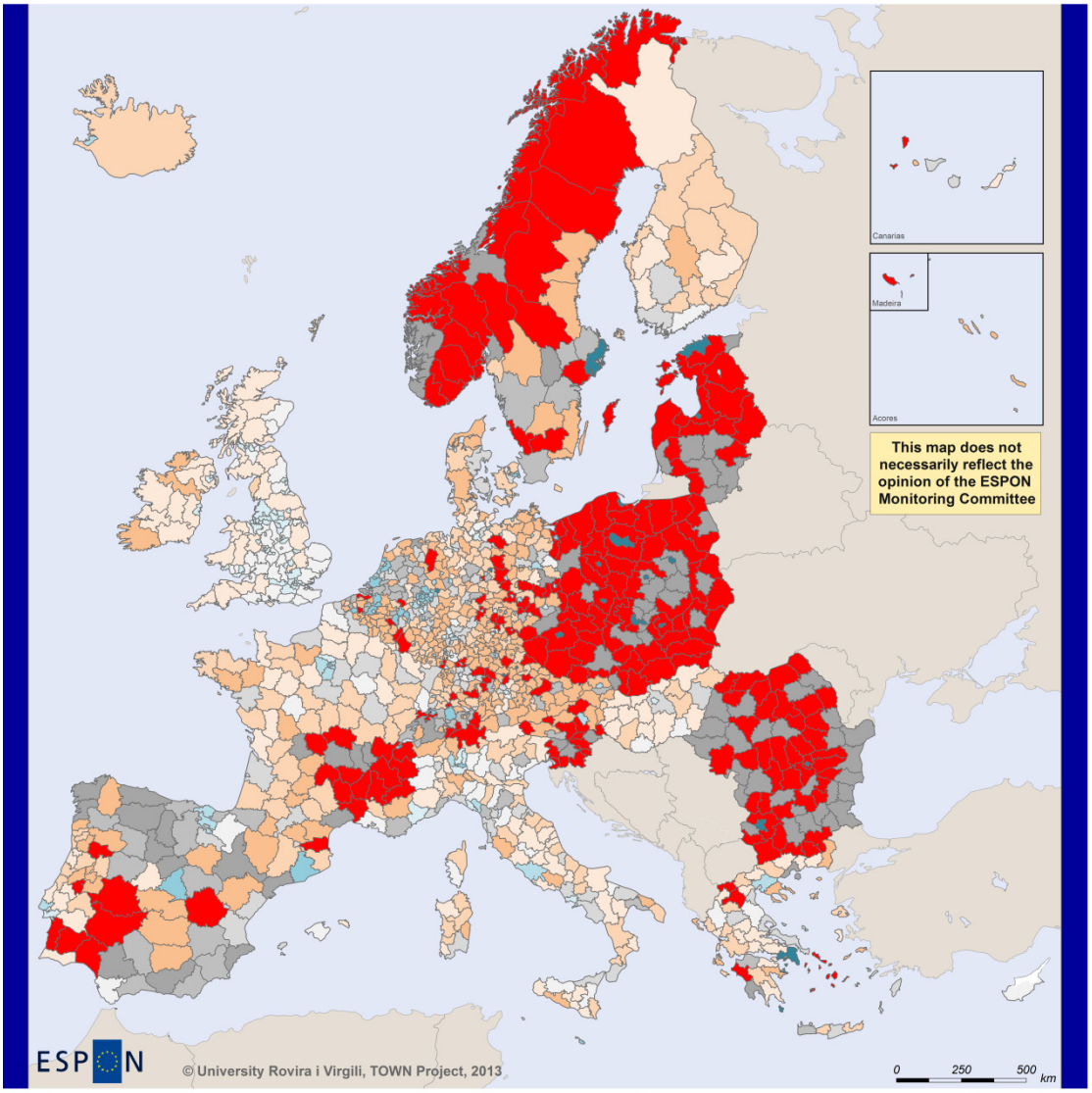
Table 5 – Average p.c. GDP growth of NUTS3 regions as classified by degree of urbanisation, in EU and national contexts

Typology based on degree of urbanisation	P.c. GDP growth in NUTS3, 2001-2011 (mean)	Dev. of P.c. GDP growth rates from EU-27 average (mean)	Dev. of P.c. GDP growth rates from national average (mean)
Pop in HDUC 2006 < 30%	41.63%	31.71%	1.38%
Pop 2006 in HDUC 30%-70%	42.46%	32.86%	1.13%
Pop 2006 in HDUC > 70%	20.74%	11.18%	-3.02%
TOTAL	38.00%	28.22%	0.51%

This information, together with the fact that more urbanised regions have gained population relatively to the less urbanised ones, indicates that the former regional types have lost some of their wealth to the 'periphery' at least at the national scale. In other words, it can be deduced that de-urbanisation has mostly interested the wealthier classes, while urbanisation from less to more urbanised regions has mostly interested the less wealthy.

Map 12 illustrates the distribution of p.c. GDP variation compared to the EU average and it shows a general trend. Due to the high disparity in absolute GDP per capita of the eastern country at the beginning of 2000, it is understandable that the higher performances were registered in the Eastern Europe and the most negative on the Western Europe. Nevertheless, there are notable regional variations in three countries at the EU core, like Germany, France, and Austria, as well as in some countries at the periphery (Ireland, Latvia, Norway, and Portugal) in which less urbanised regions have grown significantly more than others in this period.

Map 12 – P.c. GDP growth scores in regional types by degree of urbanisation (dev. from EU average)



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Regional level: NUTS 3
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Origin of data: DG Regio
Authors: F. Brandajs, A.P. Russo, D. Serrano Giné
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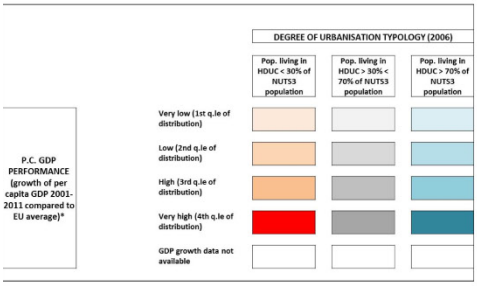
Typology based on p.c. GDP change rates 2001-2011 as a difference from the EU-27 average

