ESPON

EUROPEAN SPATIAL PLANNING OBSERVATION NETWORK

ESPON project 1.4.3
Study on Urban Functions

Final Report
March 2007

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Part 1. Reminder of the project programme

The Espon 1.4.3 project was initially organised in 5 main parts:

1. Assessment of the results of Espon 1.1.1

2. Identification and delimitation of the Functional Urban Areas (FUA) in Europe (29 countries)

3. Measure of the Functional Specialization and updating of the typology of the FUAs

4. Discussion on the Polycentricity issue

5. Proposition for further research (Espon II future programme).

This project had its kick-off meeting on March 9 2006 and is intended to finish by the end of October 2006.

Part 2. Executive Summary

Espon 1.1.1 has produced an exhaustive list of the Functional Urban Areas (FUAs) for 29 European countries. Globally this list appears to be correct but some errors have been made, according to the criticisms made on the final report by the Espon Contact Points. We don't intend - nor have the mission - to establish a new exhaustive list of the FUAs but we have enhanced the methodology to incorporate the Morphological Urban Areas (MUAs) of the cities in the definition of the FUAs. We have thus started to list the European cities on a morphological base by selecting the FUAs (from the Espon 1.1.1 list) with more than 50,000 inhabitants and characterizing them at the NUTS-5 level, using the NUTS-5 database developed by Nordregio and IRPUD for the European commission. From this database we have extracted the number of inhabitants and the areas for each NUTS-5 unit and put them on a map of Europe. Creating this list of all the NUTS 5-units contained in each European MUA and in the FUAs of some countries will be our main contribution to the study of the European urban network. By lack of data during the time of the project we haven't been able to define the FUA areas in NUTS-5 units for a majority of countries. Nevertheless this can still be done later and the database can be completed and corrected if necessary. These data can be used to support other studies in the future and allows already further researches on the core cities of the FUAs.

It has appeared to us that the characterization of the FUAs should include the chrraracterization of the Morphological Urban Areas (MUAs) inside them. Of course, the FUA, which corresponds to the employment pools, is an essential concept in functional terms and imposes itself more and more in a context of suburbanisation and growing mobility of active populations. However, the MUA, as a dense and coherent morphological whole, remains an essential concept: with identical populations, it clearly appears that FUAs which have better opportunities are those having a strong MUA in their centre, especially if the latter has some good quality historical and cultural heritage. This is an important element in the new forms of cross-city competitiveness.

We have also included in the study the characterization of the transborder FUAs, which are essential in the European dimension.

Finally, in order to stay close to that European perspective we have used the same homogenous criteria for every country (see the morphological areas methodology).

MUAs and FUAs delineation

Basically a city is organised around a densely populated node, with a true urban landscape and even better a historical core. Therefore, we have approached those characteristics by considering at first all the municipalities (NUTS-5 level) with more than 650 inhab./km2. Then all the contiguous municipalities with this threshold of density, as well as the municipalities not reaching the threshold but enclosed by the others, were added to define central or morphological urban areas.

However, in some cases, municipalities have a true urban character but are not reaching the level of 650 inhab./km², due for instance to some specificities of the delimitation of the municipality (a very large municipal territory; a large part of the territory occupied by a lake, or mountains or forests…). Therefore we have also taken into consideration all the municipalities with more than 20,000 inhabitants, whenever they have a clear concentrated morphological core.

Besides their morphological character, cities are also employment cores, surrounded by a labour pool. This functional dimension becomes more and more significant, as commuting

and suburbanisation are growing. These functional urban regions (FUAs) are in principle defined in ESPON 1.1.1 on this base of the labour basins of the morphological urban areas. But in fact, the data provided by the ESPON 1.1.1 study don't seem to follow strictly this criteria in many countries, and sometimes truly not. Discussing that point in each national case is one of the main goals of the present study.

Here, and only from the point of view of the population of the morphological cores and the FUAs, we will consider two levels, metropolises on one side, small, medium and large cities, on the other side, according to the above theoretical first paragraph of this chapter. The ultimate goal, which will be reached after a quantitative and a qualitative analysis, is to consolidate the characterisation of the European urban pattern, described according to the ESPON 1.1.1 terminology in MEGAs (Metropolitan Growth Areas), transnational/national FUAs and regional/local FUAs.

For each FUA, we give the population of the morphological core (MUA) and of the FUA (with the comparison to the data given in ESPON 1.1.1).

For each European metropolis or polycentric metropolitan area, we provide also with a proxy of the FUA at the NUTS-3 level, which will allow us later to give an estimation of the GDP and the economic structure of the FUA. We have included in the proxy all the NUTS-3 units contiguous to the NUTS-3 including the core and with at least 60% of their population in NUTS-5 units pertaining to the FUA. It is not possible to do accurately this exercise for cities with less than 500,000 inhabitants, due to their size generally much smaller than the one of the NUTS-3 unit in which they are incorporated.

The results are presented country by country, except for the transborder FUAs which were gathered in a separate table preceded by a specific typology.

The Functional measures of the FUAs

We have studied the functional aspects of all the FUAs defined by the morphological study. We have studied 5 functions for which we could gather enough data:

the administrative functions, consisting of the national functions (capital city, chief towns, etc) and the international functions (cities hosting headquarters of important european and international institutions)

the decision functions, consisting of the localisation of the heaquarters and their subsidiaries of national and international important companies

the transport functions that measure the connectivity of a city with the others, consisting of the road and rail connectivity as well as the air traffic and the sea transport

the knowledge functions, consisting of the localisation of the most important universities, research centres and high-technology production

the tourism functions, consisting of a measure of the touristic activities estimated by the number of beds available and the number of nights spent in the touristic facilities, and by the appreciation reflected by the touristic guides (we did it only with Michelin but it should be done as well with other tourist guides). This criterion should also be completed by other cultural criteria such as the congress cities, and other cultural activities (museums, theatres, festivals, etc).

Unfortunately we couldn't find relevant data for the industrial activities at the city level. We have then used the data provided by Espon 1.1.1 but these were missing for France, UK and Switzerland, so that we didn't use them to compute our global functional index.

The morphological polycentricity

For this part we have taken into account only the FUAs of more than 500.000 inhabitants as the data are available at the NUTS-3 level which is usable to qualify these metropolises (see the morphological descriptions above).   For smaller FUAs (i.e. more than 250.000 inhabitants) this analyse could be done too for punctual data but not for the structural indices for the NUTS-3 are too disagragated. This should be done in the future if EUROSTAT can provide data at a lower level than in the present time.

A more polycentric urban network, as opposed to monocentrism, is a central objective of the official European policies of planning and dominates its rhetoric (ESDP, 1999). The ESPON report 1.1.1 aims to investigate it in depth. More polycentrism - the concept being used as well at the intra-metropolitan level, at the intra-national level and at the European level as a whole - is supposed to help containing urban sprawl, to favour cooperative strategies and networking between the cities, and, at the upper scale, which we intend to examine here, to lead to more efficient economies and at the same time to more equitable regional developments. The polycentric project is now so present in the official documents that questioning the content and the validity of the concept could seems out of place. However, we intend to show that this concept is often unsubstantial, ambiguous, badly defined, used as well from a morphological (the urban pattern) as from a functional point of view (the flows, the effective networks), confusing the geographical scales and more a normative than a scientific one (see also S. Davoudi, 2003).

Our main question is thus to examine if it is true, looking at the empiric evidences – *i.e.* morphological polycentrism as a measurable scientific object, and not as a territorial planning political goal -, that more polycentric national and European structures could lead simultaneously to more equity and effective regional development, to less inequalities between the regions and to a more effective, competitive and better integrated European economy, favouring also the sustainable development.

As for us, we have computed two measures of the polycentrism on the basis of a sole methodology, the one at the level of the States, the other at the level of more or less similar sized units, i.e. the small and medium-sized countries considered as a single unit, and the biggest countries divided into macro-regions of about 10 millions inhabitants.

Our index is computed on the basis of a simple and purely morphological methodology (as approached by the proxies of population data). We have used the cardinal ranking of the following indicators:
- Part of the main FUA in the total population of the country
- Part of the main FUA in the population of the whole set of FUAs with more than 250 thousands inhab.poids du 1 dans FUA>250000
- Part of the main FUA in the population of the whole set of FUAs with more than 50 thousands inhab.
- Standard deviation of the population of the FUAs with more than 50 thousands inhab.
- Average of the differences between the ranked populations of the FUAs until the threshold of 50 thousands inhab.

- The value of each of these five indicators has been distributed on a scale bounded from 100 (the highest value for the indicator) and 0 (the lowest one). The arithmetic average of these seven indicators gives the cardinal global index (Table 1). We stress that we compute here (the proxy of) an exclusively morphological index of polycentrism, and not a measure of functional polycentrism, decisional functions

appearing to be much more concentrated in most countries than the urban populations

The sole surprise arising from our ranking regarding a qualitative knowledge of the European urban patterns is the position of Hungary, which appears a priori to be very monocentric due to the weight of Budapest.

Our index of polycentrism is not linked to the results of any territorial planning policy. It aims first at showing the product of national histories and territorial building, in a very long time perspective. The economic and political developments, sometimes from the Middle Ages, gave rise to different urban patterns, with a whole range of situations between monocentricity and polycentricity:

- a monocentric pattern combined with a relative sterilization of the rest of the country, for a long time characterised by out migration (ex. : Ireland, for a long time in a quasi-colonial context ; Greece, with the exception of Thessalonica, located at the top of an international corridor) ;
- a restrained monocentricity, linked to an early national building, but without sterilization of the development outside the capital region (ex. : Denmark and Sweden, where the agrarian revolution played an important role in the initial phases of access to modernity);
- a strong monocentrism, yet more decisional than morphological, in countries with a very early territorial formation, where the powers are strongly concentrated in the capital, but however with other important cities, possibly also with their own strong historical weight. These cities can have been reinforced, as well as other medium-sized cities and intermediate areas, by regional and equilibrium metropolises policies during the last half-century, even if they remain under the control of the capital. France pertains to this type, which doesn't exclude macro-regional polycentrism, like in the East or the West of the country;
- a more or less similar situation, but where the decisional supremacy of the capital doesn't exclude big manufacturing conurbations, born during the early phases of a very intense industrial revolution, implying locations on the coalfields or on the proto-industrial manpower basins, or even allows more recent urban-regional developments (ex. : Great-Britain) ;
- a more or less equilibrated bicephalous pattern, possibly with a more political and a more private economic head (ex. : Spain or Italy, with in this last country very strong inter-regional economic inequalities and more, in the South, regional more or less parasitic primacies, like Naples or to a certain extent Seville, which reflect the long-lasting survival of aristocratic and archaic structures in their rural environment);
- a mid-European strongly polycentric pattern, with a very dense urbanisation and a very open urban hierarchy, from millionaire cities to a dense network of medium-sized cities, in the context of old urban autonomy tradition. This model includes polynuclear conurbations, even if these don't recover necessarily truly lived identities or spaces of strong planning and economic cooperation (Delta Metropolis in the Netherlands; Rhine-Ruhr; Rhine-Main; the Walloon industrial axis). This polycentrism can be the result of late national unifications and federal systems. However, the German polycentrism doesn't exclude the extreme monocentrism of the North-East of the country, besides not a part of the medieval Germany of cities and merchants ;
- finally, Switzerland is characterised by a typical mid-European polycentrism, but without big millionaire cities nor conurbations born during the coal based industrialisation period.

Polycentricity and economic efficiency

As we have already seen, European policies assign to polycentricity a normative value of efficiency: it is supposed to favour regional and, through this one, global development, either by adding more performing regional growths or by avoiding diseconomies supposed to affect the biggest agglomerations.

What is the evidence?

We have computed the correlation between level of polycentricity and three indices of relative dynamics as shown beneath.

If it is any, but not significant or slight correlation, it is between the level of development and more monocentrism.

To conclude, this statistical link between monocentrism and economic efficiency seems to be consistent with the main present trends towards more globalisation, which favour the main advanced services nodes of the world-wide economy.

The brief economic analysis we have achieved does not show any obvious advantage of polycentricity in terms of economic efficiency, measured globally by relative GDP growth compared to the European average: on the contrary, even if a very weak statistical relationship appears (quite insignificant indeed), this rather shows that States or more monocentric macroregions show little better economic behaviours, which can be understood in the framework of a globalization and tertiarisation of the economy benefiting big cities, which are the strongest integration nodes in the world economy. The free play of the dominant globalised economic powers tends to reinforce this situation in favour of the "hubs" of the world economy. This can naturally impact negatively in terms of cohesion inside national territories (let us think for example of the new member countries in which the opening to market economy and the sudden tertiarisation and internationalisation have very much favoured the growth of capital regions to the detriment of industrial areas. The latter used to be, on the contrary, favoured by planned economy, which had also ensured an administratively balanced distribution of industrial activities on the whole of the national territory, even if command functions were centralized from the capital.

The political discourse in favour of polycentrism should be able to rely on a sufficiently refined statistical analysis, specifying which scales are concerned. This report tries to contribute to solve both questions, although it remains an incomplete preliminary draft that should be completed and refined, with increased means, especially if one wishes to add to the analysis the dimension of contribution to sustainable development.
In case an accurate analysis of polycentricity and its fitting on different scales fails to be achieved, the polycentrism option will remain an empty political slogan, an "auberge espagnole" where any partner will bring himself what he wants. Some will bring a line of argument to get regional aid, cohesion funds or public aid. Others inversely, will argue in favour of a *laisser-faire* policy and competition between urban areas, and a weakening of the regulating power of the States.

. In order to be in line with the development aims of world competition, cohesion, and Lisbon criteria and the concept to be operational, the reflection on a polycentric Europe should meet three fundamental questions:
- specification and definition of urban areas, as a basis of any reflection on polycentrism;
- analysis of the polycentricity scales and its modalities, with impacts at different scales;
- examination of the deficiencies of the statistical measure tools and of the tracks to follow.

These are discussed at the end of this report.

Networking report

Contacts have been taken with the BBR where Mr Schmidt-Seiwert gave us the geographical database used during this project. Other information where sent by Norderegio as well as Espon Contact Points from different countries.

Part 3. Characterization of the Functional Urban Areas

1. First: Identification of the FUAs on the basis of their demographic weight

Espon 1.1.1 has produced an exhaustive list of the FUAs for 29 European countries. Globally this list appears to be correct but some errors have been made, according to the criticisms made on the final report by the Espon Contact Points. We don't intend - nor have the mission - to establish a new exhaustive list of the FUAs but we have enhanced the methodology to incorporate the Morphological Urban Areas (MUAs) of the cities in the definition of the FUAs. We have thus started to list the European cities on a morphological base by selecting the FUAs (from the Espon 1.1.1 list) with more than 50,000 inhabitants and characterizing them at the NUTS-5 level, using the NUTS-5 database developed by Nordregio and IRPUD for the European Commission[1]. From this database we have extracted the number of inhabitants and the areas for each NUTS-5 unit and put them on a map of Europe. Creating this list of all the NUTS 5-units contained in each European MUA and in the FUAs of some countries will be our main contribution to the study of the European urban network. By lack of data during the time of the project we haven't been able to define the FUA areas in NUTS-5 units for a majority of countries. Nevertheless this can still be done later and the database can be completed and corrected if necessary. These data can be used to support other studies in the future and allows already further researches on the core cities of the FUAs.

It has appeared to us that the characterization of the FUAs should include the characterization of the Morphological Urban Areas (MUAs) inside them. Of course, the FUA, which corresponds to the employment pools, is an essential concept in functional terms and imposes itself more and more in a context of suburbanisation and growing mobility of active populations. However, the MUA, as a dense and coherent morphological whole, remains an essential concept: with identical populations, it clearly appears that FUAs which have better opportunities are those having a strong MUA in their centre, especially if the latter has some good quality historical and cultural heritage. This is an important element in the new forms of cross-city competitiveness.

We have also included in the study the characterization of the transborder FUAs, which are essential in the European dimension.

Finally, in order to stay close to a European perspective we have used the same homogenous criteria for every country (see the morphological areas methodology below).

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[1] In coooperation with an extensive research consortium, and as part of the DG REGIO Study on Mountain Areas in Europe. This database covered all municipalities of countries with mountain areas. It was then extended to other countries as part of an ESPON project carried out by Nordregio and IRPUD.

1.1   Methodology for the morphological study

1.1.1   Introduction

Indeed we have systematically examined the list and the delimitations of the MUAs because of methodological considerations linked to the criticism of the FUAs determined by Espon 111.

Our intention never was to substitute the MUAs to the FUAs even if we state that the strength of the FUAs in a polycentric system comes for a good part from their inner MUAs where the most significant functions in the framework of national and international urban networks are concentrated. The identification of the MUAs that is based on the same definition whatever the country, appeared to be an indispensable first step for the consolidation of the FUAs.

A tool to assess the FUAs

The determination of the MUAs inside the FUAs provides a critical point of view on the FUAs identified by Espon 111.

The study of the MUAs is the result of a functional approach of the FUAs : indeed the core cities of the FUAs are the real living poles of the FUAs, nothing would exist without them and the relation between cores and labour pools is a dependence of the second on the first. Should a core start to decline the whole FUA would follow, should a core city enter in some economical growth period the whole FUA would follow immediately. Most of the economical or cultural activities occur in the MUAs and all of the important transport connections (trains, planes, highways, as well as the freight) link cities to other cities. How could we study the urban functions - which means to study activities taking place inside or in the neighbourhood of cities - of the FUAs without knowing what cities are actually in the FUAs ?

Studying the internal structures of the FUAs (see the typology below) shows that the FUAs must not be merely described by the number of inhabitants. There's a functional difference between a FUA made of a single big city surrounded by a labour pool and another FUA with the same total population but made of several small core cities with a shared labour pool (if the labour pool is not shared, it's not a FUA anymore).

The corrections of the Espon 111 list of FUAs based on the comments made by the ECPs only would not have been satisfying as for most cases the comments were not accurate enough and nothing allowed us to consider them as comprehensive nor even correct. These were sometimes general comments with some examples but certainly not a list of errors, and some countries even considered the work done by Espon 111 as not satisfying at all without any other more precise considerations. From that statement and considering that Espon 111 did not use any common methodology for all countries, but rather turned to national experts (which was not possible for us), and considering above all that the same common approach for all countries would better suit the European scope of Espon we have decided to use the morphological urban areas to assess the ESPON 111 FUAs. It is also important to remember here that we did not make our own list of FUAs but stuck to the existing one even if sometimes our MUA identification methodology would have led us to consider differently some cities (see Napoli for example).

A quick comparison between the populations of the MUAs and those of the FUAs shows - by calculating for each FUA the quotient of the population values provided by Espon 111 divided by the population of the MUAs - that Espon 111 gives values lower than 1 for around 15 % of them, equal to 1 for around 10 % of them and lower to 1,2 for around 30

%. Logically there should be more population in the FUA than in the MUA and never less. This shows that the population values of Espon 111 FUAs are problematic and should be improved. The problem is that we don't have sufficient information on the labour pools for each of the 29 countries but we have data (NUTS-5 population and area data provided by Espon) that can be used to compute the population of the MUAs, and considering that a FUA is basically an area centered on a MUA and moreover that exists only because of a MUA, we found that identifying the MUAs would be an essential first step.