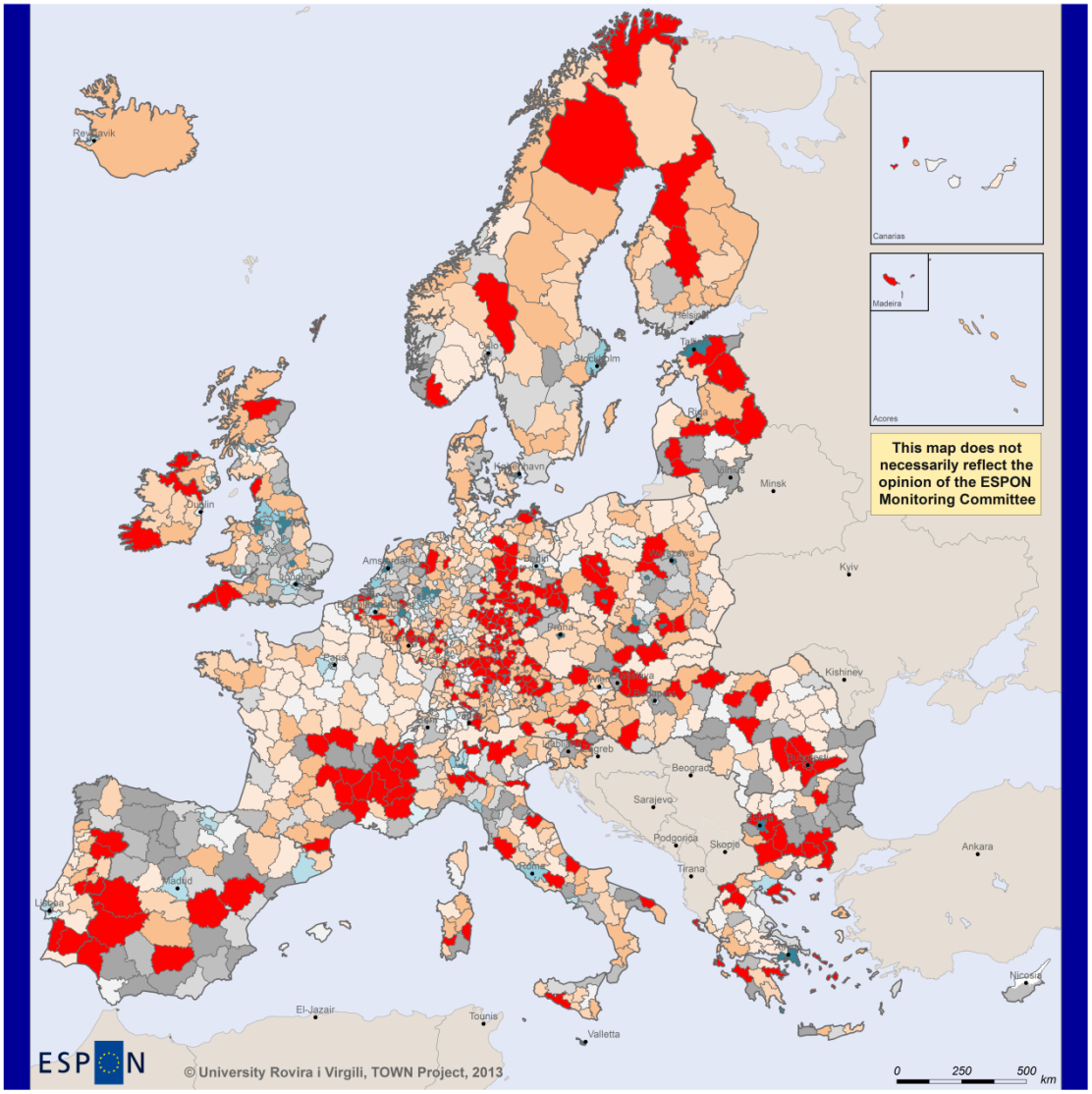


* Per capita GDP growth rates based on change of per capita GDP in current market prices between 2001 and 2011, as difference from change in same indicator for the whole EU27. Whenever either of these data are not available, most recent and older available year within the 2001-2011 range have been used and compared to EU change rate in the same period.

Again we look at a hotspot map (Map A3 in the Annex 2) to capture some of the more general EU trends. The picture indeed results quite different from that nuanced in Map A1 indicating EU trends of population growth; except from Scandinavia, the two maps are almost the 'negative' of one another. Thus a cold spot of relatively decreasing per capita GDP traverses the core of Europe from Ireland and Denmark to Greece and the Italian south, while there are hot spots at the eastern periphery in Romania, Latvia and central Poland, plus a local hotspot in central-southern France and a general above-average growth in some sparsely populated regions in Sweden and neighbouring Norway. Based on these two maps,

it is noticeable that the macro-trend of the 2000 decade is thus one of convergence, by which the eastern European regions, and 'Objective 1' regions in the west have done much better in terms of per capita wealth than the EU core; regions with a lower degree of urbanisation have gone along.

Map 13 - P.c. GDP growth scores in regional types by degree of urbanisation (dev. from nat. average)



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Typology based on p.c. GDP change rates 2001-2011 as a difference from the national (NUTS0) average

P.C. GDP PERFORMANCE (growth of per capita GDP 2001-2011 compared to NATIONAL average)*	DEGREE OF URBANISATION TYPOLOGY (2006)		
	Pop. living in HDUC < 30% of NUTS3 population	Pop. living in HDUC > 30% < 70% of NUTS3 population	Pop. living in HDUC > 70% of NUTS3 population
Very low (1st q.le of distribution)			
Low (2nd q.le of distribution)			
High (3rd q.le of distribution)			
Very high (4th q.le of distribution)			
Pop. growth data not available			

* Per capita GDP growth rates based on change of per capita GDP in current market prices between 2001 and 2011 , as difference from average change rate in same indicator for all NUTS3 regions in the country. Whenever either of these data are not available, most recent and older available year within the 2001-2011 range have been used.

Also in this case, the general picture changes significantly when GDP growth is compared to each country's average (Map 13). Per capita GDP growth 2001-11 is on average positive in

regions with a lower degree of urbanisation and negative in those with a lower degree, and the difference is significant (see Table A14 in the Annex). This map evidences that the growth in per capita wealth of regions with a lower degree of urbanisation in Belgium, Germany and Austria is at the expenses of metropolitan regions in the same countries including the neighbouring 'intermediate' regions. In Spain and Portugal, 'intermediate' regions are those that do worst.

Conversely, the growth in less urbanised regions in Slovakia, Hungary, Poland, Bulgaria and Greece seems to be occurring at the expenses of remote rural areas. The UK is characterised by polarization of growth in the extreme opposite regional types, i.e. in both the main urban areas and in the smaller settlements regions, at the expenses of those regions in which the population is evenly distributed in high urban clusters and smaller settlements. France comes out patchy to this respect, with a strong role of the second-tiers urban poles. In any case it should be pointed out how peripheral regions that are tourist destinations (both domestic and international) in core areas do particularly well: it is the case of Cornwall and the Lake District in the UK, the Southern part of the region Centre in France, the West of Germany, some provinces in Sardinia and Sicily as well as the Alpine regions in Italy.

Map A4 in the Annex provides hotspot values in this complex territorial pattern; the general trend is that of a re-equilibrium of wealth in many countries in the West and the Centre, where the rural periphery does better than the core and less urbanised regions are at the forefront of this trend; conversely, the breach seems to widen at the south-eastern edge of Europe, where regions characterised by lower degrees of urbanisation are left behind in a typical ongoing metropolitanisation process of these economies. Significant 'national' hotspots are thus found in the south of France, Eastern Germany through the Polish west, the south of Norway, Estonia and Western Bulgaria; interesting local phenomena regard areas in Spanish Galicia, Apulia, central Sardinia, southern Greece and northern Scotland.

4. Conclusions

The analyses at NUTS3 level have brought interesting results, and they offered the possibility to have insights on the overall distribution of smaller settlements across Europe, some spatial trends, and main performances associated to regions with prevailing settlement types. Of course, a certain degree of approximation should be noted mainly due to the facts that only very few NUTS3 regions are occupied by only type of urban settlements and the NUTS3 dimensions vary consistently across countries.

All in all, evidences show that settlements types have a varied distribution throughout the ESPON space with a diversity of degrees of concentration and articulation of polycentric urban structures. Such variety is influenced by the overlapping of physical factors and geo-political macro-structures. Therefore, macro-regional and geographical features such mountain areas, islands and coastal regions are at the same time confronted with very present national characterisations. All together, they present several settlement patterns that articulate the European space.

In this perspective, it was possible first of all to distinguish at least three main types of national urban settlement structures:

- Countries with a neat prevalence of urbanised population in NUTS3 regions, clustered in high-density urban centres, as Belgium, Switzerland, Greece, the Netherlands, Spain, the UK, as well as smaller island states as Malta and Cyprus;
- Countries with an overrepresentation of population living in smaller settlements, like France, Ireland, Lithuania, Luxembourg, Norway and Slovakia.
- All other countries, showing with a more balanced repartition of population between classes of high-density urban clusters and small and medium towns, like Austria, Bulgaria, the Czech Republic, Denmark, Estonia, Latvia, Poland, Portugal, Romania, Sweden and Slovenia.

Here the different historical circumstances of the urbanisation process in each country in the last century – associated to each different socio-administrative institutional framework, not last the NUTS3 dimension – proved to be relevant.

At the same time, in terms of geographical distribution, we obtained evidence of correlation between regions with low degrees of urbanization and coastal, insular and mountainous areas. All these three geographical specificities are associated with regions in which smaller settlements tend to be the prevalent type, though only in the case of mountain regions this association is statistically significant. In the other cases, such as islands and coastal regions, especially those of the Western Mediterranean arc, highly urbanized patterns grew in the past decades.

Another relevant correlation has been found between regions with smaller settlements and border (internal and/or external) positions. The result for the regions on the external border is not that surprising as they largely coincide with sparser population regions especially on the eastern EU border, but the result for internal border regions is interesting, because it indicates how national peripheries have limited the growth capacity of urban settlements. Therefore, from a policy point of view, cross-border cooperation is an important policy framework in which to address smaller settlements.

Interesting information came also from the relation between a low degree of urbanisation and an index of economic performance such as the ESPON typology of regions in industrial transition. On the one hand, and in absolute terms, the overall picture of EU regions indicates an extensive distribution of regions with smaller settlements that present

industrial branches losing importance (using an ESPON indicator with 2006 data). On the other hand, the relative comparison between regions with smaller settlements and regions with bigger urban areas seems to indicate a certain flexibility of industrial structures in the former. Still, the presence of the large majority of regions with low degree of urbanisation characterised by negative trends provides a warring message, because these regions may be more vulnerable when facing structural changes.

The predominance of macro trends that characterise large regions is in a way the most evident insight about regional performance analysis. Despite a very scattered picture of Europe, the analysis performed in this chapter shows a strong dependency with macro dynamics and macro territorial trends for regions predominantly characterized by a lower degree of urbanization. These regions seem to be able to offer less spatial inertia toward larger-scale phenomena. We can read in this way the fact that the macro-dynamics of population changes tend to prevail in comparison with regional specificities. Therefore, it seems that territorial characteristics can offer few bouncing back capacities toward macro trends of population dynamics. It is an example the dominance of a territorial trend characterized by a shift of population from the East and the North to South and the West of Europe (or high out-migration rate of the former, and high in-migration rate of the latter) that affects all types of regions.

Together with macro scale phenomena, there is also a macro/meso regional path dependency shown both in wealthier areas of the central Europe and in some other regions. In this perspective, while globally the bulk of population has grown more in more urbanised regions, it cannot be argued that the shift has also been one from 'rural' to 'urban'; on the contrary, it seems that at least in a large part of the EU core, less urbanised regions had a protagonist role in retaining or attracting population, and a decidedly important one as far as the Mediterranean Arc (extending to inland regions in Spain, France and Italy) is concerned. Moreover, the regions with smaller settlements around metropolitan areas seems the most well-performing, indicating there wide processes of suburbanisation and even sub-regionalisation. This process is predominantly evident in the surrounding of Eastern metropolitan areas, e.g. Prague, Krakow, and Bucharest, but also Madrid, Paris, London and other metropolitan areas of EU 15 show the same trend.

These phenomena suggest the presence of saturation effects in the metropolitan areas that, together with the enhancement of mobility systems (mainly on road), has determined a delocalization shift of firms and population. Moreover, it is possible that the activities rooted in areas characterized by smaller settlements have been able to resist better and strengthen their autonomy in those areas in which networks with bigger urban areas have been established (e.g. 'borrowing-size' effects).

However, there are specific national differences, which may indicate that specific urban-systems features and national policies matter. It is the case of regions with industrial branches gaining importance, of those affected by national and international tourism (e.g. southern France and some Austrian regions). At the same time, overheated regions that behaved as strong attractor in the early 2000 show effects of saturations such the case of Catalonia.

A remarkable insight from this analysis is that not always high per capita GDP growth coincides with population growth. On the opposite, it more often the case of an inverted relationship: regions with smaller settlements that experienced an increase of population tend to present lower GDP growth and, vice versa, those with higher GDP growth tend to show a decrease of population. The interpretation of this phenomenon is too risky and there are no enough evidences to define some correlations. A basic hypothesis however would indicate as general motivation decentralization of activities and of wealthier population

trend from congested urban areas on the one hand and in urbanization trends affecting poorer segments of population on the other hand. In other words, it is possible to suppose that de-urbanisation has mostly interested the wealthier classes, while urbanisation from less to more urbanised regions has mostly interested the poorer classes.

In general term, concerning GDP changes, the general trend is that of a re-equilibrium of wealth in many countries in the West and the Centre, where the rural periphery does better than the core and less urbanised regions are at the forefront of this trend; conversely, the breach seems to widen at the south-eastern edge of Europe, where regions characterised by lower degrees of urbanisation are left behind in a typical ongoing metropolitanisation process of these economies. Significant 'national' hotspots are thus found in the south of France, Eastern Germany through the Polish west, the south of Norway, Estonia and Western Bulgaria; interesting local phenomena regard areas in Spanish Galicia, Apulia, central Sardinia, southern Greece and northern Scotland.