Besides testing the probability of the Espon 111 values, the determination of the MUAs allowed us to see where the mistakes did come from : especially - but not only - the cases mentioned above where the FUAs and the MUAs have exactly the same population can be explained by the choice by Espon 111 of administrative boundaries instead of labour pool values.

An enrichment for the study of the urban functions

The identification of the MUAs must be seen as a real starting point for future studies on Urban Functions.

The knowledge of the internal structure of the FUAs improves the study of the urban functions by allowing to study the territorial development in relation with the type of local urban network, and hence to better study the polycentricity in Europe.

The use of MUAs in the study of the FUAs allowed us to highlight the existence of polycentric areas, sometimes at a higher level than the level of the FUA. In Germany for instance there are polycentric regions divided in FUAs (according to the list of ESPON 111) that can be nevertheless also considered as pure polycentric functional urban areas, since a significant proportion of workers actually commute from one FUA to another.

Same for the transborder FUAs.

It is now possible to improve the delimitations of the MUAs : should some value appear to be wrong, it would be very easy to find out why. It could be due either to a wrong population number provided for some NUTS-5 or to a wrong selection of NUTS-5. In the first case the only thing to do would be to correct the value in the NUTS -5 database and in the second it should be possible to modify the list. In the same way taking into account new population values will allow an almost automatic adaptation of the MUAs' population numbers as well as for the FUAs that are defined at the NUTS-5 level.

The knowledge of the MUAs allows future researches on the evolution of labour pools.

The knowledge of the MUAs allows now to better define the limits of the FUAs, according to the interpretation of new or future data (Urban Audit ?), indeed the labour basins are defined as a set of municipalities that send workers to a core city (a MUA) that is now defined itself as a set of municipalities. So whenever the data concerning the commuters are updated at the NUTS-5 level (so to say from one municipality to another) the sets of NUTS-5 of the FUAs can be automatically updated too.

Note that the identification of the MUAs allowed us also to provide a comprehensive list of transborder FUAs, as well as a typology, which is in strict keeping with the European dimension and for which the FUA approach is not sufficient. These transnational FUAs are mapped below in the report and are detailed in chapter 4.

1.1.2   The methodology

First the criteria are built up to make a clear distinction between two main classes of cities:

•   Small, medium and large cities which are more to be studied in a Christallerian perspective, they are providing services and the basic infrastructural framework for the territory. However, it is clear that many large, or even some medium and small cities, can carry out important specific functions at the European scale, either as specialised cores inside networks, or as more or less specialised satellites of big metropolises.

•   The main metropolises, at a European level, which are for most of them the nodes for the insertion in a competitive international economy. The category of the main metropolises is the most relevant at the point of view of our study, for it drives the future of Europe in the Lisbon perspective. However, even some such cities don't have the qualitative level corresponding to the amount of their population. It will also be discussed later.

From the EUROPEAN point of view, it appears to be essential to follow the same criteria for every country, whatever their sizes. We are not working in the point of view of NATIONAL territorial planning.

Morphological Urban Areas

Basically a city is organised around a densely populated node, with a true urban landscape and even better a historical core. Therefore, we have approached those characteristics by considering at first all the municipalities (NUTS-5 level) with more than 650 inhab./km². Then all the contiguous municipalities with this threshold of density, as well as the municipalities not reaching the threshold but enclosed by the others, were added to define central or morphological urban areas.

The threshold of 650 inhabitants/km2 and the 10 % criteria for the people working in the core city come from the publication "Bulletin du Crédit Communal, 53ème année, N° 207-208, 1999/1-2, pp 79-91.

"Previous studies (GEMACA1 and the "Atlas comparatif des villes européennes" 2)

have shown that a very good approximation of the population volume in morphological

agglomerations – FUA nodes in other words – can be obtained when adding to the central NUTS-5 unit of the FUA all the contiguous NUTS-5 units of more than 650 or 700

inhab./km2, a simple criterion indeed, but a criterion that seems to be confirmed by

monographic analyses carried out in different countries and by a comparison with CORINE data, even if some minor adjustments have to be made in order to take account of specific situations (periurban forests, mountains, etc.). In the very densely urbanised areas and in areas close to core cities, FUAs, or even core agglomerations, can be contiguous. What matters in such cases is to decide if contiguous NUTS-5 units belong to one and the same (possibly multipolar) FUA or not. »

However, in some cases, municipalities have a true urban character but are not reaching the level of 650 inhab./km², due for instance to some specificities of the delimitation of the municipality (a very large municipal territory; a large part of the territory occupied by a

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lake, or mountains or forests…). Therefore we have also taken into consideration all the municipalities with more than 20,000 inhabitants, whenever they have a clear concentrated morphological core.

The areas less populated but consisting of facilities like airports, seaports or industries, and specific contiguous areas like a forest, a small lake or other natural forms are also considered as part of the cities as well as the populated areas contiguous to them, but separated from the centre of their city only by these specific areas.

Sometimes, very densely populated municipalities are in fact very small isolated entities with only a few thousands inhabitants: therefore, we have not considered municipalities or sets of contiguous municipalities not reaching the 20,000 inhabitants threshold, even if they meet the density criteria.

In some cases, sets of contiguous municipalities, each reaching the 650 inhab./km² and/or the 20,000 inhabitants threshold, form a very large area which is in fact structured by different nodes, each with a clear identity, which is the case in some large conurbations. We have then identified different cities, but only when the different nodes are clearly separated from a morphological point of view and also identified as such at the upper levels of the urban hierarchy in the national studies of the urban networks.

We have used the Espon NUTS-5 database elaborated by Nordregio, from which we have taken the population for 2001, the main area values and the shapefile of the 29 "Espon" countries. These were quite complete but whenever there was a missing data (population number) we have taken a value elsewhere from the available statistics. To ensure that the statistical information given by the data fits enough with to the morphological reality we've checked them by viewing satellite images (mainly provided by GoogleEarth from http://earth.google.com/, or by http://www.geoportail.fr/).

So GoogleEarth was used only to fine-tune the selection made on statistical criteria, never to calculate a population number or to decide where to look for. It was a perfectly accurate and convenient tool for this specific job and it helped us to decide where to put the limits between two contiguous cities or to decide whether a slightly distant residential district should be included, and therefore to respect the list of the FUAs provided by ESPON. After looking at them we're not convinced that a tool as the Corine images provided by the European Environmental Agency would have allowed us to find these limits since the images give only spots of colours according to the types of land cover without any limits corresponding to the definition of the MUAs (with respect to their administrative delimitations). For instance whenever two contiguous cities are considered as two FUAs by Espon 111 they might appear on the Corine image as well as in the statistical data as a single urban area and we would not know where to put the limit between the contiguous NUTS-5 if these cities consist of several NUTS-5. Simply think of Milano or Napoli, which are both very widely urbanized regions consisting of many FUAs (according to ESPON 111) and much more MUAs. In some regions the urban areas are contiguous sometimes over a hundred km, like in montaneous areas. Only small details in the urban structure or natural irregularities can lead us to put a reasonable limit between two well known and distinct cities. GoogleEarth gives real details, Corine images in our case is a little bit redundant with the statistical data. Nevertheless it would be interesting to determine a methodology to use these images in relation to the statistical data on an automatic mode but it certainly will not be that trivial and will be time consuming.

Functional Urban Areas

Besides their morphological character, cities are also employment cores, surrounded by a labour pool. This functional dimension becomes more and more significant, as commuting and suburbanisation are growing. These functional urban regions (FUAs) are in principle defined in ESPON 1.1.1 on this base of the labour basins of the morphological urban areas. Nevertheless, the data provided by the ESPON 1.1.1 study don't seem to follow strictly this criteria in many countries, and sometimes truly not. Discussing that point in each national case is one of the main goals of the present study.

Here, and only from the point of view of the population of the morphological cores and the FUAs, we will consider two levels, metropolises on one side, small, medium and large cities, on the other side, according to the above theoretical first paragraph of this chapter. The ultimate goal, which will be reached after a quantitative and a qualitative analysis, is to consolidate the characterisation of the European urban pattern, described according to the ESPON 1.1.1 terminology in MEGAs (Metropolitan Growth Areas), transnational/national FUAs and regional/local FUAs.

Metropolises

From a quantitative point of view, the population of the FUA is more than 500,000 inhabitants.

Polycentric Metropolitan areas

In some cases, we have to consider the situation where different metropolises, with the centre of their cores distant from less than 60 km, are contiguous, or are only separated one from the other by other cities, with their own labour pool, or yet are bordered by other large, medium or small cities, distant from less than 30 km, also with their own individualised manpower basin. In these cases, we have identified conurbations of POLYCENTRIC METROPOLITAN AREAS (poly-FUAs). We have also considered as forming a POLYCENTIRC METROPOLITAN AREA two large cities distant one from the other less than 30 km and reaching together the level of 500,000 inhabitants. For the rest, we don't have considered as being a polycentric metropolitan area two or more large, medium or small cities with contiguous manpower basins, even if they reach together the threshold of 500,000 inhabitants.

So to form a poly-fua structure we must have either :

- 2 metropolises (> 500 000 inh.) with their centres less than 60 km apart, and labour basins touching each other

- 2 large cities (> 250 000 inh.) with their centres less than 30 km apart, and labour basins touching each other

- 1 metropolis and 1 large or medium city (> 100 000 inh.) with their centres less than 30 km apart, and labour basins touching each other

- 2 metropolises with their centres less than 60 km apart, labour basins separated only by the labour basin of a smaller fua touching the both of them

Other cities

In this category, which is more relevant at a national scale planning than from the European point of view, we can yet consider three sublevels, i.e. large, medium and small cities.

LARGE FUAs	the population of the FUA is more than 250,000 inhabitants.
MEDIUM FUAs	the population of the FUA is more than 100,000 inhabitants.
SMALL FUAs	the population of the FUA is more than 50,000 inhabitants.

We have thus not considered morphological cities that would have more than 20,000 inhabitants but with less than 50,000 in the whole FUA.

If medium or small morphological cores don't have a clear individual FUA and are also incorporated inside the labour pool of Metropolitan areas or even large cities, they are not considered as such. The population of their own secondary FUA is included in the population of the main FUA, but they are however named as secondary cores inside the principal FUA.

1.1.3   Presentation of the data

In next chapter for each FUA, we give the population of the FUAs and of their morphological cores (MUAs) (with the comparison to the data given in ESPON 1.1.1).

For each European metropolis or polycentric metropolitan area, we provide also with a proxy of the FUA at the NUTS-3 level, which will allow us later to give an estimation of the GDP and the economic structure of the FUA. We have included in the proxy all the NUTS-3 units contiguous to the NUTS-3 including the core and with at least 60% of their population in NUTS-5 units pertaining to the FUA. It is not possible to do accurately this exercise for cities with less than 500,000 inhabitants, due to their size generally much smaller than the one of the NUTS-3 unit in which they are incorporated.

1.1.4   Summary of the thresholds

FUA = morphological area (MUA) + labour pool (LP)

Criteria for the classification of the FUAs:	population number (minimum 50,000)
Criteria for the morphological area (MA) identification:	density of the NUTS-5 units (> 650 inhab./km^2)
	Population number (> 20,000)
	Contiguity (possible inclusions)
	Identity (possibly FUAs with several MA)

1.1.5   Summary of the FUA types

The following diagrams summarize for instance four different situations in a high-density area, implying quite different realities as regards functions, economy, management of mobility and territorial planning, but which could be confused if the analysis did not sufficiently explicit the definitions used. Even if these four patterns are purely theoretical, they are respectively globally based on the situation of an old coal basin for the first (type 1), the Ile-de-France Region for the second (type 2, with new cities functionally not much independent from Paris), the Belgian central metropolitan area (type 3) and the big London metropolitan area (type 4), where secondary centres of the external fringe of the FUA have more decisional autonomy and are moreover doubled by a belt of important or specialized cities (cf. Cambridge, Oxford) inside the FUA.

| Type 1 | Type 2 |
| Type 3 | Type 4 |
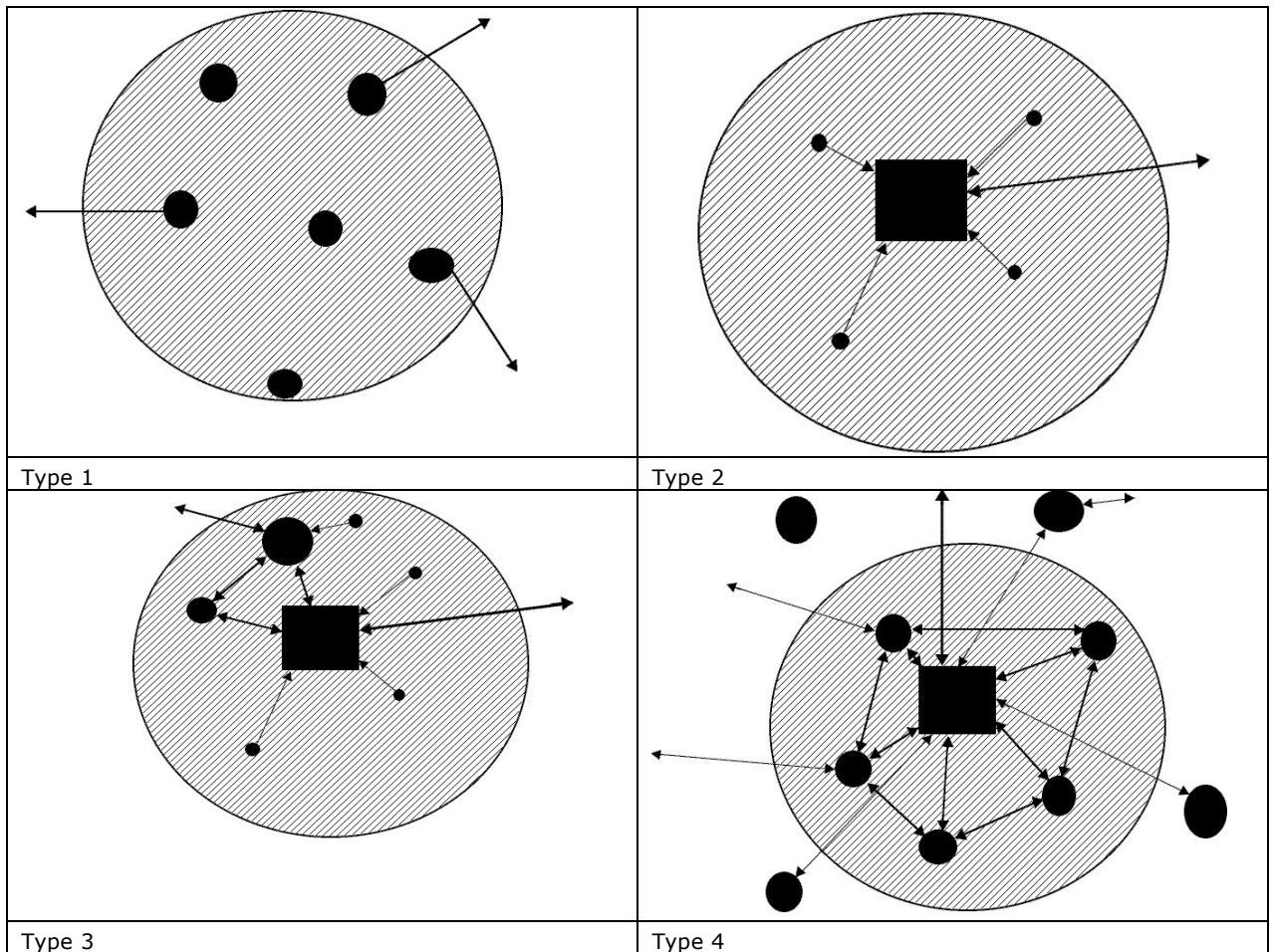
2. Second: Characterisation of the FUAs' functions

2.1   Methodology for the Functional study

We have gathered information to measure the functions of the 1221 FUAs of our list. Our categories are the same as those of Espon 1.1.1 except that we couldn't find relevant data on the industrial sector and that we had to decide to ignore this criterion instead of producing an inappropriate result. Nevertheless we have computed a second indicator that takes into accont the industry, using the Espon 1.1.1 data in which unfortunately France, the United Kingdom and Switzerland are missing.

2.1.1   The methodology and the data used to measure the functionality

The methodology used is detailed below in table 1
As always the limitations are due to the lack of available data or the too large scale covered by the available data (nuts-3, nuts-2). In particular industry data should be available at the city level, the nuts-3 level being far too large to make the assumption that the region value could be applied to any of its cities. Same for the employement data that are provided at nuts-2 level by eurostat but we have used nevertheless considering that applying its values to the FUAs was acceptable.

Regarding the "culture and tourism" criterion we had only data about tourism, we would have used also data on the cities that have congress facilities, which should be possible with a little bit more time.

Characterization of the FUAs

Criteria		Data	Value	Significance	Source and geographical scale	Comments
Population		FUA population (million inhab.)	> 4	7 pts	Espon nuts5 database for all the MUAs and for some FUAs depending on the country, otherwise national data on labour basins when available, otherwise Espon 1.1.1 data.	These two values are added to obtain a score between 1 and 10. The MUA size emphasizes the importance of a big core to strengthen the FUA. A FUA with one single big core is stronger than a FUA with many small cores.
			> 2	6 pts		
			> 1	5 pts		
			> 0.5	4 pts		
			> 0.25	3 pts		
			> 0.125	2 pts		
			> 0.05	1 pt		
		Main MUA population (inhab.)	> 1	3 pts		
			> 0.5	2 pts		
			> 0.25	1 pt		
Decision	international	Number of headquarters of the top-2000 biggest world companies located in the European FUAs (523 in total)	> n/2	3 pts	Forbes, 2005. Core city level.	"n" is the max value among all the FUAs
			> n/4	2,5 pts		
			> n/8	2 pts		
			> n/16	1,5 pt		
			> n/32	1 pt		
			> n/64	0,5 pt		
		Globalization and World Cities (GaWC) Prop. Highest Connectivities	> n/2	3 pts	Connectivity of the cities in the world-wide advanced services network. http://www.lboro.ac.uk/gawc/ Core city level.	"n" is the max value among all the FUAs
			> n/4	2,5 pts		
			> n/8	2 pts		
			> n/16	1,5 pt		
			> n/32	1 pt		
			> n/64	0,5 pt		
	national	Number of headquarters of the main (3000) European national companies selected in each country so that they weigh together 50 % of the national added value.	> n/2	2 pts	Van Dijk database. Core city level.	"n" is the max national value among all the FUAs of the country considered (it varies upon the countries)
			> n/4	1,5 pt		
			> n/8	1 pt		
			> n/16	0,5 pt		
		Number of sub-headquarters of the top-200 bigger world companies located in the European FUAs	> n/2	2 pts	Forbes 2000 and systematic search of all the subsidiaries. Core city level.	
			> n/4	1,5 pt		
			> n/8	1 pt		
			> n/16	0,5 pt		

Criteria	Data	Value	Significance	Source and geographical scale	Comments
Administration	National administrative functions	country capital	8, if national population > 20 mio		Exception : Bonn (4 pts), Amsterdam (3,5 pts)
			7, if national population < 20 mio		
			6, if national population < 2 mio		
		Chief town of region with real autonomy	5, if regional pop > 5 mio	Core city level.	Regional capitals in federal countries, and Catalonia and Basque Country, Scotland, Wales and Northern Ireland
			4, if regional pop < 5 mio		
		Chief town in decentralised countries	3, if regional pop > 5 mio		Regions in France, Italy, Spain, Madeira, Acores. 1,5 pts for British regions.
			2, if regional pop < 5 mio		
		Administr. chief town	1		Level of the Kreis not taken into consideration.
	International administrative functions	UE headquarter	3 pts		
		UE secondary HQ	2 pts		
		UE agency	0,5 pt	Core city level.	
		International institutions	1 pt		Ex : ECB, NATO, IRCC, Council of Europe, UNESCO, UN, IOC, IWO, etc.