To conclude, this chapter has provided some 'macro' evidence on the association of different urbanisation structures to territorial and geographical features, and to regional performance. In the following Chapters 9 and 10 of this Scientific Report, we will develop a more fine-grained and articulated analysis of the performance of SMST in their territorial context using municipal data in 10 case study areas, which allows picking local phenomena through more sophisticated statistical analysis. The combination of these two approaches should give a broad insight over the overall role that SMST are likely to have played in regional development trends.

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ANNEX 1

Statistical tests on the analysis of regional typologies

Table A1 – Statistical analytics: Predominant settlement type in terms of population hosted * Island typology membership

		Predominant settlement type in terms of population hosted			
typ_island		Pop in HDUC 2006 < 30%	Pop 2006 in HDUC 30%-70%	Pop 2006 in HDUC > 70%	Total
0 NOT ISLAND	Count	728	302	240	1270
	% within typ_island	57.3%	23.8%	18.9%	100.0%
1 ISLAND	Count	50	13	5	68
	% within typ_island	73.5%	19.1%	7.4%	100.0%
Total	Count	778	315	245	1338
	% within typ_island	58.1%	23.5%	18.3%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8,209[a]	2	.016
Likelihood Ratio	9.350	2	.009
Linear-by-Linear Association	7.685	1	.006
N of Valid Cases	1338		

[a]. 0 cells (,0%) have expected count less than 5. The minimum expected count is 12.45.

Table A2 – Statistical analytics: Predominant settlement type in terms of population hosted * Mountainous region typology membership

		Predominant settlement type in terms of population hosted			
typ_island		Pop in HDUC 2006 < 30%	Pop 2006 in HDUC 30%-70%	Pop 2006 in HDUC > 70%	Total
0 NOT MOUNTAIN	Count	539	218	223	980
	% within typ_mountains	55.0%	22.2%	22.8%	100.0%
1 MOUNTAIN	Count	239	97	22	358
	% within typ_mountains	66.8%	27.1%	6.1%	100.0%
Total	Count	778	315	245	1338
	% within typ_mountains	58.1%	23.5%	18.3%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	48,363[a]	2	.000
Likelihood Ratio	57.473	2	.000
Linear-by-Linear Association	21.684	1	.000
N of Valid Cases	1338		

[a]. 0 cells (,0%) have expected count less than 5. The minimum expected count is 65.55.

Table A3 – Statistical analytics: Predominant settlement type in terms of population hosted * Coastal typology membership

		Predominant settlement type in terms of population hosted			
typ_island		Pop in HDUC 2006 < 30%	Pop 2006 in HDUC 30%-70%	Pop 2006 in HDUC > 70%	Total
0 NOT COASTAL	Count	559	201	173	933
	% within typ_coastal	59.9%	21.5%	18.5%	100.0%
1 COASTAL	Count	219	114	72	405
	% within typ_coastal	54.1%	28.1%	17.8%	100.0%
Total	Count	778	315	245	1338
	% within typ_coastal	58.1%	23.5%	18.3%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6,980[a]	2	.031
Likelihood Ratio	6.833	2	.033
Linear-by-Linear Association	2.943	1	.086
N of Valid Cases	1338		

[a] 0 cells (,0%) have expected count less than 5. The minimum expected count is 74.16.

Table A4 – Statistical analytics: Predominant settlement type in terms of population hosted * Border regions typology membership

		Predominant settlement type in terms of population hosted			
typ_border_B		Pop in HDUC 2006 < 30%	Pop 2006 in HDUC 30%-70%	Pop 2006 in HDUC > 70%	Total
0 Not a border region	Count	403	174	188	765
	% within typ_border_B	52.7%	22.7%	24.6%	100.0%
1 internal Border	Count	288	102	53	443
	% within typ_border_B	65.0%	23.0%	12.0%	100.0%
2 External Border	Count	87	39	4	130
	% within typ_border_B	66.9%	30.0%	3.1%	100.0%
Total	Count	778	315	245	1338
	% within typ_border_B	58.1%	23.5%	18.3%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	48,363[a]	2	.000
Likelihood Ratio	57.473	2	.000
Linear-by-Linear Association	21.684	1	.000
N of Valid Cases	1338		

[a] 0 cells (,0%) have expected count less than 5. The minimum expected count is 23.8

Table A5 – Statistical analytics: Predominant settlement type in terms of population hosted * Outermost regions typology membership

		Predominant settlement type in terms of population hosted			
typ_island		Pop in HDUC 2006 < 30%	Pop 2006 in HDUC 30%-70%	Pop 2006 in HDUC > 70%	Total
0 Not outermost	Count	771	313	245	1329
	% within typ_outermost	58.0%	23.6%	18.4%	100.0%
1 Outermost	Count	7	2	0	9
	% within typ_outermost	77.8%	22.2%	.0%	100.0%
Total	Count	778	315	245	1338
	% within typ_outermost	58.1%	23.5%	18.3%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2,266[a]	2	.322
Likelihood Ratio	3.857	2	.145
Linear-by-Linear Association	1.734	1	.188
N of Valid Cases	1338		

[a.] 0 cells (,0%) have expected count less than 5. The minimum expected count is 65.55.

Table A6 – Statistical analytics: Predominant settlement type in terms of population hosted * urban-rural typology membership

		Predominant settlement type in terms of population hosted			
typ_urbrur		Pop in HDUC 2006 < 30%	Pop 2006 in HDUC 30%-70%	Pop 2006 in HDUC > 70%	Total
1 Predominantly urban region	Count	43	89	184	316
	% within typ_urbrur	13.6%	28.2%	58.2%	100.0%
21 Intermediate region, close to a city	Count	236	193	58	487
	% within typ_urbrur	48.5%	39.6%	11.9%	100.0%
22 Intermediate region, remote	Count	18	3	0	21
	% within typ_urbrur	85.7%	14.3%	.0%	100.0%
31 Predominantly rural region, close to a city	Count	320	24	3	347
	% within typ_urbrur	92.2%	6.9%	.9%	100.0%
32 Predominantly rural region, remote	Count	161	6	0	167
	% within typ_urbrur	96.4%	3.6%	.0%	100.0%
Total	Count	778	315	245	1338
	% within typ_urbrur	58.1%	23.5%	18.3%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	733,857[a]	8	.000
Likelihood Ratio	767.124	8	.000
Linear-by-Linear Association	561.682	1	.000
N of Valid Cases	1338		

Table A7 – Statistical analytics: Predominant settlement type in terms of population hosted * typology of regions in industrial transition membership

		Predominant settlement type in terms of population hosted			
typ_indtrans		Pop in HDUC 2006 < 30%	Pop 2006 in HDUC 30%-70%	Pop 2006 in HDUC > 70%	Total
A1 Region with industrial branches losing importance	Count	361	161	106	628
	% within typ_indtrans	57.5%	25.6%	16.9%	100.0%
A2 Region with industrial branches gaining importance	Count	38	10	2	50
	% within typ_indtrans	76.0%	20.0%	4.0%	100.0%
A3 Region with internal industrial structural change	Count	116	35	11	162
	% within typ_indtrans	71.6%	21.6%	6.8%	100.0%
B Area not covered by typology	Count	263	109	126	498
	% within typ_indtrans	52.8%	21.9%	25.3%	100.0%
Total	Count	778	315	245	1338
	% within typ_indtrans	58.1%	23.5%	18.3%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	43,875[a]	6	.000
Likelihood Ratio	48.348	6	.000
N of Valid Cases	1338		

Table A8 – Statistical analytics: Predominant settlement type in terms of population hosted * typology of regions in industrial transition membership (association analysis)

typ_indtrans * TYP_NUTS3_A1 Crosstabulation

			TYP_NUTS3_A1			Total
			1	5	6	
typ_indtrans	A1	Count	361	161	106	628
		Expected Count	365.6	147.4	115.0	628.0
		% within typ_indtrans	57.5%	25.6%	16.9%	100.0%
		% within TYP_NUTS3_A1	**46.3%**	51.3%	43.3%	**46.9%**
		% of Total	27.0%	12.0%	7.9%	46.9%
	A2	Count	38	10	2	50
		Expected Count	29.1	11.7	9.2	50.0
		% within typ_indtrans	76.0%	20.0%	4.0%	100.0%
		% within TYP_NUTS3_A1	**4.9%**	3.2%	.8%	**3.7%**
		% of Total	2.8%	.7%	.1%	3.7%
	A3	Count	116	35	11	162
		Expected Count	94.3	38.0	29.7	162.0
		% within typ_indtrans	71.6%	21.6%	6.8%	100.0%
		% within TYP_NUTS3_A1	**14.9%**	11.1%	4.5%	**12.1%**
		% of Total	8.7%	2.6%	.8%	12.1%
	B	Count	264	108	126	498
		Expected Count	289.9	116.9	91.2	498.0
		% within typ_indtrans	53.0%	21.7%	25.3%	100.0%
		% within TYP_NUTS3_A1	**33.9%**	34.4%	51.4%	**37.2%**
		% of Total	19.7%	8.1%	9.4%	37.2%
Total		Count	779	314	245	1338
		Expected Count	779.0	314.0	245.0	1338.0
		% within typ_indtrans	58.2%	23.5%	18.3%	100.0%
		% within TYP_NUTS3_A1	100.0%	100.0%	100.0%	100.0%
		% of Total	58.2%	23.5%	18.3%	100.0%

Table A9 – Statistical analytics: Predominant settlement type in terms of population hosted * typology of regions in industrial transition membership (population changes, ANOVA test on averages)

		TYP_NUTS3_A1			
		1	5	6	Total
		dPOP_nat	dPOP_nat	dPOP_nat	dPOP_nat
		Mean	Mean	Mean	Mean
typ_indtrans	A1	-1.41%	0.47%	-0.58%	-0.79%
	A2	0.43%	1.15%	4.66%	0.74%
	A3	-0.87%	-0.87%	-1.25%	-0.90%
	B	-1.10%	-0.05%	0.78%	-0.40%
	Total	-1.14%	0.16%	0.14%	-0.60%

ANOVA Table

		Sum of Squares	df	Mean Square	F	Sig.
dPOP_nat * TYP_NUTS3_A1	Between Groups (Combined)	.054	2	.027	13.027	.000
	Within Groups	2.764	1335	.002		
	Total	2.818	1337			

Table A10 – Statistical analytics: Predominant settlement type in terms of population hosted * typology of regions in industrial transition membership (p.c. GDP changes, ANOVA test on averages)

		TYP_NUTS3_A1			
		1	5	6	Total
		dGDP_nat	dGDP_nat	dGDP_nat	dGDP_nat
		Mean	Mean	Mean	Mean
typ_indtrans	A1	-3.08%	-3.55%	-1.65%	-2.96%
	A2	0.54%	8.48%	8.53%	2.44%
	A3	-1.77%	-3.23%	3.12%	-1.75%
	B	-0.75%	-2.51%	-0.15%	-0.98%
	Total	-1.92%	-2.78%	-0.58%	-1.88%

ANOVA Table

		Sum of Squares	df	Mean Square	F	Sig.
dGDP_nat * TYP_NUTS3_A1	Between Groups (Combined)	.067	2	.033	2.168	.115
	Within Groups	20.496	1335	.015		
	Total	20.563	1337			

Table A11 – Statistical analytics: Predominant settlement type in terms of population hosted * population growth in NUTS3 regions as deviation from EU average

Deviation of population growth rates from EU-27 average

	95% Confidence Interval for Mean		Minimum	Maximum
	Lower Bound	Upper Bound		
Pop in HDUC 2006 < 30%	-,0353223	-,0230233	-,59037	,95731
Pop 2006 in HDUC 30%-70%	-,0056481	,0136180	-,29846	,39755
Pop 2006 in HDUC > 70%	-,0077142	,0072951	-,20022	,18615
Total	-,0205822	-,0115441	-,59037	,95731

ANOVA test

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	,322	2	,161	23,428	,000
Within Groups	9,171	1335	,007		
Total	9,493	1337			

Multiple Comparisons

(I) Typology based on degree of urbanisatio	(J) Typology based on degree of urbanisatio	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Pop in HDUC 2006 < 30%	Pop 2006 in HDUC 30%-70%	-,03315774*	,00553522	,000	-,0440164	-,0222991
	Pop 2006 in HDUC > 70%	-,02896323*	,00607204	,000	-,0408750	-,0170515
Pop 2006 in HDUC 30%-70%	Pop in HDUC 2006 < 30%	,03315774*	,00553522	,000	,0222991	,0440164
	Pop 2006 in HDUC > 70%	,00419451	,00706033	,553	-,0096560	,0180451
Pop 2006 in HDUC > 70%	Pop in HDUC 2006 < 30%	,02896323*	,00607204	,000	,0170515	,0408750
	Pop 2006 in HDUC 30%-70%	-,00419451	,00706033	,553	-,0180451	,0096560

*. The mean difference is significant at the 0.05 level.