Criteria	Data		Value	Significance	Source and geographical level	Comments
Transport	Road connectivity			Max 2 pts	Espon 1.2.1 : based on the average value of three variables (« Daily population accessible by car » + « Potential accessibility by road in ESPON space » + « Accessibility time to market by road »). Nuts-3 level.	
	Rail connectivity			Max 3 pts	Espon 1.2.1 : based on the average value of two variables (''Potential accessibility rail » + « Accessibility time to market by rail »). Nuts-3 level.	
	Air traffic			Max 3 pts	Igeat data : Average between the number of destinations and the number of seats on regular flights. Core city level.	
	Sea traffic	Sea ports – global fret in millions of tons	> 75	1 pt	Eurostat, mar_go_qm_2005 Core city level.	
			> 20	0,75 pt		
			> 10	0,5 pt		
			> 5	0,25 pt		
		Sea ports – containers fret in TEU.	> 3	1 pt	Eurostat, mar_go_qm_c2004 Core city level.	
			> 1	0,75 pt		
			> 0.25	0,5 pt		
			> 0.05	0,25 pt		

Characterization of the FUAs

Criteria	Data	Value	Significance		Source and geographical level	Comments
	Top-500 European universities	Position in the ranking	(501–pos) / 500	Max 5 pts	http://www.webometrics.info/ Core city level	
	Top-100 Research Centres		(101–pos) / 100	Max 2,5 pts		
Knowledge	Annual data on employment in high-technological and knowledge-intensive sectors in the services (%)	Class of percentage	Max 1,875 pt		Eurostat, htec_emp_reg_2005 Nuts-2 level	
	Annual data on employment in high-technological and knowledge-intensive sectors in manufacturing (%)		Max 0,625 pt			
	Nr of beds and nr of nights		Max 5 pts			Estimation for some cities where one of the series was not available on the basis of data for the other set and/or on the situation of similar cities.
		3 stars	3 pts			
		2 stars	2 pts			
		1 star	1 pt			
		> 2 pages	5 pts			
Culture and tourism	Tourist appreciation	> 1 page	4 pts	* 5/8	Michelin guide for Europe Core city level	
		> 1/2 page	3 pts			
		> 1/4 page	2 pts			
		just mentioned	1 pt			
Industry	No data available					We have nevertheless provided a functional index with the industry value produced by Espon 1.1.1 included but the methodology is unclear and it doesn't include data for UK, France and Switzerland which count for about 20 % of the FUAs and not the less. Nuts-3 level.

Table 1   Methodology to measure the functionality

2.1.2   Global values

All of our main categories have received a score on 10 points, except the administration that got only 5 points because its influence would have been too important in the total. Three global values were then obtained for each FUA by calculating a weighted average of all the scores as following:

Global score: Total of all the scores, except industry, divided by 5,5
Functional score: Total of all the scores, except industry and population, divided by 4,5
Global score including industry: Total of the 7 scores divided by 6,5

Then we have calculated a specificity value for our 5 function scores by dividing each of these by the Functional score in order to highlight the cities that would have a specific function. The results are shown in the maps below.

3. List of the Functional Urban Areas on the morphological base

The countries are classified by alphabetical order. All the transborder FUAs are detailed in chapter 4.

3.1   Austria

3.1.1   Criticism of the ESPON 1.1.1 FUAs

ESPON 1.1.1 data for Austrian FUAs are clearly wrong and definitely underestimate the level of urbanisation of this country. In fact, ESPON 1.1.1 only considers as population of the so-called FUAs the population of its central municipality. Therefore, some so-called FUAs have a population even inferior to the population of the only MUA, as suburbs have not been included or have been considered as separate FUAs! It is the case for Vienna, Graz, Linz, Salzburg and Innsbruck, the biggest five Austrian cities. In fact, due to the presence of quite big cities clearly separated from each other by more rural or mountainous regions, the FUAs of the main Austrian cities, computed on the basis of our criteria, are quite large. Krems an der Donau does not reach the threshold of 50 thousand inhab. for the FUA.

3.1.2   The Austrian urban pattern: population data

The lines in yellow show the FUAs that are integrated in the poly-fua described in the preceding white line, so every white line preceding a yellow one describes a poly-FUA.

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Metropolises						
Wien	2584	1550 (a)	Wien Baden Wiener Neustadt	1674 25 38	AT112, AT122, AT125, AT126, AT127, AT130	2682
Linz-Wels-Steyr	926	n.c.	Linz Wels Steyr	234 56 39	AT312, AT313, AT314	883
Linz	648	184 (b)	Linz	234		
Wels	166	56	Wels	56		
Steyr	112	39	Steyr	39		
Graz	645	226	Graz	232	AT221, AT225	556
Salzburg (c)	363	143	Salzburg	154	AT323	339
Large cities						
Innsbruck	339	113	Innsbruck	128		
Klagenfurt	277	90	Klagenfurt	90		

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Medium cities						
Sankt-Pölten	155	49	Sankt-Pölten	49		
Villach	154	57	Villach	57		
Bregenz (d)	117	27	Bregenz	60		
Feldkirch	108	29	Feldkirch	29		
Dornbirn-Lustenau (d)	99	42	Dornbirn Lustenau	42 20		
Small cities						
Leoben	85	26	Leoben	26		
Kapfenberg/Brück an der Mur	62	22	Kapfenberg/Brück an der Mur	36		
Amstetten	59	23	Amstetten	23		
Wolfsberg	52	25	Wolfsberg	25		

(a) ESPON 1.1.1 considers Klosterneuburg, Mödling, which are inside the MUA of Wien, as two separate FUAs (with only their municipal population, respectively 25 and 20 thousand inhab.). It also considers separately the Baden and Wiener Neustadt (with respectively 25 and 38 thousand inhab. for their FUAs), which are secondary cores inside Wien's FUA.

(b) Linz' FUA according to ESPON 1.1.1 alone. ESPON 1.1.1 considers Traun and Leonding, which are inside the MUA of Linz, as two separate FUAs (with only their municipal population, respectively 23 and 22 thousand inhab.), as well as Wels and Steyr, which are in fact cores at the fringe of Linz' FUA, with partially their own FUA but less than 30 km from the centre of Linz.

(c) Austrian side only. See "transborder FUAs" chapter.

(d) Austrian side only. See "transborder FUAs" chapter. With the Swiss side, Dornbirn-Lustenau can be considered as a medium FUA.

3.1.3   Conclusions

The Austrian network is characterised by the strong dominance of Vienna, yet more from a functional point of view, while Linz, Graz and even Salzburg, Innsbruck and Klagenfurt appear to be more important cities than sometimes thought, due to their very large labour pools, in the absence of significant small or medium cities in their surroundings. As for the rest, the Vorarlberg is characterised by a dense network of small cities, much interrelated and with strong cross-border connections with Switzerland, Germany (and Liechtenstein): three main nodes, even if they remain small cores, appear in this network (Feldkirch, Dornbirn and Bregenz). The two main corridors along which urbanisation is organised are the west-east Germany-Linz-Vienna-Hungary-Slovakia corridor, and the eastern north-south corridor between the Czech and the Slovak Republics-Vienna-Graz and the Adriatic coast. Besides, Salzburg, Innsbruck but also Villach and Klagenfurt are important places on the north-south transalpine links.

3.2   Belgium

3.2.1   Criticism of the ESPON 1.1.1 FUAs

The fundamental mistake in the Espon 1.1.1 FUAs delineation for Belgium is the wrong definition of Brussels' labour pool: the authors have only considered the Brussels-Capital federated Region, which is much smaller than Brussels' morphological area itself, not to mention the FUA. In fact, for all FUAs, they have exclusively considered the administrative divisions at NUTS-3 level incorporating the urban cores, without examining the true extent of the labour pools.

In fact, Brussels' labour basin, as defined on the basis of 10% or more of the occupied active population commuting towards an employment core – Brussels being the main commuting direction – covers the whole central part of Belgium, i.e. the two provinces of Walloon and Flemish Brabant (with the exception of the area surrounding Leuven), the Eastern part of Oost Vlaanderen, the north of Hainaut and some municipalities of the provinces of Namur and Liège. This is due to the weight of Brussels as first employment core in Belgium, to a very early tradition of commuting and to a strong suburbanisation, in a small country with a very dense transport network and weak urban planning regulations. In fact, Brussels' labour basin is nearly three times more populated than that proposed by ESPON 1.1.1. ESPON 1.1.1 has also used too narrow delimitations (based on administrative limits) for the other big Belgian FUAs.

As a consequence, the population in the FUAs of the smaller employment cores surrounding Brussels is very much overestimated in ESPON 1.1.1. It is the case for Leuven, Mechelen, Sint-Niklaas. As another consequence of the same mistake, ESPON 1.1.1 considers Aalst as a labour pool in itself, but even if this city is a morphological and an employment core, it is also included in the Brussels' labour pool.

ESPON 1.1.1 does not consider transborder pools: many municipalities of the province of Luxembourg are clearly included in the Luxembourg labour pool, including Arlon, the capital of the province, which is also an employment core in itself. Comines belongs to Lille's labour pool, whereas other municipalities make part of Aachen's, Maastricht's, Eindhoven's or Tilburg's labour pools.

ESPON 1.1.1 failed to consider two smaller FUAs with more than 50,000 inhabitants and with a morphological core of more than 20,000 inhabitants, i.e. Turnhout and Sint-Truiden, which we have added to the list. The other FUAs do not gather 50,000 inhabitants and/or their morphological centre does not reach a population of 20,000 inhabitants.

3.2.2   The Belgian urban pattern: population data

The lines in yellow show the FUAs that are integrated in the poly-fua described in the preceding white line, so every white line preceding a yellow one describes a poly-FUA.

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Metropolitan and polynuclear metropolitan areas						
Belgian central metropolitan region ("Vlaamse ruit" + Bruxelles/ Brussel, "Flemish diamond")	5103	n.c.	Bruxelles/ Brussel Antwerpen Gent Aalst Leuven Mechelen Waregem Sint-Niklaas Oudenaarde Herentals	1498 830 300 160 89 76 73 68 28 26	BE100,BE211,BE212,BE 231, BE232,BE233,BE234,BE 235, BE236,BE241,BE242,BE 257,BE310 (h)	5025
Bruxelles/ Brussel (a)	2639	964	Bruxelles/Bruss el Aalst	1498 160	BE100,BE231,BE232,BE 241, BE310 (h)	2325
Antwerpen (b)	1406	1238	Antwerpen Mechelen	830 76	BE211, BE 212	1238
Gent (c)	704	497	Gent Oudenaarde	300 28	BE233,BE234,BE235,BE 257	778
Leuven	241	458	Leuven	89	BE242 (i)	458
Sint-Niklaas	113	224	Sint-Niklaas	68	BE236	224
Euroregio MAHL (belgian part) (d)	1538	n.c.	Liège Hasselt-Genk Verviers Sint-Truiden	451 131 67 37	BE331,BE332,BE333,BE 334, BE221,BE222,BE223	1815
Liège	750	584	Liège	451	BE331,BE332,BE334	754
Hasselt-Genk	520	385	Hasselt-Genk	131	BE221,BE222,BE223	795
Verviers	106	266	Verviers	67	BE333	266
Sint-Truiden	66	n.c.	Sint-Truiden	37	included in Hasselt-Genk	
Aachen's FUA (e)	52	n.c.			included in Verviers	
Maastricht's FUA (e)	44	n.c.			included in Hasselt-Genk	
Charleroi-Centre	714	n.c.	Charleroi La Louvière	314 142	BE322,BE325,BE326,BE 353	802

Charleroi	524	420	Charleroi	314	BE322,BE326,BE353	628
La Louvière	190	174	La Louvière	142	BE325	174
Belgian side of Lille metropolis (f)	524	n.c.	Kortrijk Tournai Mouscron Ieper	151 67 52 35	BE253,BE254,BE324,BE 327	593
Kortrijk	218	278	Kortrijk	151	BE254	278
Tournai	139	141	Tournai	67	BE327	141
Ieper	87	104	Ieper	35	BE253	104
Mouscron	62	70	Mouscron	52	BE324	70
Lille's FUA (e)	18	n.c.			included in Mouscron	
Large cities						
Mons-Borinage	274	249	Mons-Borinage	193		
Brugge	264	271	Brugge	117		
Medium cities						
Namur	231	284	Namur	105		
Turnhout	161	n.c.	Turnhout	49		
Roeselare	141	141	Roeselare	92		
Oostende	132	143	Oostende	82		
Waregem	119	n.c.	Waregem	73		
Others						
Luxembourg's FUA (e)	146	n.c.	Arlon Aubange (g)	25 15		
Eindhoven's FUA (e)	41	n.c.				
Tilburg's FUA (e)	2	n.c.				

(a) ESPON 1.1.1 data relate to the Brussels-Capital Region population only.

(b) Including in ESPON 1.1.1 306 thousand inhab. for a separate Mechelen's FUA, which is in fact the population of Mechelen's arrondissement. Even if Mechelen is an employment core, most of the municipalities of the arrondissement are included in Antwerp's FUA. Data on Antwerp's FUA thus include the population of the small FUAs of Mechelen, considered as a secondary centre, as well as Herentals.

(c) Data for Gent's FUA include those for the small FUA of the secondary centre of Oudenaarde.

(d) Belgian side of the Euregio MAHL only. See "transborder FUAs" chapter for the whole polynuclear transborder metropolis.

(e) Belgian side only.

(f) See "transborder FUAs" chapter for the whole polynuclear Lille metropolitan region.

(g) Belgian part of the transborder MUA Longwy-Rodange-Aubange.

(h) Due to the strange delineation of the arrondissement of Soignies, it is not possible to include the arrondissement of Ath in Brussels' FUA proxy (as well as should be incorporated the north of the arrondissement of Soignies).

(i) The proxy is less than 60% of the population of the FUA, but the rest of the area of the proxy is for the most part included in Brussels' FUA.

3.2.3   Conclusions

Belgium is a country with a very dense polycentric urban pattern and a very strong process of suburbanisation, in a context of loose planning and scattered settlements. This pattern is dominated by a central metropolitan region, which gathers half the country's population. But at the same time, Belgium's urban network is strongly dominated, from a functional point of view, by Brussels. One can say the Belgian urban pattern is rather morphologically than functionally polycentric. Three Belgian urban sub-systems are clearly marked by effective or at least potential transborder characteristics: the East is included in the Euroregio network with the South of Dutch Limburg and Aachen's area in Germany, and the South-West could be polarized by Lille in France. While these two transborder sub-systems may be quite potential from the point of view of effective cooperation, the South-East is conversely more and more effectively polarized by Luxembourg through strong and growing commuting flows.

3.3   Bulgaria

3.3.1   Criticism of the ESPON 1.1.1 FUAs

ESPON 1.1.1 data relate to municipalities only (ESPON 1.1.1 has however made a clear mistake for Plovdiv, confusing data for the municipality with data for the department). Meanwhile, Bulgarian municipalities have a very big size. Considering the fact that suburbanization was nearly unknown for decades, data are perhaps not too much incorrect to describe Bulgarian FUAs, but accurate information about the labour pools should be useful for the future. We have estimated a correction for Plovdiv, Varna and Burgas only, and we have added to the population of the very municipality the population of the neighbouring municipalities. This rectification was not made for Sofia, as the territory of the capital is very large and clearly extends beyond morphological limits.

3.3.2   The Bulgarian urban pattern: population data

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
FUAs	FUA's population	Espon 1.1.1 Population	Cores	MUA's popula-tion	NUTS-3 proxys	Population
Metropolises						
Sofia	1174	1174	Sofia	1174	BG041	1217
Large cities						
Plovdiv	415	722	Plovdiv	341		
Varna	362	320	Varna	322		
Medium cities						
Burgas	223	209	Burgas	210		
Ruse (a)	182	178	Ruse	182		
Stara Zagora	169	168	Stara Zagora	169		
Pleven	150	149	Pleven	150		
Sliven	137	136	Sliven	137		
Pazardzhik	129	128	Pazardzhik	129		
Pernik	105	105	Pernik	105		
Shumen	105	104	Shumen	105		
Dobrich	100	126	Dobrich	100		
Haskovo	100	99	Haskovo	100		
Small cities						
Veliko Tarnovo	91	90	Veliko Tarnovo	91		

Vraca	86	85	Vraca	86		
Yambol	83	95	Yambol	83		
Kazanlak	82	82	Kazanlak	82		
Blagoevgrad	78	78	Blagoevgrad	78		
Vidin (b)	78	77	Vidin	78		
Gabrovo	75	75	Gabrovo	75		
Kyustendil	71	71	Kyustendil	71		
Karlovo	71	70	Karlovo	71		
Kardzhali	70	70	Kardzhali	70		
Asenovgrad	68	52	Asenovgrad	68		
Dimitrovgrad	65	65	Dimitrovgrad	65		
Targovishte	65	61	Targovishte	65		
Lovech	63	62	Lovech	63		
Silistra (b)	62	62	Silistra	62		
Montana	62	61	Montana	62		
Razgrad	59	59	Razgrad	59		
Petrich	58	58	Petrich	58		
Gorna Oriahovitsa	54	n.c.	Gorna Oriahovitsa	54		
Doupnitsa	52	n.c.	Doupnitsa	52		

(a) Bulgarian side only. See "transborders FUAs" chapter for the transborder FUA with Giurgiu.
(b) Due to the lack of a bridge on the Danube, we have not considered the Vidin-Calafat and Silistra-Calarasi pairs as transborder FUAs.