Table A12 – Statistical analytics: Predominant settlement type in terms of population hosted * population growth in NUTS3 regions as deviation from national average

Deviation of population growth rates from national average

	95% Confidence Interval for Mean		Minimum	Maximum
	Lower Bound	Upper Bound		
Pop in HDUC 2006 < 30%	-,0205734	-,0104534	-,54938	,99830
Pop 2006 in HDUC 30%-70%	-,0009372	,0137106	-,20108	,27943
Pop 2006 in HDUC > 70%	,0006308	,0141475	-,15923	,22714
Total	-,0098317	-,0024961	-,54938	,99830

ANOVA test

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	,163	2	,081	17,823	,000
Within Groups	6,091	1335	,005		
Total	6,253	1337			

Multiple Comparisons

(I) Typology based on degree of urbanisatio	(J) Typology based on degree of urbanisatio	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Pop in HDUC 2006 < 30%	Pop 2006 in HDUC 30%-70%	-,02190014*	,00451086	,000	-,0307493	-,0130510
	Pop 2006 in HDUC > 70%	-,02290255*	,00494833	,000	-,0326099	-,0131952
Pop 2006 in HDUC 30%-70%	Pop in HDUC 2006 < 30%	,02190014*	,00451086	,000	,0130510	,0307493
	Pop 2006 in HDUC > 70%	-,00100242	,00575373	,862	-,0122898	,0102849
Pop 2006 in HDUC > 70%	Pop in HDUC 2006 < 30%	,02290255*	,00494833	,000	,0131952	,0326099
	Pop 2006 in HDUC 30%-70%	,00100242	,00575373	,862	-,0102849	,0122898

*. The mean difference is significant at the 0.05 level.

Table A13 – Statistical analytics: Predominant settlement type in terms of population hosted * p.c. GDP growth in NUTS3 regions as deviation from EU average

Deviation of per capita GDP growth rates from EU-27 average

	95% Confidence Interval for Mean			
	Lower Bound	Upper Bound	Minimum	Maximum
Pop in HDUC 2006 < 30%	,2874065	,3468089	-,22658	3,18747
Pop 2006 in HDUC 30%-70%	,2744701	,3826848	-,22130	2,61671
Pop 2006 in HDUC > 70%	,0718684	,1517982	-,33615	2,64671
Total	,2591908	,3052499	-,33615	3,18747

ANOVA test

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8,737	2	4,368	24,524	,000
Within Groups	237,797	1335	,178		
Total	246,534	1337			

Multiple Comparisons

(I) Typology based on degree of urbanisatio	(J) Typology based on degree of urbanisatio	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Pop in HDUC 2006 < 30%	Pop 2006 in HDUC 30%-70%	-,01146978	,02818564	,684	-,0667627	,0438232
	Pop 2006 in HDUC > 70%	,20527433*	,03091917	,000	,1446189	,2659298
Pop 2006 in HDUC 30%-70%	Pop in HDUC 2006 < 30%	,01146978	,02818564	,684	-,0438232	,0667627
	Pop 2006 in HDUC > 70%	,21674411*	,03595163	,000	,1462163	,2872719
Pop 2006 in HDUC > 70%	Pop in HDUC 2006 < 30%	-,20527433*	,03091917	,000	-,2659298	-,1446189
	Pop 2006 in HDUC 30%-70%	-,21674411*	,03595163	,000	-,2872719	-,1462163

*. The mean difference is significant at the 0.05 level.

Table A14 – Statistical analytics: Predominant settlement type in terms of population hosted * p.c. GDP growth in NUTS3 regions as deviation from national average

Deviation of per capita GDP growth rates from national average

	95% Confidence Interval for Mean		Minimum	Maximum
	Lower Bound	Upper Bound		
Pop in HDUC 2006 < 30%	-,0002862	,0279321	-,65172	2,47315
Pop 2006 in HDUC 30%-70%	-,0095327	,0320381	-,55648	1,13114
Pop 2006 in HDUC > 70%	-,0529811	-,0074961	-1,05048	1,52946
Total	-,0052849	,0155845	-1,05048	2,47315

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	,377	2	,189	5,010	,007
Within Groups	50,236	1335	,038		
Total	50,613	1337			

Multiple Comparisons

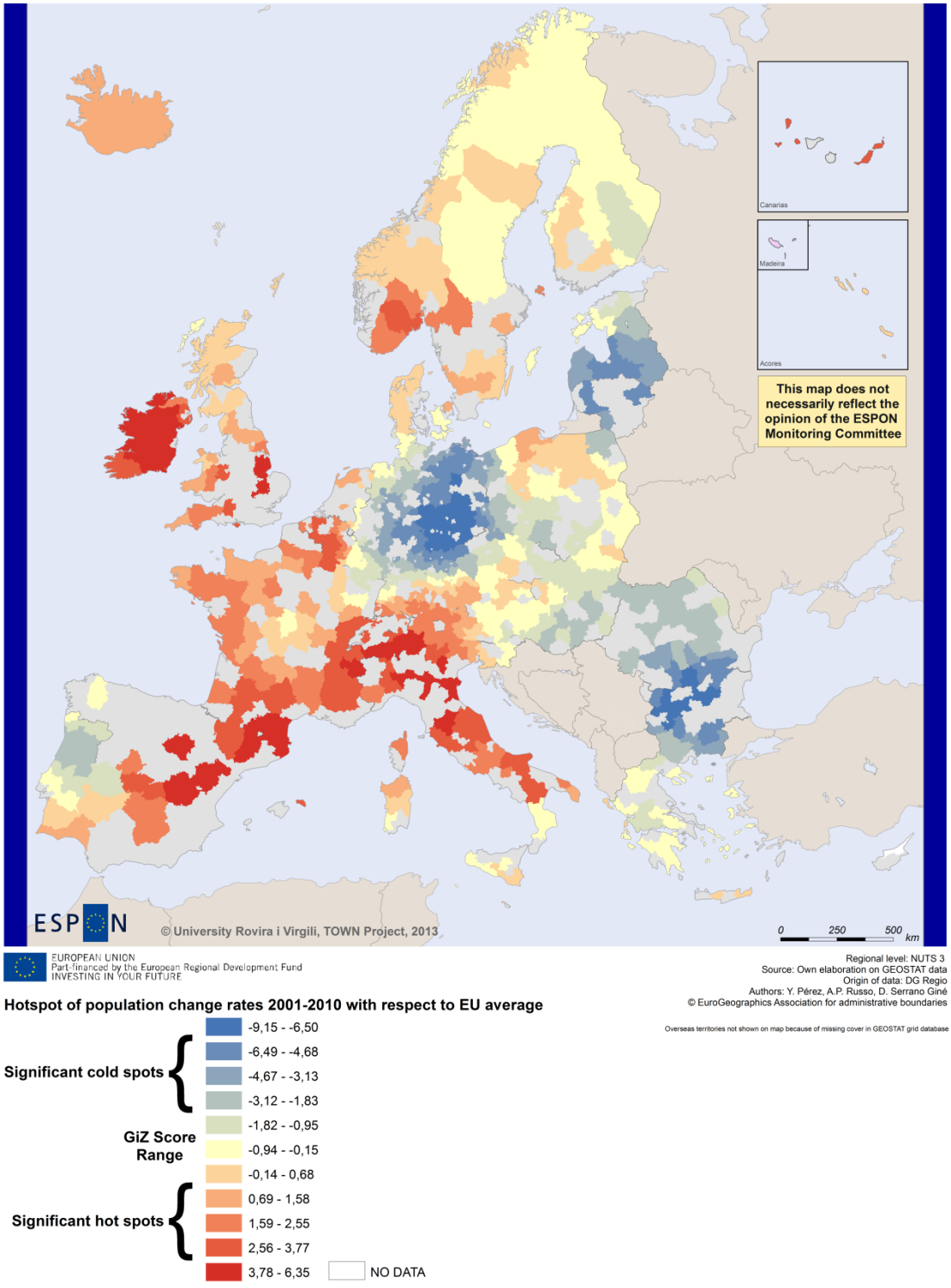
(I) Typology based on degree of urbanisation	(J) Typology based on degree of urbanisation	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Pop in HDUC 2006 < 30%	Pop 2006 in HDUC 30%-70%	,00257028	,01295488	,843	-,0228438	,0279844
	Pop 2006 in HDUC > 70%	,04406156*	,01421128	,002	,0161827	,0719404
Pop 2006 in HDUC 30%-70%	Pop in HDUC 2006 < 30%	-,00257028	,01295488	,843	-,0279844	,0228438
	Pop 2006 in HDUC > 70%	,04149128*	,01652433	,012	,0090748	,0739078
Pop 2006 in HDUC > 70%	Pop in HDUC 2006 < 30%	-,04406156*	,01421128	,002	-,0719404	-,0161827
	Pop 2006 in HDUC 30%-70%	-,04149128*	,01652433	,012	-,0739078	-,0090748

*. The mean difference is significant at the 0.05 level.

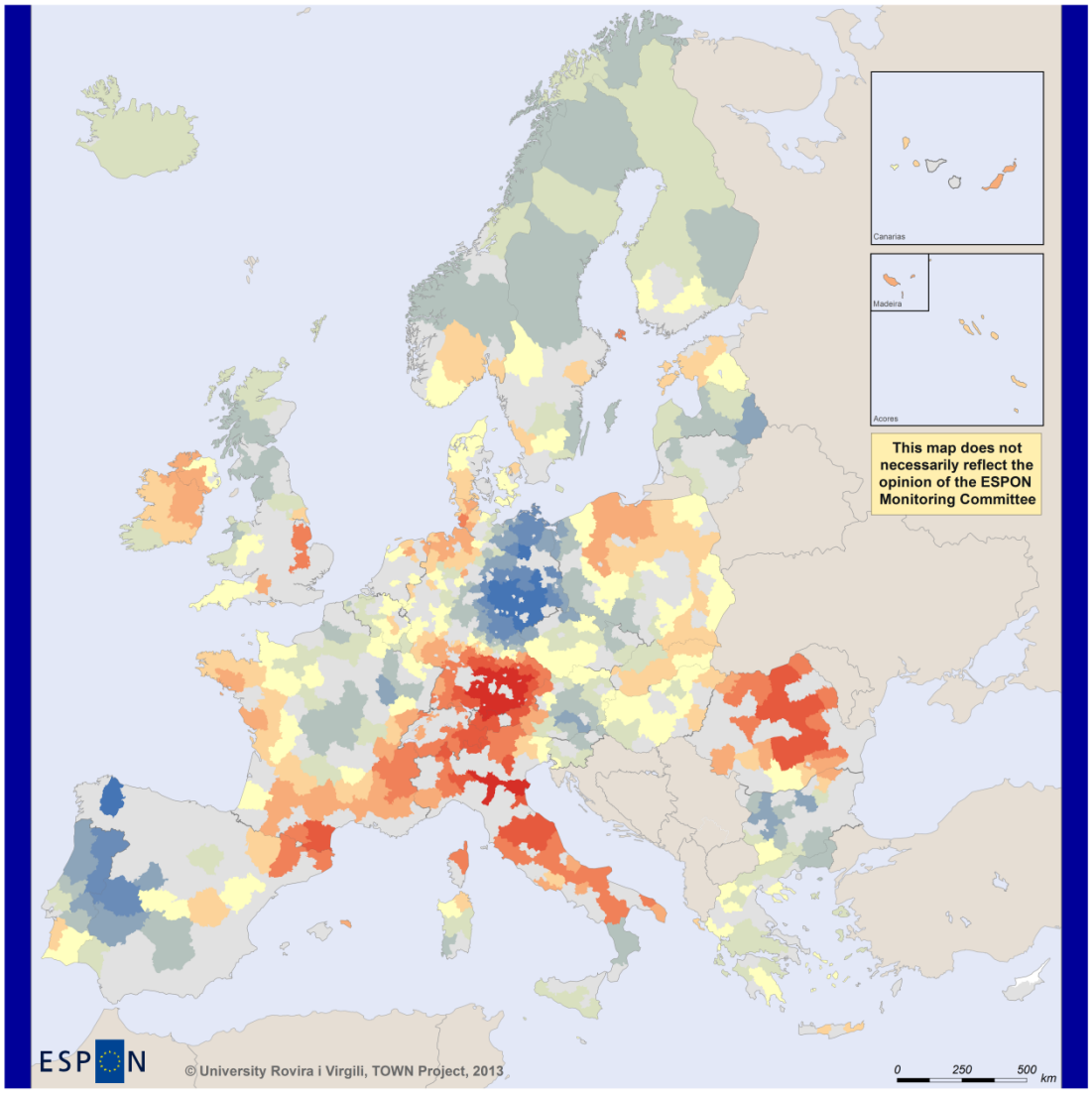
ANNEX 2

Hotspot maps of the performances of regions characterised by a lower degree of urbanisation