3.3.3   Conclusions

As in some other former socialist countries, like Romania, the urban network is characterised by the strong primacy of the capital, and for the rest by a quite equilibrated pattern of second-level cities, corresponding to the willingness of the former planned economy to disperse industry on the whole country, following the administrative hierarchy. Plovdiv, Varna and Burgas are clearly the most important cities after Sofia. Ruse-Giurgiu appears as a very big transborder FUA, quite exceptional in this part of Europe, but since borders between countries were quite close during the communist period, it seems that twin cities could rather be neighbour cities, on both banks of the Danube, than a true integrated transborder agglomeration.

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3.4   Cyprus

3.4.1   Criticism of the ESPON 1.1.1 FUAs

Data provided by ESPON 1.1.1 for the FUAs seem to be quite coherent with the MUAs' populations, if one corrects the ESPON 1.1.1 report's mistake, i.e. the inversion of the data for Larnaka and Lemessos (the municipality of Lemessos alone has a population of 94 thousand inhab., which is more than the amount given by ESPON 1.1.1 for the whole FUA !). Taking this correction into account, ESPON 1.1.1 data are also coherent with the population of the administrative districts, a bit larger than the FUAs (respectively 273 thousand, 197 thousand, 115 thousand and 66 thousand for the districts of the four mentioned cities, the last district, Famagusta, being smaller, with only 38 thousand inhab.). However, if we accept ESPON 1.1.1 data for the FUAs, Pafos is excluded from the list of FUAs at a pan-European level: the MUA reaches, with 35 thousand inhab., the threshold, but not the FUA with only 47 thousand inhab.

3.4.2   The Cyprus urban pattern: population data

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Large city						
Lefkosia (Nicosia)	274	251	Lefkosia	192		
Medium city						
Lemessos (Limassol)	161	161	Lemessos (Limassol)	150		
Small city						
Larnaka	72	72	Larnaka	55		

3.4.3   Conclusions

The urban pattern of Cyprus is quite polycentric, with a trend to a much quicker coastal development (including Pafos).
N.B.: the Northern part of the island, under Turkish occupation, is not considered.

3.5   Czech Republic

3.5.1   Criticism of the ESPON 1.1.1 FUAs

Due to the lack of commuting data, the ESPON 1.1.1 report has clearly used administrative data, in general at the level of the districts, the first administrative level above the municipalities, more or less with the same size as the Kreise in Germany. However, ESPON 1.1.1 data are totally wrong for the second Czech FUA, as they give for Ostrava and the surrounding industrial cities a population above the whole kraj province. We have followed and implemented the methodology using districts as proxys of the FUAs, however extending the FUAs of the biggest towns to their surrounding districts, and thus considering Kladno as a secondary core inside Praha's FUA. However, this methodology seems to overestimate the true FUAs for the smallest cities, located in the less urbanised parts of the country. Therefore, we have suppressed from the list all the cities with less than 25 thousand inhabitants isolated in their district. It is indeed not probable that such very small cities would be so attractive to many commuters that their FUA would be more than 50 thousand people. Even doing so, it is probable that the FUAs of the cities between 25 and 50 thousand inhab. remain overestimated. Therefore, we have arbitrarily limited the population of these FUAs to twice the population of the corresponding MUA.

3.5.2   The Czech urban pattern: population data

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Metropolitan and polynuclear metropolitan areas						
Praha (a)	1669	1407 (b)	Praha Kladno	1175 71	CZ010,CZ020 (c)	2297
Ostrava (d)	983	1535 (e)	Ostrava Frydek-Mistek Karvina Trinec Orlova Novy Jicin Cesky Tesin Koprivnice	365 64 65 39 35 27 26 24	CZ080	1280
Brno (f)	535	531	Brno	376	CZ062 (g)	1137
Large city						
Plzen (h)	352	306	Plzen	165		
Medium cities						
Liberec (i)	247	158	Liberec Jablonec nad Nisou	101 45		

Olomouc	225	224	Olomouc	103			
Karlovy Vary (j)	216	122	Karlovy Vary Sokolov	53 25			
Zlin	195	194	Zlin	104			
Opava	181	181	Opava	61			
Ceske Budejovice	178	178	Ceske Budejovice	112			
Pardubice	161	161	Pardubice	91			
Hradec Kralove	161	159	Hradec Kralove	97			
Decin	134	134	Decin	53			
Teplice	126	126	Teplice	64			
Chomutov	125	125	Chomutov	72			
Usti nad Labem	118	117	Usti nad Labem	101			
Most	117	117	Most Litvinov	68 27			
Jihlava	108	108	Jihlava	51			
Small cities							
Prostejov	96	110	Prostejov	48			
Prerov	96	135	Prerov	48			
Mlada Boleslav	90	44	Mlada Boleslav	45			
Tabor	88	n.d.	Tabor	44			
Trebic	78	n.d.	Trebic	39			
Ceska Lipa	78	n.d.	Ceska Lipa	39			
Znojmo	72	n.d.	Znojmo	36			
Pribram	72	n.d.	Pribram	36			
Cheb	66	n.d.	Cheb	33			

(a) Districts of Praha, Beroun, Kladno, Melnik, Praha-vychod, Praha-zapad.
(b) Including 71 thousand inhab. attributed by ESPON 1.1.1 to a separate Kladno's FUA.
(c) The NUTS-3 units are quite inadequate as proxys for Praha metropolitan area. CZ010 alone is too narrowly limited to the MUA and CZ020 is too big as a proxy of the suburban parts of the FUA.
(d) Districts of Ostrava, Frydek-Mistek, Karvina and Novy Jicin. Czech side only. For considering the transborder area with the Polish side (Cieszyn at a large scale; the whole Upper Silesian basin at a small scale), see further "transborder FUAs" chapter.
(e) Including 226 thousand inhab. attributed by ESPON 1.1.1 to a separate Frydek-Mistek's FUA, 86 thousand to a separate Havirov's FUA and 65 thousand inhab. to a separate Karvina's FUA. The total value of 1535 thousand inhab. given by ESPON 1.1.1 is totally improbable, as it is nearly 270 thousand more than the whole Moravoskosleszky kraj !
(f) Districts of Brno and Brno-venkov.
(g) The NUTS-3 unit is too large as a good proxy for Brno. Its population is more than twice that of the FUA.
(h) Districts of Plzen, Plzen-sever, Plzen-jih and Rokycany.
(i) Districts of Liberec and Jablonec nad Nisou.
(j) Districts of Karlovy Vary and Sokolov.

3.5.3   Conclusions

The Czech urban pattern could appear as quite polycentric, but the functional weight of Praha is however overwhelming, insofar as the Ostrava metropolitan area is a conurbation of badly structured urban settlements, with strong environmental problems to be solved. It is quite the same in the urban, mining and industrial range in crisis extending along the north-western border of the country along the Erzgebirge from Karlovy Vary-Sokolov to Liberec-Jablonec nad Nisou. Even if lacking really large cities, except for Prague, the urban system is characterized by a regular, well developed (also in terms of urban character) network of medium-size and small towns.

Brno and Plzen have a strong historical core and are in a better situation as for their development, as they are well located on two main corridors, to Austria and southern Germany. Brno and Ceske Budejovice develop a strong willingness of transborder cooperation, respectively with Vienna and Linz. However, according to our criteria, these two cities are too far from their transborder partner to be considered as parts of true polynuclear transborder metropolitan areas. The same is true at another scale for Usti nad Labem towards Dresden. Inversely, one can consider a big transborder polycentric metropolitan area at a small scale associating the Polish Upper Silesian basin with the Ostrava metropolitan area (see further, "transborder FUAs chapter"). Inside this transborder polynuclear metropolitan area, a transborder MUA links Cesky Tesin and Cieszyn.

3.6   Denmark

3.6.1   Criticism of the ESPON 1.1.1 FUAs

The list of FUAs, as identified in ESPON 1.1.1, is complete and generally corresponds with the urban network and the labour pools as identified in other sources – of scientific, planning and statistical nature. However, to respect the European-wide criteria, we have excluded 11 small FUAs considered by ESPON 1.1.1, with populations between only 35 and 23 thousand inhabitants. When only FUAs above the 50,000 inhabitants threshold are considered, their list almost fully complies with the map of important urban centres produced by the Danish Ministry of Environment and Energy in 1999, except of Aabenraa. The only centres appearing on this map but not included among the FUAs are parts of the larger metropolitan area of Copenhague, either included in Copenhague's morphological area (Roskilde), or as secondary cores (Helsingor, Hillerod, Koge). Fredericia (with Middelfart) can be considered as a secondary core inside the Kolding's FUA. Due to their big size, Danish municipal cores don't reach the 650 inhab./km^2 threshold, except in the Copenhague metropolitan area: it is even true for the second and the third most important Danish cities, Aarhus and Odense.

3.6.2   The Danish urban pattern: population data

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Metropolis						
Kobenhavn (a)	1881	1881	Kobenhavn Helsingor Koge Hillerod	1360 61 39 37	DK001, DK002, DK003, DK004	1800
Large cities						
Aarhus	430	430	Aarhus	287		
Odense	367	367	Odense	184		
Aalborg	270	270	Aalborg	162		
Medium cities						
Kolding	171	171	Kolding Fredericia	62 68		
Vejle	162	162	Vejle	55		
Esbjerg	157	157	Esbjerg	83		
Randers	153	153	Randers	62		
Holbaek	129	129	Holbaek	34		
Slagelse	124	124	Slagelse	37		
Herning	119	119	Herning	58		

Naestved	103	103	Naestved	47		
Small cities						
Viborg	93	93	Viborg	42		
Horsens	90	90	Horsens	57		
Holstebro	86	86	Holstebro	41		
Haderslev	84	84	Haderslev	32		
Silkeborg	81	81	Silkeborg	53		
Sönderborg	75	75	Sönderborg	30		
Hjörring	68	68	Hjörring	35		
Aabenraa	60	60	Aabenraa	22		
Svendborg	58	58	Svendborg	43		
Nyköbing Falste	54	54	Nyköbing Falste	25		
Frederikshavn	53	53	Frederikshavn	35		
Skive	51	51	Skive	28		

(a) Danish side only. See "transborder FUAs" chapter for the links with Malmö, in the framework of an Öresund polycentric transborder metropolis.

3.6.3   Conclusions

The Danish urban system appears strangely in the light of the ESPON 1.1.1 report as one of the most polycentric in Europe. It should be noted, however, that with regard to one of the basic polycentricity criteria, i.e. the size distribution of urban places, but also its functional hierarchy, its structure is highly skewed in favour of Copenhague's metropolitan area. It is true that for the rest, Danish cities are quite small and properly cover the territory (with a slight underrepresentation in Southern and Western Jutland), sometimes forming networks of specialised cities, like in Central Jutland. Urbanisation is organised along two main axes: the Western Jutland South-North axis, from Aabenraa to Frederikshavn, and the West-East axis, linking the first one to Copenhague through Odense. Aarhus, with the most dynamic growth among Danish cities, Odense, Aalborg and Esbjerg have been designated as national centres by the Danish spatial planning authorities. Two other multipolar so-called national centres have recently been designated: Herning-Holstebro and Kolding-Fredericia-Vejle.

3.7   Estonia

3.7.1   Criticism of the ESPON 1.1.1 FUAs

Some small towns identified as FUAs in ESPON 1.1.1 are clearly not of European-wide importance, with their FUAS' populations from only 37 to 22 thousand inhabitants and their cores' populations under 20 thousand (and in decline, but this is also the case of bigger cities, due to the emigration of non-Estonians after 1991, a negative natural balance and the decline of the Soviet-time heavy industry). For the rest, the 5 remaining FUAs fit with the criteria and generally correspond to the urban hierarchy identified for the purpose of the National Planning Document "Estonia 2010" and by the document "The Estonian urban System" produced by Rivo Noorkoiv for Interreg IIC project on Urban Systems in the Baltic Sea Region.

It is understandable that FUAs are defined in terms of economic linkages of various kinds, not necessarily only involving daily commuting. However, if the estimations of FUAs' populations given by ESPON 1.1.1 are not very higher than morphological cores' populations, they seem to be likely, if one takes into account the low population densities, the size of some NUTS-5 areas and the low level of suburbanization which characterized the centrally planned economies. We will thus consider ESPON 1.1.1 populations as correct for the retained FUAs.

3.7.2   The Estonian urban pattern: population data

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Metropolis						
Tallinn	501	501	Tallinn	416	EE001	526
Medium city						
Tartu	134	134	Tartu	101		
Small cities						
Narva (a)	73	73	Narva	68		
Kohtla-Järve	68	68	Kohtla-Jarve	47		
Pärnu	65	65	Pärnu	45		

(a) Estonian side of the Narva-Ivangorod transborder FUA. Population for the Russian side of the MUA: 11 thousand inhab., unknown for the FUA. See "transborders FUAs" chapter.

3.7.3   Conclusions

Tallinn is clearly the only Estonian city of European-wide importance, even if it remains a small capital city. More than one third of the Estonian population lives in Tallinn's FUA, which strongly dominates the Estonian urban network. Tartu is clearly the second pole in the Estonian urban network, even if it appears as a quite small city at the European scale. It is also the only inland FUA. Narva and Kothla-Järve are located in an industrialized and urbanized area situated in the north-eastern corner of the country. Narva is on the border with Russia and, as an industrialized city, does not perform any important central-place functions. Narva is also a transborder city, but we don't have data for the Russian side of the Ivangorod FUA. Nearly half of the Estonian population lives in the five FUAs.

3.8   Finland

3.8.1   Criticism of the ESPON 1.1.1 FUAs

The list of FUAs in Finland, as presented in the ESPON 1.1.1 final report, is a too complete representation of the set of towns in that country. It includes very small FUAs, with less than 50 thousand inhabitants. Excluding these small FUAs, the whole set of the cores of the towns proposed as FUAs have populations above the threshold of 20 thousand inhabitants (at least at municipal level, even if a part of the population may not live in the very urban part of the municipality, so that most of the "core" municipalities don't reach the level of 650 inhab./km²). Even if the Finnish conditions are quite specific, due to the generally low population densities, it remains fully coherent and justified to use the European-wide criteria. We have thus excluded 12 so-called FUAs considered as such in ESPON 1.1.1. Kemi and Tornio are considered as a single labour pool, as suggested by Statistics Finland. The remaining FUAs give an image very similar to the one proposed by the Interreg IIC project on Urban systems in the Baltic area, and more generally by the geographical literature.

We argue that ESPON 1.1.1 FUAs fit with the labour pools defined by Statistics Finland in 1998 and thus the populations of the FUAs are coherent with our European-wide definition. Moreover, examining the ratio between FUAs' populations provided by ESPON 1.1.1 and cores' populations gives plausible results. This is why we have used the ESPON 1.1.1 data as such.

3.8.2   The Finnish urban pattern: population data

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Metropolis						
Helsinki	1285	1285	Helsinki	1065	FI181	1298
Large cities						
Turku	365	365	Turku	218		
Tampere	337	337	Tampere	269		
Medium cities						
Oulu	201	201	Oulu	123		
Lahti	162	162	Lahti	118		
Jyvaskyla	150	150	Jyvaskyla	80		
Kuopio	116	116	Kuopio	87		
Pori	108	108	Pori	76		
Vaasa	101	101	Vaasa	57		
Small cities						
Kouvola	92	92	Kouvola	52		
Joensuu	90	90	Joensuu	52		
Lappeenranta	83	83	Lappeenranta	58		

Hameenlinna	82	82	Hameenlinna	46		
Kotka	82	82	Kotka	55		
Rauma	67	67	Rauma	37		
Seinajoki	63	63	Seinajoki	31		
Kemi-Tornio (a)	61	61	Kemi Tornio	23 22		
Rovaniemi	57	57	Rovaniemi	35		
Mikkeli	55	55	Mikkeli	33		
Kajaani	54	54	Kajaani	36		
Salo	53	53	Salo	25		
Kokkola	50	50	Kokkola	36		

(a) Data for the Finnish side. Kemi-Tornio is considered as a single labour pool by Statistics Finland, even if the two cores are separated. In addition, the morphological centre of the Swedish municipality of Haparanda is only separated from the morphological core of Tornio by a river, crossed by a bridge, forming a transborder FUA. See "transborder's FUAs" chapter.

3.8.3   Conclusions

Finland remains less urbanised than the other Nordic countries.
The Finnish urban pattern is strongly dominated by the capital-city region, including the new towns of Espoo and Vantaa. Helsinki appears to be the only metropolis in Finland. The strong internationalisation of the Finnish economy has still accentuated this trend.
The only two other large cities are Turku and Tampere, the last one also with its important satellite city of Nokia.
The Finnish urban system is organised along three axes of "urban trajectory", the two most important crossings at Helsinki. The first one stretches along the Southern coast from Turku to Kotka and the Russian boundary towards St. Petersburg. The second one stretches South-North from Helsinki to Tampere. Another more secondary axis of urban trajectory hugs the coast from Vaasa to the Swedish border at Kemi-Tornio.
Even when excluding the smallest FUAs which were considered by ESPON 1.1.1, the Finnish urban network seems to support quite well local development and welfare services in the less densely populated regions of the central and Eastern parts of the country. However, the rural areas still lose inhabitants to the advantage of provincial cities, which in turn send people to the biggest cities, mainly Helsinki metropolitan region, but also Turku, Tampere and, to a lesser extent, Oulu.

3.9   France

3.9.1   Criticism of the ESPON 1.1.1 FUAs

ESPON 1.1.1 data fit perfectly with the very good labour pools data (the "aires urbaines") computed by the INSEE, i.e. the urban cores and the set of surrounding municipalities where 40% of the active population work in the "aire urbaine" as a whole. Even if it not exactly our definition, results should be more or less similar. We have excluded some FUAs proposed by ESPON 1.1.1 but with less than 50 thousand inhab. in the FUA and/or less than 20 thousand in the core.

3.9.2   The French urban pattern: population data

The lines in yellow show the FUAs that are integrated in the poly-fua described in the preceding white line, so every white line preceding a yellow one describes a poly-FUA.

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Metropolitan and polynuclear metropolitan areas						
Paris	11175	11175	Paris Melun Mantes-la-Jolie Meaux Fontainebleau Chantilly Rambouillet Etampes	9591 93 86 66 59 32 25 22	FR101, FR102, FR103, FR104, FR105, FR106, FR107, FR108	11002
Lille-Bassin minier (a)	2591	n.c.	Lille Lens Douai Somain-Aniche Bruay-la-Buissière Béthune Valenciennes Denain Arras Armentières Cambrai	953 374 142 27 70 59 155 49 77 41 45	FR301 (partim, arrondissements of Cambrai, Douai, Lille, Valenciennes), FR302 (partim arrondissements of Arras, Béthune, Lens) (b)	2854
Lille (a)	1143	1143	Lille	953	FR 301 (arr. Lille)	
Douai-Lens	550	553	Lens Douai Somain-Aniche	374 142 27	FR 301 (arr. Douai), FR302 (arr. Lens)	
Valenciennes	400	400	Valenciennes Denain	155 49	FR 301 (arr. Valenciennes)	

Béthune	258	268	Bruay-la-Buissière Béthune	70 59	FR302 (arr. Béthune)	
Arras	123	124	Arras	77	FR302 (arr. Arras)	
Armentières	59	59	Armentières	41	included in FR301 (arr. Lille)	
Cambrai	58	59	Cambrai	45	FR301 (arr. Cambrai)	
Lyon metropolitan area	1787	n.c.	Lyon Bourgoin-Jallieu/L'Isle-d'Abeau Givors Villefranche-sur-Saône Vienne	1175 64 36 49 37	FR716	1591
Lyon (c)	1669	1648	Lyon Bourgoin-Jallieu/L'Isle-d'Abeau Givors	1175 64 36		
Villefranche-sur-Saône	64	64	Villefranche-sur-Saône	49		
Vienne	54	54	Vienne	37		
Marseille-Aix-en-Provence (d)	1530	1516	Marseille Aix-en-Provence Vitrolles Fos/Martigues Gardanne La Ciotat	862 134 117 75 32 32	FR824	1852
Nice-Côte d'Azur (e)	1082	n.c.	Nice Cannes Antibes Fréjus Monaco Menton	495 237 119 77 32 29	FR823	1018
Nice	932	933	Nice Cannes Antibes	472 237 119		
Monaco-Menton (e)	80	67	Monaco Menton	32 42		
Fréjus	83	84	Fréjus	77		
Bordeaux	918	925	Bordeaux	652	FR612	1301
Toulouse	832	965	Toulouse	588	FR623 (f)	1067
Nantes	708	711	Nantes	536	FR511	1150
Strasbourg (g)	607	612	Strasbourg	417	FR421 (h)	1039
Rouen-Elboeuf	599	614	Rouen	419	FR232 (partim,	611

(i)					arr. Rouen) (j)	
Grenoble	555	515	Grenoble Voiron	415 24	FR714 (partim arr. Grenoble) (k)	493
Toulon	518	565	Toulon	410		
Rennes	517	521	Rennes	252		
Large cities						
Montpellier	460	460	Montpellier	323		
Metz	426	430	Metz Hagondange	207 72		
Clermont- Ferrand	407	410	Clermont- Ferrand	261		
Saint-Etienne	407	322	Saint-Etienne Saint-Chamond	256 66		
Tours	376	376	Tours	242		
Caen	364	371	Caen	195		
Orléans	355	356	Orléans	243		
Nancy	333	411	Nancy Dombasle-sur- Meurthe	218 21		
Angers	330	333	Angers	185		
Avignon	329	290	Avignon Carpentras Cavaillon	154 26 25		
Dijon	324	327	Dijon	228		
Brest	304	303	Brest	161		
Mulhouse- Thann (l)	302	271	Mulhouse	211		
Le Havre	297	297	Le Havre	236		
Le Mans	290	293	Le Mans	171		
Reims	285	292	Reims	213		
Dunkerque	266	266	Dunkerque	159		
Amiens	265	271	Amiens	154		
Medium cities						
Limoges	247	248	Limoges	149		
Nîmes	221	221	Nîmes	133		
Chambéry	221	131	Chambéry Aix-les-Bains	103 29		
Perpignan	217	249	Perpignan	124		
Besançon	216	222	Besançon	128		
Pau	216	217	Pau	135		
Bayonne	212	214	Bayonne	142		

Annemasse (m)	210	212	Annemasse	69	
Poitiers	209	209	Poitiers	101	
Annecy	189	190	Annecy	125	
Lorient	186	186	Lorient	110	
Montbéliard	179	180	Montbéliard	113	
Saint-Nazaire	172	172	Saint-Nazaire	111	
Troyes	170	172	Troyes	117	
La Rochelle	170	171	La Rochelle	102	
Valence	167	167	Valence	101	
Thionville (n)	156	156	Thionville	138	
Angoulême	153	154	Angoulême	84	
Forbach-Saint-Avold (o)	143	104	Forbach	76	
Boulogne-sur-Mer	135	135	Boulogne-sur-Mer	86	
Châlon-sur-Saône	130	131	Châlon-sur-Saône	69	
Chartres	130	131	Chartres	86	
Calais	126	126	Calais	83	
Niort	125	126	Niort	57	
Béziers	125	125	Béziers	75	
Bourges	123	124	Bourges	81	
Saint-Brieuc	121	121	Saint-Brieuc	82	
Quimper	121	120	Quimper	63	
Vannes	118	118	Vannes	52	
Cherbourg	118	118	Cherbourg	83	
Maubeuge	118	117	Maubeuge	64	
Blois	116	117	Blois	53	
Colmar	116	116	Colmar	74	
Tarbes	109	110	Tarbes	70	
Compiègne	108	108	Compiègne	50	
Charleville-Mézières	107	108	Charleville-Mézières	59	
Roanne	105	105	Roanne	56	
Belfort	104	105	Belfort	72	
Saint-Quentin	101	104	Saint-Quentin	66	
Laval	101	103	Laval	51	
Bourg-en-Bresse	101	101	Bourg-en-Bresse	41	

Nevers	101	101	Nevers	44		
Small cities						
Beauvais	99	101	Beauvais	55		
Creil	98	98	Creil	72		
La Roche-sur-Yon	98	98	La Roche-sur-Yon	49		
Evreux	97	97	Evreux	55		
Agen	95	95	Agen	45		
Saint-Omer	94	94	Saint-Omer	34		
Périgueux	92	92	Périgueux	44		
Châteauroux	91	91	Châteauroux	58		
Epinal	90	90	Epinal	56		
Le Creusot-Montceau-les-Mines	90	n.c.	Montceau-les-Mines Le Creusot	30 26		
Alès	89	89	Alès	51		
Brive-la-Gaillarde	89	89	Brive-la-Gaillarde	56		
Macon	89	89	Macon	45		
Auxerre	85	85	Auxerre	38		
Saint-Louis (p)	82	84	Saint-Louis	29		
Carcassonne	83	83	Carcassonne	44		
Dieppe	81	81	Dieppe	35		
Vichy	80	80	Vichy	48		
Châlons-en-Champagne	78	80	Châlons-en-Champagne	53		
Montluçon	78	78	Montluçon	46		
Ajaccio	77	77	Ajaccio	53		
Bastia	76	76	Bastia	38		
Montauban	75	75	Montauban	52		
Cholet	74	74	Cholet	54		
Albi	72	86	Albi	59		
Bergerac	72	73	Bergerac	26		
Narbonne	71	71	Narbonne	47		
Saint-Malo	70	70	Saint-Malo	63		
Thonon-les-Bains	70	70	Thonon-les-Bains	29		
Châtellerault	69	68	Châtellerault	34		
Montargis	66	66	Montargis	35		
Sète	66	66	Sète	64		

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Le Puy-en-Velay	66	66	Le Puy-en-Velay	36	
Romans-sur-Isère	66	66	Romans-sur-Isère	45	
Rodez	65	65	Rodez	24	
Alençon	65	65	Alençon	36	
Soissons	64	64	Soissons	36	
Cluses	61	61	Cluses	33	
Haguenau	59	60	Haguenau	50	
Montélimar	59	59	Montélimar	31	
Moulins	58	58	Moulins	39	
Dreux	58	58	Dreux	43	
Sens	57	57	Sens	27	
Saint-Dizier	56	56	Saint-Dizier	33	
Aurillac	55	57	Aurillac	31	
Mont-de-Marsan	55	55	Mont-de-Marsan	30	
Arcachon	54	54	Arcachon	34	
Lons-le-Saunier	53	54	Lons-le-Saunier	23	
Arles	53	53	Arles	50	
Saintes	52	52	Saintes	26	
Salon-de-Provence	51	51	Salon-de-Provence	37	
Luxembourg	41	n.c.	Longwy (n)	35	
Luxembourg		n.c.	Villerupt (q)	18 (q)	
Donostia-San Sebastian		n.c.	Hendaye (r)	13 (r)	
Genève		n.c.	Fernay-Voltaire (s)	7 (s)	

(a) French side only. See "transborder FUAs" chapter for the transborder polycentric metropolitan area with the Belgian side and the small Belgian part of Lille's own FUA.

(b) The whole departments of Nord (FR301) and Pas-de-Calais (FR302) can not be used as proxys. It should be necessary to revise the NUTS3 division in this area, or to provide more data at the NUTS4 level.

(c) Including the FUA of Bourgoin-Jallieu.

(d) Including the FUA of Fos-sur-Mer.

(e) French side only (including Monaco). See "transborder FUAs" chapter for the Italian side.

(f) It could be better to exclude the arrondissement of Saint-Gaudens (73 thousand inhab.) from the proxy if data were provided at the NUTS4 level.

(g) French side only. See "transborder FUAs" chapter.

(h) The department of Bas-Rhin is a bit too large as proxy for Strasbourg. If more data were available at NUTS4 level, it should be better to exclude the arrondissements of Saverne, Haguenau and Wissembourg, with respectively 88, 64 and 121 thousand inhab.

(i) Including Elboeuf's FUA, which is a part of the MUA of Rouen.

(j) The whole department of Seine-Maritime (1224 thousand inhab.) is too large to be used as proxy. Data at NUTS4 level should be necessary.

(k) The whole department of Isère (1108 thousand inhab.) is too large to be used as proxy. Data at NUTS4 level should be necessary.

(l) See "transborder FUAs" chapter for the transborder polycentric metropolis with Basel.
(m) French side of the southern part of the Geneva FUA. See "transborder FUAs" chapter for the transborder metropolis of Geneva as a whole.
(n) French side only. Thionville and Longwy basins can also be considered as two parts of the Luxembourg basin. See "transborder chapter". Moreover, Longwy's MUA is a part of a transborder MUA with Pétange (Luxemburg) and Aubange (Belgium).
(o) French side only. We have added the FUAs of Saint-Avold and Forbach, but Saint-Avold doesn't reach the threshold for being an individual MUA. See "transborder FUAs" chapter for the links with Saarbrücken.
(p) French side of Basel's FUA. See "transborder FUAs" chapter.
(q) French part of Esch-sur-Alzette's MUA only. See "transborder FUAs" chapter.
(r) French part of Irun-Hendaye's MUA only. See "transborder FUAs" chapter.
(s) French part of the north of Geneva's MUA only. See "transborder FUAs" chapter.

3.9.3   Conclusions

For centuries, the French urban system has been very macrocephalic, strongly dominated by Paris. However, due to a policy of development of "métropoles d'équilibre" from the 60s and to a weaker growth of the Parisian basin from the 90s, a set of regional metropolises emerges, whereas, more generally, French urbanisation was very dynamic after World War 2. However, these metropolises have much difficulty to impose themselves as main cores at the European level, due to the functional concentration in Paris. Even if the whole population of the Lille-Bassin minier polycentric metropolis is more numerous than the population of Lyon's metropolitan area, the latter benefits from a stronger urban structure. Secondary cities, mainly in the west and the south of the country, benefit from the very dynamic growth of the last two decades.

Outside the main corridor Lille/Le Havre-Paris-Lyon-Marseille and the north-eastern border area, the French urban system remains characterised by FUAs isolated from each other by rural areas, footprint of the situation which prevailed until the end of World War 2, when France was still predominantly agricultural on the largest parts of its territory. Rural exodus continues in deep rural areas outside the limits of the FUAs, even if these are expanding.

3.10 Germany

3.10.1   Criticism of the ESPON 1.1.1 FUAs

Generally, data provided by ESPON 1.1.1 underestimate the size of German FUAs very much, as they often limit a FUA to the sole Kreisfreistadt located at its centre. We have used German commuting data, allowing the application of our criteria at the threshold of 10% of the active population commuting to a centre, considering the main commuting direction. Some very small FUAs considered by ESPON 1.1.1, but which do not reach the 50 thousand inhab. threshold, have been excluded (Rendsburg, Singen, Wolfen, Greiz, Bühl, Freiberg, Riesa, Eisenach).

3.10.2   The German urban pattern: population data

The lines in yellow show the FUAs that are integrated in the poly-fua described in the preceding white line, so every white line preceding a yellow one describes a poly-FUA. The lines in light blue are also poly-FUAs but integrated themselves in a "super-poly-fua" described in the preceding white line.

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Metropolitan and polynuclear metropolitan areas						
Rhein-Ruhr	12190	n.c.	see beneath		DEA23,DEA24,DEA27, DEA2B,DEA22,DEA2C, DEA11,DEA1C,DEA1D, DEA12,DEA14,DEA15, DEA1E,DEA52,DEA5C, DEA13,DEA16,DEA17, DEA31,DEA32,DEA36, DEA51,DEA55,DEA1A, DEA56,DEA53,DEA54, DEA18,DEA19,DEA33, DEA35,DEA38	11357
of which Rhein-Süd	3070	n.c.	see beneath		DEA23,DEA24,DEA27, DEA2B,DEA22,DEA2C	2729
Köln	2216	1897	Köln Troisdorf Bergheim Pulheim Gummersbach Brühl Siegburg Leichlingen (Rh)	1398 73 64 53 53 44 38 27	DEA23,DEA24,DEA27, DEA2B	1853
Bonn	705	879	Bonn	306	DEA22,DEA2C	876

			Sankt Augustin Meckhenheim	56 25		
Euskirchen	149	54	Euskirchen	54	included in DEA27	
of which Rhein-Nord	3073	n.c.	see beneath		DEA11,DEA1C,DEA1D, DEA12,DEA14,DEA15, DEA1E	2840
Düsseldorf	1286	1316	Düsseldorf Langenfeld (Rh) Monheim am Rhein Mettman	1016 59 44 39	DEA11,DEA1C,DEA1D	1519
Duisburg	862	512	Duisburg	758	DEA12	517
Krefeld	393	240	Krefeld Willich	270 51	DEA14	241
Mönchen-Gladbach	392	476	Mönchen-Gladbach	263	DEA15,DEA1E	563
Viersen	77	n.c.	Viersen	77	included in DEA1E	
Dormagen	63	n.c.	Dormagen	63	included in DEA1D	
of which Ruhr	5376	n.c.	see beneath		DEA52,DEA5C,DEA13, DEA16,DEA17,DEA31, DEA32,DEA36,DEA51, DEA55,DEA1A,DEA56, DEA53,DEA54,DEA18, DEA19	5029
Dortmund	1090	589	Dortmund Unna Bergkamen Kamen	750 70 53 46	DEA52,DEA5C	1019
Essen-Oberhausen	986	592	Essen-Oberhausen	986	DEA13,DEA16,DEA17	992
Gelsenkirchen-Bottrop-Marl	946	n.c.	Gelsenkirchen-Bottrop Marl Oer-Erkenschwich	666 93 31	DEA31,DEA32,DEA36	1061
Bochum-Herne	725	390	Bochum-Herne	804	DEA51,DEA55	567
Wüppertal	478	928	Wüppertal Wülfrath	395 23	DEA1A,DEA56	719
Hagen	301	202	Hagen	291	DEA53	204
Hamm	234	184	Hamm	184	DEA54	182
Remscheid	197	n.c.	Remscheid	119	DEA18	120
Solingen	165	n.c.	Solingen	165	DEA19	165

Iserlohn	136	99	Iserlohn	99	not included in the proxy	
Velbert-Heiligenhaus	118	n.c.	Velbert-Heiligenhaus	118	included in DEA1C	
of which Münster	671	287	Münster	267	DEA33,DEA35,DEA38	759
Rhein-Main	4149	n.c.	Frankfurt am Main-Offenbach-Hanau Darmstadt Wiesbaden Mainz Rüsselsheim Aschaffenburg Bad Nauheim	1462 407 277 194 138 99 30	DE712,DE713,DE718, DE71A,DE71C,DE719, DE71E,DE261,DE264, DE269,DE711,DE716, DE717,DE714,DE71D, DEB35,DEB3B,DEB3J	4237
Frankfurt am Main (a)	2764	2164	Frankfurt am Main-Offenbach-Hanau Rüsselsheim Aschaffenburg Bad Nauheim	1462 138 99 30	DE712,DE713,DE718, DE71A,DE71C,DE719, DE71E,DE261,DE264, DE269	2610
Darmstadt	501	525	Darmstadt	407	DE711,DE716,DE717	673
Wiesbaden	453	780	Wiesbaden	277	DE714,DE71D	453
Mainz	431	377	Mainz	194	DEB35,DEB3B,DEB3J	501
Berlin (b)	4016	4231	Berlin	3776	DE301,DE302,DE404	3513
München-Augsburg	3271	n.c.	München Augsburg Freising	1647 371 42	DE212,DE217,DE21C, DE21H,DE21L,DE21A, DE21B,DE218,DE21F, DE216,DE271,DE275, DE276	3143
München	2665	1894	München Freising	1647 42	DE212,DE217,DE21C, DE21H,DE21L,DE21A, DE21B,DE218,DE21F, DE216	2529
Augsburg	606	430	Augsburg	371	DE271,DE275,DE276	614
Hamburg	2983	2515	Hamburg	2123	DE600,DE933,DE939, DEF06,DEF09,DEF0D, DEF0F	3067
Rhein-Neckar	2931	n.c.	Mannheim Karlsruhe Heidelberg	508 440 269	DE122,DE123,DE125, DE126,DE128,DEB34, DEB38,DEB39,	2876

			Ludwigshafen am Rhein Pforzheim Neustadt an der Weinstrasse Speyer Landau (Pfalz)	265 124 54 50 41	DEB33,DEB3H, DEB36,DEB3I,DEB3C, DEB3E,DE129,DE12B	
Karlsruhe	842	672	Karlsruhe	440	DE122,DE123	696
Mannheim	683	1569	Mannheim	508	DE125,DE126,DE128	970
Ludwigshafen am Rhein	453	162	Ludwigshafen am Rhein	265	DEB34,DEB38,DEB39, DEB33,DEB3H,DEB36, DEB3I,DEB3C,DEB3E	901
Heidelberg	395	142	Heidelberg	269	included in Mannheim	
Pforzheim	282	170	Pforzheim	124	DE129,DE12B	309
Landau (Pfalz)	123	53	Landau (Pfalz)	41	included in Ludwigshafen	
Neustadt an der Weinstrasse	78	72	Neustadt an der Weinstrasse	54	included in Ludwigshafen	
Speyer	75	50	Speyer	50	included in Ludwigshafen	
Stuttgart Metropolitan area	2665	n.c.	Stuttgart Tübingen Reutlingen	1735 82 41	DE111,DE112,DE113, DE114,DE115,DE116, DE141,DE142	3093
Stuttgart	2289	2593	Stuttgart	1735	DE111,DE112,DE113, DE114, DE115,DE116	2608
Tübingen	193	209	Tübingen	82	DE142	208
Reutlingen	183	358	Reutlingen	41	DE141	277
Nürnberg-Fürth metropolitan area (c)	1583	1359	Nürnberg-Fürth Erlangen	769 114	DE254,DE255,DE253, DE252,DE258,DE259, DE257,DE25B,DE248, DE251,DE256	1605
Nürnberg-Fürth (c)	1443	1359	Nürnberg-Fürth Erlangen	769 114	DE254,DE255,DE253, DE252, DE258,DE259,DE257, DE25B, DE248	1382
Ansbach	140	40	Ansbach	40	DE251,DE256	223
Leipzig-Halle	1214	n.c.	Leipzig Halle/Saale	516 243	DED31,DED32,DED34, DED35,DEE21,DEE25	1245
Leipzig	842	568	Leipzig	516	DED31,DED32,DED34, DED35	913
Halle/Saale	372	314	Halle/Saale	243	DEE21,DEE25	332