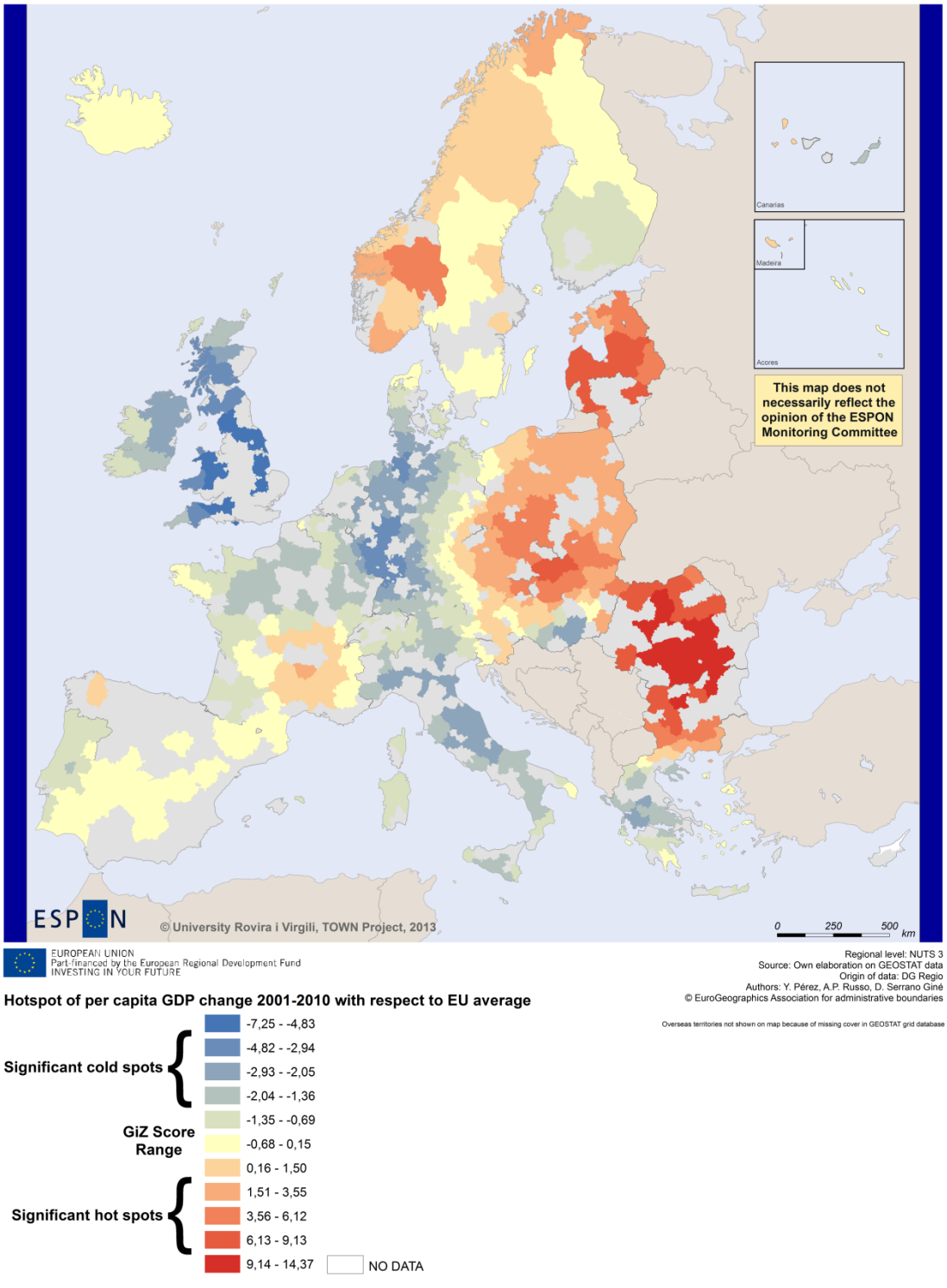
Map A1 – Hot and cold spots of population change (as dev. from EU average) for regions characterised by a lower degree of urbanisation



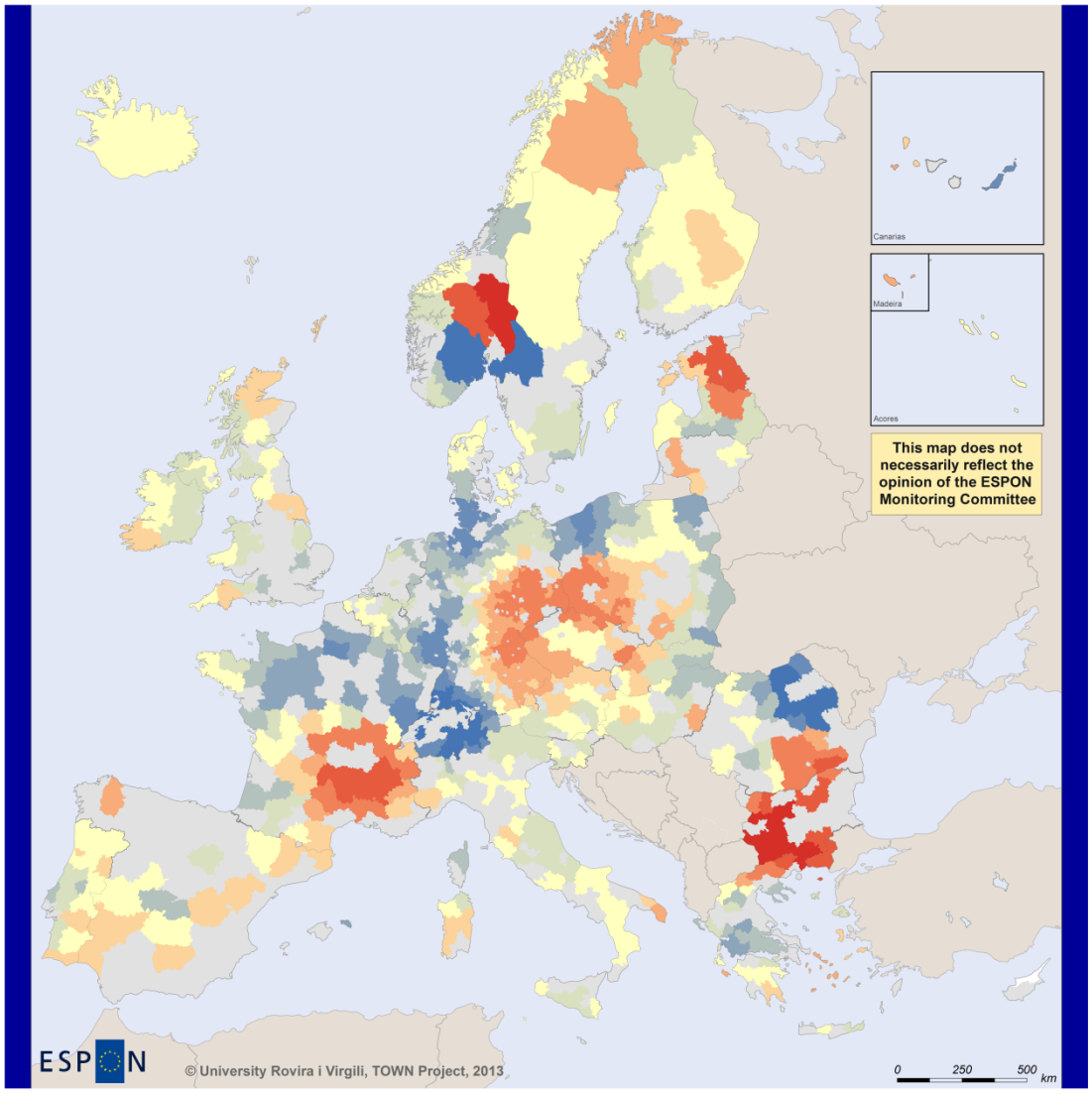
Map A2 – Hot and cold spots of population change (as dev. from national average) for regions characterised by a lower degree of urbanisation



Map A3 – Hot and cold spots of p.c. GDP change (as dev. from EU average) for regions characterised by a lower degree of urbanisation



Map A4 – Hot and cold spots of p.c. GDP change (as dev. from national average) for regions characterised by a lower degree of urbanisation



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