			Merseburg	37		
Bielefeld-Detmold	1173	n.c.	Bielefeld Bad Oeyenhaus en Herford Detmold	419 91 86 74	DEA41,DEA42,DEA43, DEA45	1284
Bielefeld	767	579	Bielefeld	419	DEA41,DEA42	665
Detmold	208	110	Detmold	74	DEA45	365
Bad Oeynhausen	112	174	Bad Oeynhause n	91	DEA43	254
Herford	86	120	Herford	86	included in DEA43	
Bremen	1077	850	Bremen	709	DE501,DE936,DE941	727
Braunschweig-Wolfsburg	1004	n.c.	Braunschwe ig Wolfsburg Salzgitter Peine	246 122 112 49	DE911,DE918,DE913, DE914,DE917,DE912, DE91A	1036
Braunschweig	402	347	Braunschwe ig	246	DE911,DE918	398
Wolfsburg	374	128	Wolfsburg	122	DE913,DE914,DE917	393
Salzgitter	143	124	Salzgitter	112	DE912	113
Peine	85	73	Peine	49	DE91A	132
Hannover	997 (h)	997	Hannover	747	DE921,DE924	1117
Saarbrücken (d)	959 (h)	959	Saarbrücke n	552	DEC01,DEC03,DEC04, DEC05, DEC06	964
Aachen Metropolitan area (Euroregio MAHL's german side) (d)	907	n.c.	Aachen Herzogenra th Düren Eschweiler	283 93 92 55	DEA21,DEA25,DEA29, DEA26	1066
Aachen (d)	672	584	Aachen Herzogenra th Eschweiler	283 93 55	DEA21,DEA25,DEA29	799
Düren	235	135	Düren	92	DEA26	267
Dresden	882	682	Dresden	697	DED21,DED25,DED27, DED2A	879
Chemnitz-Zwickau	875	n.c.	Chemnitz Zwickau Aue	263 140 37	DED11,DED15,DED1A, DED13,DED1C,DED1B	879
Chemnitz-Zwickau (e)	800	432	Chemnitz Zwickau	263 140	DED11,DED15,DED1A, DED13,DED1C	737
Aue	75	96	Aue	37	DED1B	142
Freiburg im	554	373	Freiburg im	263	DE131,DE132,DE133	595

Breisgau			Breisgau			
Kassel	550	330	Kassel	255	DE731,DE734	441
Large cities						
Osnabrück	469	310	Osnabrück	164		
Kiel	460	329	Kiel	266		
Magdeburg	447	256	Magdeburg Schönebeck /Elbe	230 36		
Regensburg	433	193	Regensburg	139		
Ulm (f)	431	294	Ulm	169		
Koblenz	427	349	Koblenz	124		
Erfurt (g)	387	271	Erfurt Weimar	200 64		
Würzburg	376	204	Würzburg	164		
Heilbronn	371	320	Heilbronn	176		
Lübeck	369	289	Lübeck	237		
Göttingen	348	149	Göttingen	124		
Ingolstadt	346	151	Ingolstadt	117		
Paderborn	321	178	Paderborn	141		
Rostock	320	212	Rostock	199		
Oldenburg	315	192	Oldenburg	156		
Siegen	275	257	Siegen	141		
Kaiserslautern	265	130	Kaiserslautern	100		
Giessen	265	309	Giessen	89		
Medium cities						
Trier	245	141	Trier	100		
Fulda	231	104	Fulda	63		
Bamberg	224	105	Bamberg	73		
Schweinfurt	224	89	Schweinfurt	62		
Hildesheim	212	147	Hildesheim	104		
Rosenheim	212	141	Rosenheim	77		
Bremerhaven	204	196	Bremerhaven	119		
Schwerin	201	109	Schwerin	100		
Strasburg - Offenburg (d)	200	85	Offenburg Kehl (j)	58 34		
Offenburg	146	85	Offenburg	58		
Kehl (d)	54	n.c.	Kehl	34		
Minden	195	146	Minden	83		

Bayreuth	195	85	Bayreuth	75		
Marburg an der Lahn	194	85	Marburg an der Lahn	78		
Passau	186	57	Passau	51		
Flensburg	182	114	Flensburg	84		
Landshut	182	82	Landshut	60		
Emden	182	59	Emden	51		
Celle	174	87	Celle	72		
Jena	171	103	Jena	101		
Schwäbisch Gmünd	171	86	Schwäbisch Gmünd	68		
Gera	168	132	Gera	110		
Lüneburg	167	99	Lüneburg	68		
Cottbus	166	122	Cottbus	106		
Hameln	157	59	Hameln	59		
Wilhelmshaven	150	116	Wilhelmshaven	85		
Hof	147	61	Hof	51		
Kleve (d)	147	61	Kleve	49		
Coburg	147	86	Coburg	48		
Weiden (Oberpfalz)	146	57	Weiden (Oberpfalz)	43		
Bautzen	140	48	Bautzen	43		
Dessau	137	97	Dessau	81		
Wetzlar	137	53	Wetzlar	53		
Kempten (Allgau)	136	71	Kempten (Allgau)	62		
Neumünster	133	84	Neumünster	87		
Rheine	132	90	Rheine	76		
Amberg (Oberpfalz)	130	58	Amberg (Oberpfalz)	44		
Plauen	129	84	Plauen	71		
Straubing	128	44	Straubing	44		
Basel (d)	127	n.c.	Lörrach Rheinfelden / Baden	78 32		
Lörrach -Weil (a)	81	164	Lörrach - Weil	78		
Rheinfelden/ Baden	46	n.c.	Rheinfelden / Baden	46		
Lippstadt	127	83	Lippstadt	67		

Neubranden-burg	125	73	Neubranden-burg	72		
Limburg	125	75	Limburg	44		
Goslar	123	81	Goslar	44		
Arnsberg	120	110	Arnsberg	77		
Memmingen	120	51	Memmingen	46		
Bad Kreuznach	121	106	Bad Kreuznach	49		
Baden-Baden	115	146	Baden-Baden	53		
Halberstadt	114	41	Halberstadt	41		
Gotha	111	49	Gotha	49		
Wittenberg	109	52	Wittenberg	48		
Stendal	107	40	Stendal	39		
Lingen	104	51	Lingen	51		
Bocholt	102	91	Bocholt	73		
Pirmasens	102	64	Pirmasens	45		
Nordhorn (d)	101	52	Nordhorn	52		
Nordhausen	100	52	Nordhausen	45		
Small cities						
Görlitz (d)	99	68	Görlitz	60		
Bad Hersfeld	99	31	Bad Hersfeld	31		
Stralsund	98	62	Stralsund	60		
Deggendorf	97	31	Deggendorf	31		
Altenburg	93	52	Altenburg	41		
Neumarkt	93	39	Neumarkt	39		
Suhl	88	60	Suhl	47		
Kaufbeuren	87	42	Kaufbeuren	42		
Frankfurt an der Oder (d)	86	70	Frankfurt an der Oder	70		
Brandenburg	84	81	Brandenburg	76		
Hoyerswerda	84	54	Hoyerswerda	48		
Dillenburg	84	73	Dillenburg	25		
Greifswald	83	55	Greifswald	54		
Villingen-Schwenningen	82	103	Villingen-Schwenningen	82		

Wismar	82	52	Wismar	47		
Saalfeld	82	30	Saalfeld	30		
Ibbenbüren	81	62	Ibbenbüren	49		
German side of Salzburg's FUA (d,h)		n.c.		81		
Konstanz (d)	79	92	Konstanz	79		
Cuxhaven	76	53	Cuxhaven	53		
Ravensburg	72	79	Ravensburg	72		
Menden (Sauerland)	71	n.c.	Menden (Sauerland)	59		
Naumburg	58	30	Naumburg	30		
Eberswalde-Finow	56	51	Eberswalde-Finow	44		
Garmisch-Partenkirchen	55	26	Garmisch-Partenkirchen	26		
Heidenheim	51	64	Heidenheim	51		
Rudolstadt	50	28	Rudolstadt	28		
Bregenz	46 (h)	n.c.	Lindau (d)	32		
Enschede - Hengelo	45 (h)	n.c.	Gronau (d)	45		

(a) Offenbach, Hanau and Aschaffenburg are considered by ESPON 1.1.1 as separate FUAs, with only the population of their Kreisfreistadt for the two first. Rüsselsheim is also considered as a separate FUA by ESPON 1.1.1, with the population of the municipality only. These cities are in fact included in Frankfurt's FUA ; Offenbach and Hanau even in Frankfurt's MUA.

(b) Potsdam is considered as a separate FUA by ESPON 1.1.1, with only the population of the Kreisfreistadt. It is included in Berlin's MUA and FUA using our criteria.

(c) Fürth is included in Nürnberg's MUA. It is considered by ESPON 1.1.1 as a separate FUA, with only the population of the Kreisfreistadt. Erlangen is also considered as a separate FUA by ESPON 1.1.1.

(d) German side only. See "transborder FUAs" chapter

(e) According to the German commuting statistics, Zwickau is included in the FUA of Zwickau.

(f) Neu-Ulm is included in Ulm's MUA. It is considered by ESPON 1.1.1 as a separate FUA.

(g) Weimar is considered as a separate FUA by ESPON 1.1.1, with a population of 66 thousand inhabitants, that is, the population of the Kreisfreistadt only. ESPON 1.1.1 mentions a population of 205 thousand inhab. for the sole FUA of Erfurt.

(h) Estimation.

3.10.3   Conclusions

The German urban network is perhaps the strongest and the most truly polycentric in Europe, as it is also the most polycentric from the functional point of view. But the German polycentricity is organised mainly in the west and the south of the country around very large conurbations, the Rhine-Ruhr area being globally of the same size as London and Paris metropolitan regions (even if not with the same weight regarding the location of the headquarters of transnational firms). In fact, German polycentricity can be recognised at two levels: a global polycentricity at the level of Germany as a whole; a regional

polycentricity inside the most important metropolitan areas (Rhine-Ruhr, Rhine-Main, Rhine-Neckar, Stuttgart metropolitan area, Nürnberg-Fürth, Leipzig-Halle, Bielefeld-Detmold, Braunschweig-Wolfsburg, Chemnitz-Zwickau), with the exception of Berlin, München and Hamburg. The urban network is less dense and more a Christallerian one in the north-east and in the south-east, outside Nürnberg and München metropolitan areas. Berlin is clearly opposed to the Rhineland area: on one side, an heritage of a royal and imperial political construction at the mid of an empty medieval frontier area; on the other, the result of the development of the industrial revolution, on the basis of a dense network of small historical merchant cities, in one of the most densely populated parts of Europe.

3.11 Greece

3.11.1   Criticism of the ESPON 1.1.1 FUAs

ESPON 1.1.1 has strictly considered as FUAs the NUTS-3 corresponding units for the two main cities and the municipalities (NUTS 5) for all the others (with the only exceptions of Patrai where four municipalities were gathered, and Alexandroupolis, where three were gathered, exactly on the same basis as we have used for our own delineation of the MUAs). However, due to the character of small cities at the centre of generally quite low densely populated rural areas of most of the Greek cities outside the two main ones, and due to the characteristics of the often partitioned topography and to the size of the Greek municipalities, this approximation is perhaps not too bad. The FUAs of Athens and Thessaloniki extend however presumably further than the NUTS-3 borders, for instance around Athens until Korinthi, which should then be considered as a secondary core inside Athens' FUA, with 37 thousand inhabitants. More work remains thus to examine more in-depth the geography of the labour pools in Greece. Until now, it is not possible to use better data than ESPON 1.1.1. We have nevertheless added Kozani to the list, as it fits the 50,000 inhabitants threshold and is recognized as second-level place in the Greek urban hierarchy by the official Greek planning sources. A more in-depth analysis of the labour pools should perhaps add to the list of the more than 50 thousand inhabitants FUAs some small centres with less than this population size in the central municipality but presumably polarizing neighbour municipalities on their island, like Kerkyra and Mytilini. Conversely, the core's populations are presumably in general a bit smaller than the one we have proposed hereafter on the basis of the municipal data. The exception is Volos, where we have added a second municipality which pertains the density threshold.

3.11.2   The Greek urban pattern: population data

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Metropolises						
Athinai	3761	3761	Athinai Korinthi (a) Megara	3331 37 28	GR300	3761
Thessaloniki	1052	1052	Thessaloniki	777	GR122	1052
Medium cities						
Patrai	198	198	Patrai	198		
Iraklion	155	155	Iraklion	155		
Larisa	126	126	Larisa	126		
Small cities						
Volos	85	82	Volos	85		
Ioannina	70	70	Ioannina	70		
Kavalla	63	63	Kavalla	63		
Lamia	59	59	Lamia	59		

Kalamata	58	58	Kalamata	58		
Katerini	56	56	Katerini	56		
Serrai	56	56	Serrai	56		
Drama	56	56	Drama	56		
Agrinion	54	54	Agrinion	54		
Rhodos	54	54	Rhodos	54		
Khalkis	54	54	Khalkis	54		
Khania	53	53	Khania	53		
Alexandroupolis	53	53	Alexandroupolis	53		
Komotini	53	53	Komotini	53		
Kozani	52	n.c.	Kozani	47		
Xanthi	52	52	Xanthi	52		
Trikala	52	52	Trikala	52		

(a) Korinthi is presumably a secondary centre inside Athens' FUA, but is located outside the limits of our (too restricited) proxy for the FUA.

3.11.3   Conclusions

The Greek urban network is extremely polarized around Athens and Thessaloniki, the two metropolises. The level of the large cities is empty, and the other cities are local centres, often more or less of the same size, mainly organized along two axes, the first between Athens and Thessaloniki, the second from Athens to Patras (Patrai). Heraklion (Iraklion) is clearly the main centre in Kriti. Some polycentric urban systems are proposed by the Greek planning authorities (Karditsa-Trikkala-Larisa-Volos; in Thraki between Serrai and Alexandroupolis), but as it concerns small cities and since we lack more empirical data, it is uneasy to know if they are true functional systems or rather seem to be planning aims only.

3.12 Hungary

3.12.1   Criticism of the ESPON 1.1.1 FUAs

ESPON 1.1.1 data for the Hungarian FUAs seem to be quite coherent with population data for the MUAs. The main problem appears around Budapest, where ESPON 1.1.1 has considered as separate FUAs localities which are clearly, according to commuting data, secondary centres inside a big Budapest FUA, or even true morphological parts of the capital, at the fringe of the agglomeration.

As to the rest, we have used ESPON 1.1.1 data (with the only exception of the twin city Tatabanya-Tata). We have however excluded some small FUAs whose core does not reach the threshold of 20 thousand inhab. (Nagykata, Kisvarda, Mateszalka, Berettyoujfalu, Szerencs, Kiskoros, Kalocsa, Puspolkladany), as well as twenty FUAs proposed by ESPON 1.1.1 but with less than 50,000 thousand inhab. Even so, the number of small cities remains remarkable.

3.12.2   The Hungarian urban pattern: population data

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Metropolis						
Budapest	2523	1775 (a)	Budapest Vac Gödöllo Szentendre Monor	2123 35 30 23 21	HU101, HU102	2838
Large cities						
Debrecen	297	297	Debrecen	209		
Miskolc	283	283	Miskolc	184		
Medium cities						
Nyiregyhaza	222	222	Nyiregyhaza	119		
Szeged	214	214	Szeged	165		
Pecs	208	208	Pecs Komlo	160 28		
Györ	175	175	Györ	128		
Bekescsaba	169	169	Bekescsaba	66		
Kecskemet	167	167	Kecskemet Nagyköros	109 25		
Szekesféhervar	166	166	Szekesféhervar Varpalota	105 22		
Kaposvar	125	125	Kaposvar	68		
Szolnok	122	122	Szolnok Torokszentmiklos	78 24		

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Cegled	121	121	Cegled	38		
Szombathely	114	114	Szombathely	82		
Dunaujvaros	112	112	Dunaujvaros	55		
Zalaegerszeg	106	106	Zalaegerszeg	61		
Small cities						
Eger	95	95	Eger	58		
Sopron (b)	94	94	Sopron	54		
Szekszard	90	90	Szekszard	36		
Tatabanya	97	90	Tatabanya Tata	73 24		
Jaszbereny	89	89	Jaszbereny	29		
Veszprem	86	86	Veszprem	60		
Nagykanizsa	83	83	Nagykanizsa	53		
Baja	77	77	Baja	38		
Karcag	77	77	Karcag	23		
Gyöngyös	77	77	Gyöngyös	34		
Özd	76	76	Özd	42		
Mosonmagyar-ovar (c)	73	73	Mosonmagyar-ovar	30		
Salgotarjan	69	69	Salgotarjan	47		
Kazincbarcika	65	65	Kazincbarcika	34		
Oroshaza	64	64	Oroshaza	33		
Papa	63	63	Papa	33		
Hodmezovasar-hely	61	61	Hodmezovasar-hely	49		
Ajka	60	60	Ajka	33		
Hajduboszor-meny	60	60	Hajduboszor-meny	32		
Hatvan	56	56	Hatvan	24		
Esztergom (c)	56	56	Esztergom	29		
Mohacs	53	53	Mohacs	20		
Kiskunfelegy-haza	52	52	Kiskunfelegy-haza	33		
Mako	50	50	Mako	26		
Paks	50	50	Paks	21		
Komarno	40	n.c.	Komarom (d)	20		

(a) Without the so-called individual FUAs considered by ESPON 1.1.1 for Budaors (125 thousand inhab.), Rackeve (118), Gyal (98), Pilisvorosvar (86) which are in fact incorporated in the MUA of Budapest, and the FUAs of the small secondary centres inside the Budapest metropolitan region (Szentendre, with a so-called FUA of 69 thousand inhab.; Gödöllo, 116; Vac, 75; Monor, without any FUA identified by ESPON 1.1.1; Dunakeszi, 61, with less than 20,000 inhab. in its core. Including all those FUAs, the ESPON 1.1.1 sum for Budapest should be 2523 thousand inhab.

(b) Sopron is too far from Vienna to be considered as a part of a transborder metropolitan area, even if Sopron is strongly developing cooperation with the Austrian side.
(c) Hungarian side only. See chapter on "transborder FUAs".
(d) Hungarian side only. Population of the FUA estimated on the basis of twice the population of the MUA. See chapter on "transborder FUAs".

3.12.3   Conclusions

The Hungarian urban pattern is very strongly dominated by Budapest. The capital-city is surrounded by a belt of small secondary centres, which are more and more linked to the capital with a growing trend to suburbanisation. For the rest, the Hungarian urban system is very polycentric, and well distributed on the whole territory: it is in fact a pattern of medium and small cities, most of them originating from the big rural agglomerations which were founded in the Hungarian plain following the reconquest on the Ottoman Empire, or being small historical cities which survived on the frontier of the Habsburgian territoires, sometimes after having been wrecked or submitted to a more or less long period of Ottoman occupation or pressure.

3.13 Ireland

3.13.1   Criticism of the ESPON 1.1.1 FUAs

Irish FUAs in general and Dublin's FUA in particular are clearly underestimated by ESPON 1.1.1. For Dublin, ESPON 1.1.1 only considers the population of the NUTS-3 unit, even less than the morphological area alone. Irish literature identifies surrounding small cities, none of which reaching the threshold of 20 thousand inhabitants (except Bray and Drogheda which are included in the Dublin morphological area), as located inside the labour pool of Dublin and becoming more and more dormitory cities. We have mapped the labour pool of Dublin, as well as those of Cork, Limerick, Galway, Waterford and Dundalk, using maps of the "Travel to Work Patterns 2002", based on data provided by CSO POWSAR, at the level of 10% of the active resident population commuting to the core, exactly our criteria. For Tralee, we have excluded the southern part of the so-called basin, which is oriented towards Killarney, not dissociated from Tralee by the Irish document. As a proxy of the FUA of Dublin, one has to consider not only the NUTS-3 unit IE021, but also the surrounding unit IE022, gathering the counties of Meath, Kildare and Wicklow. The population of this region grows very quickly, and is thus higher now than the data used beneath (1661 in 2006, against 1497 with our 2000 data).

3.13.2   The Irish urban pattern: population data

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Metropolis						
Dublin	1477	1009	Dublin	1070	IE021, IE022	1497
Large cities						
Cork	374	192	Cork	149		
Limerick	254	84	Limerick	69		
Medium city						
Galway	174	66	Galway	65		
Waterford	101	47	Waterford	24		
Small cities						
Dundalk	95	33	Dundalk	40		
Tralee	71	21	Tralee	20		

3.13.3   Conclusions

The urban pattern of the Republic of Ireland is very monocentric, strongly concentrated on Dublin, with its quickly growing suburban fringe. As for the rest, the south of the Republic is more urbanised than the north, but cities, and esp. their cores, remain quite small, with the exception of Cork and to a lesser extent Limerick.

3.14 Italy

3.14.1   Criticism of the ESPON 1.1.1 FUAs

An accurate description of the Italian urban system, having strict regard for our commuting flows criteria, is very difficult, even if the general overview we can produce gives a good idea of the very dense and polycentric Italian urban system.

The reasons for these difficulties are as follows:
- The Italian urban system is so developed and small cities so close to each other in some regions (like in the Plain of the Pô, in Emilia-Romagna or along the Adriatic coast, not to mention Lombardy and Campania), that it is very difficult to isolate labour pools from each other;
- In other regions, like Puglia or Sicily, municipalities are very large and centred around former "rural cities", with a clear urban landscape in the agglomerated part of the municipality, but weak urban functions. Now, using our criteria, many such municipalities have to be considered perhaps abusively as secondary cores inside other FUAs;
- Italian statistics do not provide us with true employment cores and with the most important direction of commuting for neighbouring municipalities, but with SLL (sistemi locali del lavoro) areas, covering the whole territory of the country. These were defined in 1991 on the basis of commuting flows but sometimes merging different small employment cores, or even sometimes dividing into different units the commuting basin of the most important metropolises. ESPON 1.1.1 used SSL from 1991. We have used SSL from 2001, with some redefinitions of the areas;
- To define MUAs, it is difficult in some very densely populated regions, in particular around Milano and Napoli, to define the limits between one MUA and its neighbours (for instance, between Milano, Busto Arsizio and Como, or between Napoli and Torre Annunziatia/Castellamare di Stabia, densities are always very high and the right place to determine the lowest threshold is difficult to find. Therefore we were obliged not to cut inside those large urban areas).

For all these reasons and even if we have estimated minor corrections, it is sometimes very debatable to define so-called FUAs, quite important in population using SSL statistics, but in fact corresponding more to regions with a dense scattered system of small interlinked cities, inside a semi-urbanised landscape. It is often the case in the Plaine of the Pô. We have used 2001 data instead of 1991 data used by ESPON 1.1.1 and suppressed some small FUAs with less than 50 thousand inhab. and/or centres with less than 20 thousand inhab. (Sondrio, Lanciano, Domodossola, Oderzo, Desenzano del Garda, Sciacca, San Bonifacio, Salo, Cossato, Iseo, Guastalla, Darfo Boario Terme, Manerbio, Palmi, Luino, Montichiari, Castelvetrano, Nardo, Feltre, Cirie, Chiari, Portotolle, Gallipoli, Terracina, Avigliana, Santa Croce sull'Arno, Lonigo, Suzzara).   All these data and analyses have been achieved in collaboration with ERVET from Bologna, Emilia Romagna (http://www.ervet.it).

3.14.2   The Italian urban pattern: population data

The lines in yellow show the FUAs that are integrated in the poly-fua described in the preceding white line, so every white line preceding a yellow one describes a poly-FUA.

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Metropolitan and polynuclear metropolitan areas						
Milano polycentric metropolitan area (a)	5963	n.c.	see beneath		ITC15,ITC41,ITC42,ITC43, ITC45,ITC46,ITC48,ITC49	7465
Milano – Busto Arsizio – Como (b)	4088	4471	Milano Busto Arsizio Como Gallarate-Sestocalende Vigevano Abbiategrasso	3698 320 160 65 55 29	ITC42,ITC45	4317
Bergamo	662	720	Bergamo Palazzolo sull'Oglio Treviglio	438 34 26	ITC46	974
Lecco	251	286	Lecco	112	ITC43	312
Varese	226	254	Varese	194	ITC41	821
Novara	191	170	Novara	102	ITC15	345
Pavia	157	197	Pavia	71	ITC48	499
Lodi	181	142	Lodi	40	ITC49	197
Crema	118	97	Crema	33	not included in the proxy	
Borgomanero	89	92	Borgomanero	22	not included in the proxy	
Napoli polycentric metropolitan area	3714	n.c.	see beneath		ITF31,ITF33	3957
Napoli - Castellamare di Stabia-Torre Annunziata - Nola	2905	2981	Napoli Castellamare di Stabia-Torre Annunziata Giugliano in Campania San Giuseppe Vesuviano	2308 362 91 86	ITF33	3100

			Nola Vico Equense	80 20		
Caserta	351	364	Caserta Mondragone	308 24	ITF31	857
Aversa	222	234	Aversa	200	included in ITF31	
Nocera Inferiore	163	184	Nocera Inferiore	164	not included in the proxy	
Sorrento	73	76	Sorrento	57	included in ITF33	
Roma	3190	3314	Roma Guidonia Montecelio Tivoli Pomezia Monterotondo Albano Laziale Marino Cerveteri Ladispoli Ardea	2532 69 46 42 34 40 31 27 27 26	ITE43	3850
Torino polycentric metropolitan area	1716	n.c.	see beneath		ITC11	2215
Torino	1601	1725	Torino Chieri Carmagnola Chivasso	1309 32 25 23		
Pinerolo	115	116	Pinerolo	33		
Venezia-Padova polycentric metropolitan area	1401	n.c.	see beneath		ITD34,ITD35,ITD36	2462
Venezia	571	611	Venezia	483	ITD35	815
Padova	549	506	Padova	370	ITD36	853
Treviso	281	247	Treviso	80	ITD34	794
Firenze polycentric metropolitan area	1090	n.c.	see beneath		ITE13,ITE14,ITE15	1458
Firenze	645	877	Firenze	525	ITE14	957
Prato	240	240	Prato	234	ITE15	230
Pistoia	114	120	Pistoia	84	ITE13	271
Empoli	91	91	Empoli San Miniato	44 26	partially included in ITE14	

Palermo	861	818	Palermo Partinico Monreale Carini Misilmeri	680 31 31 42 23	ITG12	1234
Genova polycentric metropolitan area	859	n.c.	see beneath		ITC32,ITC33	1183
Genova	694	796	Genova	611	ITC33	903
Savona	119	133	Savona	66	ITC32	280
Rapallo	46	n.c.	Rapallo	39	included in ITC33	
Catania	707	694	Catania Paterno Giarre Belpasso	602 45 40 20	ITG17	1102
Bologna	690	754	Bologna Vignola	432 21	ITD55	922
Bari	584	1123	Bari Bitonto Terlizzi Mola di Bari Noicattaro Palo del Colle Giovinazzo	411 56 27 25 24 21 20	ITF42 (c)	1581
Verona	509	470	Verona	320	ITD31	830
Large cities						
Cagliari	438	461	Cagliari Capoterra	276 21		
Taranto	426	551	Taranto Martina Franca Massafra San Giorgio Ionico	201 47 31 26		
Brescia	384	381	Brescia	327		
Salerno	373	457	Salerno Battipaglia Eboli	175 50 36		
Latina	320	285	Latina Anzio-Nettuno Aprilia Cisterna di Latina Sezze	109 73 56 32 22		
Pescara	313	347	Pescara Chieti	206 50		
Modena	289	243	Modena	175		

			Castelfranco Emilia	25		
Reggio nell' Emilia	269	254	Reggio nell' Emilia Scandiano Correggio	141 23 21		
Parma	264	258	Parma	156		
Vicenza	262	234	Vicenza	125		
Messina	250	236	Messina	237		
Udine	250	357	Udine	116		
Medium cities						
Frosinone	236	259	Frosinone Alatri Ceccano	45 27 22		
Trieste	232	262	Trieste	223		
Lecce	224	399	Lecce San Cataldo	117 23		
Reggio di Calabria	216	222	Reggio di Calabria	179		
Cosenza	216	238	Cosenza	119		
Pordenone	216	222	Pordenone	79		
Siracusa	215	258	Siracusa Augusta Floridia	121 33 21		
Rimini	194	218	Rimini	176		
Ancona	194	230	Ancona Osimo	143 29		
Cittadella-Castelfranco Veneto	194	225	Cittadella Castelfranco Veneto	40 31		
Perugia	185	190	Perugia	149		
Foggia	184	176	Foggia	146		
Sassari	184	204	Sassari	134		
Piacenza	183	167	Piacenza	95		
La Spezia	182	216	La Spezia Sarzana	112 20		
Brindisi	177	367	Brindisi Mesagne	92 28		
Livorno	169	187	Livorno	148		
Terni	169	170	Terni	104		
Pisa	168	179	Pisa San Giuliano Terme	124 30		

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Vittorio Veneto-Conegliano	167	159	Vittorio Veneto Conegliano	29 35		
Ferrara	166	196	Ferrara	130		
Bisceglie	165	114	Bisceglie	165		
Trento	165	155	Trento	112		
Bassano del Grappa	164	131	Bassano del Grappa	67		
Ravenna	163	172	Ravenna	138		
Biella	163	124	Biella	82		
Agrigento	162	177	Agrigento Licata Palma di Montechiaro Favara	53 35 22 31		
Barletta (d)	161	161	Barletta	91		
Bolzano	150	157	Bolzano	93		
Cuneo	146	150	Cuneo	52		
Lucca	144	156	Lucca	120		
Avellino	144	159	Avellino	64		
Massa-Carrara	143	151	Massa Carrara	66 66		
Sassuolo	142	110	Sassuolo	99		
Mantova	142	139	Mantova	46		
Alessandria	139	151	Alessandria	82		
Potenza	138	136	Potenza	69		
Catanzaro	137	144	Catanzaro	94		
Forli	135	150	Forli	108		
Cassino	131	151	Cassino	33		
Asti	130	129	Asti	71		
Monfalcone (e)	130	130	Monfalcone	38		
Marsala	127	135	Marsala Mazara del Vallo	77 48		
Trapani	127	136	Trapani Erice	67 25		
Viterbo	126	133	Viterbo	57		
Benevento	125	103	Benevento	61		
Cremona	124	137	Cremona	69		
Arezzo	121	136	Arezzo	92		
Lugo	120	97	Lugo	89		
Montebelluna	112	100	Montebelluna	34		

Pesaro	111	109	Pesaro	111		
Carpi	111	82	Carpi	61		
Montevarchi	111	n.c.	Montevarchi	39		
Cesena	110	155	Cesena	89		
Crotone	110	98	Crotone	51		
Campobasso	109	113	Campobasso	47		
Portogruaro	109	80	Portogruaro	24		
Viareggio	108	107	Viareggio Camaiore Massarosa	58 30 20		
Arzignano	108	75	Arzignano	56		
San Remo-Ventimiglia (f)	107	143 (f)	San Remo	101		
Caltanisetta	107	155	Caltanisetta	61		
Montecatini-Terme	107	109	Montecatini-Terme	29		
Putignano	106	n.c.	Putignano Conversano	28 24		
San Benedetto del Tronto	104	100	San Benedetto del Tronto	81		
Ascoli Piceno	104	107	Ascoli Piceno	50		
Ivrea	104	150	Ivrea	29		
Modica	103	108	Modica Scicli	52 26		
Fano	102	71	Fano	57		
San Dona di Piave	102	105	San Dona di Piave	35		
Gela	100	159	Gela Niscemi	72 28		
Siena	100	101	Siena	49		
Small cities						
Altamura	99	n.c.	Altamura Gravina in Puglia	63 42		
Chiavari	99	72	Chiavari	45		
Velletri	98	198	Velletri	49		
Thiene	98	96	Thiene	35		
Lamezia Terme	97	97	Lamezia Terme	71		
Pontedera	97	100	Pontedera	26		
Alba	96	91	Alba	30		
Formia-Gaeta	95	89	Formia-Gaeta	57		

Avezzano	95	95	Avezzano	37		
Rosetto degli Abruzzi - Giulianova	94	76	Rosetto degli Abruzzi Giulianova	22 21		
Andria	92	n.c.	Andria	92		
Rieti	91	98	Rieti	41		
Grosseto	90	93	Grosseto	70		
L'Aquila	90	95	L'Aquila	63		
Mirandola	90	n.c.	Mirandola	21		
Belluno	89	83	Belluno	35		
Gioia del Colle	88	65	Gioia del Colle Santeramo in Colle	26 26		
Sessa Aurunca	88	n.c.	Sessa Aurunca	23		
Ragusa	87	90	Ragusa	68		
Civitanova March	86	n.c.	Civitanova March	38		
Vasto	86	89	Vasto	35		
Rovigo	84	90	Rovigo	48		
Imola	82	110	Imola	64		
Vittoria	82	92	Vittoria Comiso	54 28		
Milazzo	82	53	Milazzo	37		
San Severo	79	92	San Severo	56		
Nuoro	79	80	Nuoro	36		
Vibo Valentia	79	67	Vibo Valentia	35		
Bagheria	78	77	Bagheria	60		
Faenza	78	82	Faenza	53		
Termoli	78	86	Termoli	30		
Casale Monferrato	76	75	Casale Monferrato	35		
Fossano	75	71	Fossano	24		
Fidenza	75	52	Fidenza	23		
Lentini	75	59	Lentini	24		
Foligno	74	79	Foligno	49		
Teramo	74	112	Teramo	48		
Voghera	74	83	Voghera	38		
Oristano	74	77	Oristano	29		
Schio	74	126	Schio Valdagno	37 26		
Colleferro	73	n.c.	Colleferro	20		

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Gorizia (e,g)	72	72	Gorizia	35		
Novi Ligure	72	68	Novi Ligure	27		
Jesi	71	77	Jesi	39		
Matera	70	65	Matera	57		
Civitavecchia	70	72	Civitavecchia	47		
Vercelli	70	77	Vercelli	45		
Corato	70	n.c.	Corato Ruvo di Puglia	44 26		
Fermo	70	65	Fermo	35		
Avola-Noto	70	n.c.	Avola Noto	31 23		
Legnago	70	n.c.	Legnago	24		
Casarano	70	81	Casarano	20		
Macerata	69	74	Macerata	41		
Lumezzane	69	72	Lumezzane	33		
Aosta	68	70	Aosta	34		
Isernia	68	n.c.	Isernia	21		
Barcellona Pozzo di Gotto	67	52	Barcellona Pozzo di Gotto	44		
Merano	67	68	Merano	33		
Rovereto	66	80	Rovereto	33		
Cecina	66	n.c.	Cecina	26		
Alcamo	65	68	Alcamo	42		
Cento	65	n.c.	Cento	29		
Corigliano Calabrese	64	n.c.	Corigliano Calabrese	37		
Sora	63	63	Sora	36		
Cerignola	62	65	Cerignola	57		
Fasano	61	n.c.	Fasano	38		
Manduria	61	n.c.	Manduria	31		
Galatina	61	n.c.	Galatina	28		
Poggibonsi	61	60	Poggibonsi	27		
Iglesias	59	129	Iglesias	59		
Adrano	59	62	Adrano	56		
Monopoli	59	n.c.	Monopoli	49		
Senigallia	59	50	Senigallia	41		
Olbia	59	50	Olbia	41		
Caltagirone	58	51	Caltagirone	37		
Termini Imerese	58	66	Termini Imerese	26		

Ginosa	58	61	Ginosa	22		
Manfredonia	57	83	Manfredonia	57		
Tortona	55	59	Tortona	25		
Piombino	54	68	Piombino	34		
Sarno	53	n.c.	Sarno	31		
Imperia	52	52	Imperia	47		
Canicatti	52	n.c.	Canicatti	32		
Fabriano	52	n.c.	Fabriano	30		
Bra	52	n.c.	Bra	28		
Sulmona	51	54	Sulmona	25		
Verbania	50	53	Verbania	32		
Mondovi	50	n.c.	Mondovi	22		

(a) Italian side only. See "transborder FUAs" chapter for the incorporation of the Swiss side of the Como FUA.
(b) Desio, considered as a separate FUA by ESPON 1.1.1, is included in Milano's MUA. In the present table, we have added date for the SLL of Milano, Viggevano, Busto Arsizio, Seste Calende and Como (In ESPON 1.1.1, Milano, Desio, Como, Busto Arsizio, Viggevano and Sesto Calende). The total data are slightly less than the corresponding MUA, due to the difficulty of delineation of the last one, extending in fact on other SLLs. In fact, a part of the population of the surrounding SLLs should be attributed to central Milano's FUA.
(c) Too large proxy.
(d) We have considered ESPON 1.1.1 data and not the Italian SLL, which gives a disproportionate 307 thousand inhab. data, due to the merging of different big municipalities in one unit.
(e) We have used ESPON 1.1.1 data for Gorizia and Monfalcone, which seem to give a more correct view of the urban pattern than the SLL.
(f) ESPON 1.1.1 considers San Remo and Ventimiglia separately. Italian side of the Nice-Côte d'Azur polycentric metropolis. See "transborder FUAs" chapter.
(g) For Gorizia, Italian side only. See "transborder FUAs" chapter for adding the Slovenian side.

3.14.3   Conclusions

Italy is characterised by a very dense and strongly polycentric urban pattern. Roma appears only at the third place of the metropolitan areas, after Milano and Napoli, even if the latter metropolitan region is much less important than Roma from a functional point of view. Outside the main cities, small and medium cities are very numerous, very close to each other and host many activities, in particular networks of SMEs in the Pô region, in Tuscany, along the Adriatic coast and even until Puglia. Urbanisation is mainly organised along some corridors: Torino – Milano – Venezia – with a continuation towards the east; Milano – Via Emilia range – Adriatic coast range; the Milano – Firenze – Rome – Napoli corridor. In the South, the population of many cities is high in comparison to the quality of their urban functions, as a heritage of past "rural cities". Urbanisation is weaker in mountains (Alps and Apennine range) and in Sardinia, where Cagliari has an overwhelming weight.

3.15 Latvia

3.15.1   Criticism of the ESPON 1.1.1 FUAs

The ESPON 1.1.1 FUAs have been identified following rigorous criteria, taking into account labour pools and population thresholds, and give an accurate view of the national urban system. This explains why, while the structure of the urban systems of Latvia and Estonia are quite similar, ESPON 1.1.1 proposed more FUAs in Estonia, in spite of the fact that its total population represents less than 60% of Latvia's population. However, compared to the ESPON 1.1.1 list, we have excluded Valmiera and Jekabpils, which have morphological cores around 28 thousand inhabitants but FUAs under 40 thousand inhabitants. Inversely, we have kept Rezekne, which is just under the FUA limit (49,480 inhab.) and is considered a "national city" by Latvian geographers, as well as the other FUAs considered, with the exception of any other city. ESPON 1.1.1's list of FUAs quite rightly excludes the cities of Jurmala, a seaside residential city, Ogre and Salaspils, because of their inclusion in the Riga's labour pool; but with populations of respectively 56, 26 and 21 thousand inhabitants, they can be considered as secondary morphological cores inside Riga's FUA.

3.15.2   The Latvian urban pattern: population data

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Metropolis						
Riga	1195	1195	Riga Jurmala Ogre Salaspils	764 56 27 21	LV001	963
Medium cities						
Daugavpils	137	137	Daugavpils	115		
Liepaja	112	112	Liepaja	89		
Small cities						
Jelgava	94	94	Jelgava	64		
Ventspils	53	53	Ventspils	44		
Rezekne	49	49	Rezekne	39		

3.15.3   Conclusions

The Latvian urban network is very strongly dominated by Riga, the largest city in the Baltic states and a metropolitan area with nearly half of the country's population living in its FUA. The recent evolution of most Latvian cities, including Riga in particular, was characterised during the nineties by a decline in population due to international migration, especially towards the rest of the former USSR. Nowadays Riga's morphological core loses population, migrating towards the suburban area, but also towards smaller cities of the Latvian urban network, linked to the conversion of the biggest concentrated industrial plants of the Soviet period.

3.16 Lithuania

3.16.1   Criticism of the ESPON 1.1.1 FUAs

Lithuanian ESPON 1.1.1's FUAs have been rather correctly selected, though their delineation raises doubts. However, we have excluded Marijampole and Telsiai from the list, their FUAs counting less than 50 thousand inhabitants (respectively 49 and 33 thousand). The populations of the FUAs have clearly been defined by ESPON 1.1.1 as the ones of the core cities in their administrative boundaries. This is most likely due to the lack of data on commuting to work. As the densities of population are generally quite low outside the cities, this restriction doesn't lead to too big underestimations for the smallest FUAs. Nevertheless, on the basis of an analysis of the Lithuanian settlement pattern, it is clear that the effective FUAs of the biggest three Lithuanian cities, Vilnius, Kaunas and Klaipeda, include surrounding municipalities. Therefore, considering the districts of Vilnius-city, Vilnius-rural and Trakai-urban seems to be a better proxy of Vilnius' FUA than only the population of the municipality; considering the districts of Kaunas-urban, Kaunas-rural and Jonava (with the latter as a secondary morphological core) seems to better adjust the Kaunas' FUA and the districts of Klaipeda-city, Klaipeda-rural and Kretinga better adjust Klaipeda's FUAs. This kind of correction is not so easy for smaller cities, but it is possible that Panevezys and Sialiai's FUAs are more populated than shown in the table. A more in-depth work remains to be done by national experts, on the basis of adequate statistics on commuting.

Some clearly free-standing cities between 50 and 20 thousand inhabitants have not been considered as FUAs by ESPON 1.1.1, presumably due to a too narrow labour pool. It is the case of Mazeikiai, Utena, Kedainiai, Taurage, Visaginas, Ukmerge, Plunge and Radviliskis. As already said, Jonava and Kretinga are secondary cores inside larger FUAs.

3.16.2   The Lithuanian urban pattern: population data

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Metropolises						
Vilnius	680	553	Vilnius	554	LT00A	896
Kaunas	513	377	Kaunas Jonava	379 52	LT002	750
Large city						
Klaipeda	284	192	Klaipeda Kretinga	192 46		
Medium cities						
Sialiai	134	134	Sialiai	134		
Panevezys	119	119	Panevezys	120		
Small city						
Alytus	72	72	Alytus	71		

3.16.3   Conclusions

As the other two Baltic states, Lithuania is characterised by quite low population densities and most of the cities are small cities of local importance, more or less evenly distributed throughout the country. But about half the population lives in the six FUAs. Contrary to the other two Baltic countries, the head of the urban network is bicephal, since the capital city, Vilnius, is not much bigger than Kaunas and is located in a more peripheral location, only 35 km from the border. From the European perspective, the urban system is organised on two main axes, crossing in Kaunas: one from the port of Klaipeda towards Vilnius and Minsk, in Belarus, the second being the Via Baltica, the main North-South axis through the Baltic countries, from Warsaw to St. Petersburg, via Marijampole and Panevezys.

3.17 Luxemburg

3.17.1   Criticism of the ESPON 1.1.1 FUAs

In this small country, ESPON 1.1.1 identifies two FUAs, those of Luxembourg (city) and of Esch-sur-Alzette, with respectively and strangely 125 and 135 thousand inhabitants. It seems very questionable to define Esch's FUA as more important than Luxembourg's, insofar as the economy of the country has strongly changed from a former metallurgical economy (based around Esch) toward a financial and services economy largely based in Luxembourg (city). In fact, the works of the "Grande Région" and labour statistics show that Luxembourg (city) labour pool is now streching far across the borders, incorporating many Belgian, French and German municipalities. Inside this main labour pool, some smaller cities appear as secondary centres with their own labour pool and economic specificity. Some of those secondary centres are also transborder morphological areas.

3.17.2   The Luxemburg urban pattern: population data

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Large city						
Luxembourg (a)	376 (b)	260 (c)	Luxembourg Esch-sur-Alzette (a) Pétange (a)	99 35 14		

(a) Luxemburg's side only. See further "transborder FUAs" chapter.
(b) We have used as a (quite restrictive) proxy for the population of Luxembourg-Esch's FUA the population of the two southern districts of Luxembourg and Grevenmacher.
(c) ESPON 1.1.1 considers the FUAs of Luxembourg (125 thousand inhab.) and Esch-sur-Alzette (135 thousand) separately.

3.17.3   Conclusions

Also following statistical information provided by CEPS/INSTEAD, we have definitely opted for considering Luxembourg (city) as the core of a vast labour pool, extending on the territories of the three neighbour countries. The metallurgical district of Esch appears more and more as a secondary centre inside this vast manpower basin, with people commuting from far away to work in the finance and services sector in Luxembourg (city). Data provided here only relate to the Luxemburg's part of this transborder basin (see further chapter on "transborder FUAs").

3.18 Malta

3.18.1   Criticism of the ESPON 1.1.1's FUAs

ESPON 1.1.1 proposes for the population of the FUA the whole population of the State. We have used the sole island of Malta (thus excluding Gozo) as a proxy for the FUA and we propose a delimitation of the MUA using our usual criteria and Google Earth views.

3.18.2   The Maltese pattern: population data

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Large city						
Valletta	355	389	Valletta	301		

3.18.3   Conclusions

Valletta's agglomeration is the only MUA and is located on the north-eastern coast of the island of Malta.

3.19 The Netherlands

3.19.1   Criticism of the ESPON 1.1.1 FUAs

If FUAs seem to have been quite correctly identified by Espon 1.1.1, population data for FUAs appear to be quite restrictive in general, by comparison with the labour pools definition supposed to be used. We have used data provided by the "Atlas van Nederland", providing maps on the basis of 15% of the active population at the place of residence working in the core. For the smallest cores, not examined in the atlas, we have considered as pertaining to the FUA only the population of the municipality in which the core was identified on the basis of the Google Earth observation. This does not seem to lead to many errors, since Dutch municipalities are very big in size and these smallest cores have evidently also the smallest FUAs.

We have been confronted with a quite difficult problem. ESPON 1.1.1 has considered each important core in the Randstad and around Eindhoven, Arnhem and Nijmegen as the centre of a specific FUA. Inversely, they have considered Enschede, Hengelo and Almelo as a single FUA. In fact, the Dutch literature and the "Atlas van Nederland" consider properly that even if each main core has its own FUA, one should also consider "polycentric cities", because commuting is very important between some FUAs. The "Atlas van Nederland" identifies eight "polycentric cities" (*Amsterdam*, with Haarlem, Velsen-Ijmuiden, Alkmaar, Hilversum and Almere; *Den Haag*, with Leiden and Delft; *Rotterdam*, with Dordrecht and Gouda; *Utrecht*, with Amersfoort; *Eindhoven*, with Helmond; *Heerlen*, with Geleen-Sittard and Maastricht; *Arnhem and Nijmegen*; *Enschede*, with Hengelo and Almelo). Besides, the first four ones are contiguous, forming the so-called Randstad Holland or Delta Metropolis. Delta Metropolis perfectly corresponds to our criteria to be recognized as a Polycentric metropolitan area. However, four polycentric sub-systems can be identified inside the Randstad. It also appears that Noord-Brabant's main FUAs fit our criteria to be considered as a polycentric metropolitan system (large cities distant from less than 30 km to each other).

3.19.2   The Dutch urban pattern: population data

The lines in yellow show the FUAs that are integrated in the poly-fua described in the preceding white line, so every white line preceding a yellow one describes a poly-FUA. The lines in light blue are also poly-FUAs but integrated themselves in a "super-poly-fua" described in the preceding white line.

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Metropolitan and polynuclear metropolitan areas						
Randstad Holland (Delta metropolis)	6787	5812 (a)	see beneath (blue lines)		NL310,NL322,NL323,NL324,NL325, NL326,NL327, NL331,NL332, NL333,NL334, NL335, NL336	6695

Randstad Holland Noord	2497	2237 (a)	Amsterdam	1052	NL322,NL323,NL324,NL325,NL326, NL327	2172
			Hilversum	202		
			Haarlem	179		
			Alkmaar	163		
			Almere	143		
			Velsen	138		
			Purmerend	72		
			Hoorn	66		
			Edam-Volendam	28		
			Castricum	23		
			Hillegom	21		
Amsterdam	1474	1445 (b)	Amsterdam	1052	NL325,NL326	1316
			Purmerend	72		
			Hoorn	66		
			Edam-Volendam	28		
Alkmaar	245	93	Alkmaar	161	NL322	232
Haarlem	238	390	Haarlem	179	NL324	218
			Hillegom	21		
Hilversum	225	83	Hilversum	202	NL327	233
Velsen-Ijmuiden	172	67	Velsen	138	NL323	173
			Castricum	23		
Almere	143	159	Almere	143		
Randstad Holland Zuid	1904	1526 (a)	Rotterdam	1025	NL334, NL335, NL336 (c)	2073
			Dordrecht	281		
			Gouda	111		
			Hellevoetsluis	38		
			Gorinchem	34		
			Maasluis	33		
			Oud-Beijerland	22		
Rotterdam	1431	1174	Rotterdam	1025	NL335	1340
			Hellevoetsluis	38		
			Maasluis	33		
			Oud-Beijerland	22		
Dordrecht	309	280	Dordrecht	281	NL336	411
			Gorinchem	34		
Gouda	164	72	Gouda	111	NL334 (c)	322
Randstad Holland West	1404	1258 (a)	Den Haag	589	NL331, NL332, NL333 (c)	1337
			Leiden	272		
			Zoetermeer	110		
			Delft	96		
			Alphen aan den Rijn	70		
			Naaldwijk	29		
			Noordwijk	25		
			Lisse	22		
			Pijnacker	23		
			Monster	20		
Den Haag	822	860 (d)	Den Haag	589	NL332	719

			Zoetermeer	110		
			Naaldwijk	29		
			Monster	20		
Leiden	441	398 (e)	Leiden	272	NL331 (c)	386
			Alphen aan den Rijn	70		
			Noordwijk	25		
			Lisse	22		
Delft	141	(d)	Delft	96	NL333	232
			Pijnacker	22		
Randstad Holland Oost	982	791 (a)	Utrecht	390	NL310	1113
			Amersfoort	157		
			Zeist	60		
			Soest	44		
			Woerden	47		
			Nijkerk	37		
			Houten	36		
			Culemborg	25		
			Baarn	25		
Utrecht	692	536	Utrecht	390	NL310	1113
			Zeist	60		
			Woerden	47		
			Houten	36		
			Culemborg	25		
Amersfoort	290	255	Amersfoort	155	included in NL310	
			Soest	44		
			Nijkerk	36		
			Baarn	25		
Noord-Brabant polycentric metropolitan area (f)	2040	1286 (a)	Eindhoven	316	NL411, NL412, NL413 NL414	2366
			Tilburg	218		
			Breda	161		
			Den Bosch	129		
			Roosendaal	77		
			Osterhout	52		
			Waalwijk	45		
			Zevenbergen	36		
			Valkenswaard	31		
			Boxtel	29		
			Sint-Michielsgestel	28		
			Dongen	25		
			Vucht	25		
Tilburg (f)	465	280	Tilburg	218	NL412	442
			Waalwijk	45		
			Boxtel	29		
			Dongen	25		
Eindhoven (f)	441	383	Eindhoven	316	NL414	712
			Valkenswaard	31		
Den Bosch	360	182	Den Bosch	130	NL413	618
			Sint-Michielsgestel	28		

			Vught	25		
Breda	357	297	Breda Oosterhout Zevenbergen	161 53 36	NL411	594
Helmond	211	n.c.	Helmond Deurne Nuenen c.a.	81 32 24	included in NL414	
Roosendaal	75	78	Roosendaal	77	included in NL411	
Oss	66	n.c.	Oss	66	included in NL413	
Bergen op Zoom	65	66	Bergen op Zoom	65	included in NL411	
Gelderland polycentric metropolitan area (f)	1110	963 (a)	Nijmegen Arnhem Appeldoorn Ede Veenendaal Barneveld Rheden Wageningen Epe Renkum	218 206 154 102 60 48 44 34 33 32	NL223	693
Arnhem (f)	323	321	Arnhem Rheden Renkum	206 44 32	NL223	693
Nijmegen	315	268	Nijmegen	216	included in NL223	
Ede	264	164 (f, h)	Ede Veenendaal Barneveld Wageningen	102 60 48 34	included in NL223	
Appeldoorn	208	210	Appeldoorn Epe	153 33	n.a. (g)	
South Limburg polycentric metropolitan area (Euroregio MAHL's dutch side) (f)	615	623 (a)	Heerlen Maastricht Geleen	217 142 142	NL423	648
Heerlen	308	268	Heerlen	217	included in NL423	
Maastricht (f)	186	186	Maastricht	142	included in NL423	
Geleen-Sittard	121	169	Geleen	89	included in NL423	
Large cities						
Enschede-Almelo (f)	473	305	Enschede Almelo Oldenzaal Borne	150 94 31 21		
Enschede-Hengelo	282	305 (i)	Enschede Oldenzaal Borne	150 31 21		

Almelo	191	(i)	Almelo	94		
Groningen	409	333	Groningen Hoogezand-Sappemeer	193 33		
Medium cities						
Leeuwaarden	192	155	Leeuwaarden	89		
Emmen	183	108	Emmen	107		
Middelburg-Vlissingen	176	n.c.	Middelburg Vlissingen Goes	45 44 36		
Deventer	164	86	Deventer Raalte	84 36		
Zwolle	161	169	Zwolle	107		
Venlo	131	n.c.	Venlo	91		
Small cities						
Lelystad	63	66	Lelystad	65		
Den Helder	59	60	Den Helder	60		
Assen	58	60	Assen	59		
Hoogeveen	53	n.c.	Hoogeveen	53		
Smallingerland	52	n.c.	Smallingerland	52		

(a) Computed by adding ESPON 1.1.1 data for each constituent unit. ESPON 1.1.1 does not propose data for the Randstad or parts of the Randstad as a whole.
(b) ESPON 1.1.1 considers separately the FUAs of Amsterdam (1379) and Hoorn (66). The latter is in fact included in Amsterdam's labour pool.
(c) The NUTS-3 unit NL334 is in reality more or less divided into two equal parts between the Eastern and Southern sides of the Randstad. However, the main city in this area is located in the Southern part (Gouda).
(d) Delft is supposed to have been included in Den Haag's FUA by ESPON 1.1.1.
(e) ESPON 1.1.1 considers the FUAs of Leiden (328) and Alphen aan den Rhein (71) separately, the latter appearing rather as a secondary core inside a single labour pool.
(f) Dutch side only. See "transborder FUAs" chapter.
(g) NL221 unit is too large to be a good proxy.
(h) ESPON 1.1.1 considers separately the FUAs of Ede (104) and Veenendaal (61), which actually seem to be strongly interrelated.
(i) ESPON 1.1.1 considers Enschede, Hengelo and Almelo as a single pool.

3.19.3   Conclusions

The Netherlands are a very densely populated and urbanised country. As land planning regulations are quite restrictive, urban sprawl is strongly contained: this is why individual cores are sharply delimited and in the different FUAs many secondary cores can be individualised (using satellite images), whereas in other countries only one core with a large suburban fringe should prevail.
44% of the country's population live in Randstad Holland, simultaneously a big European polycentric metropolitan area and a set of four polycentric metropolises, as each part of this whole is organized around Amsterdam, Den Haag, Rotterdam and Utrecht, each with quite clear specialisations. Even if traffic flows and inter-linkage are very strong in all directions inside this single metropolitan area, political bodies, regulations, planning and economic

competition between the main cores imply that it remains understandable to consider at least the four separate sub-systems, if not the different cities inside each of them.

The South and the East of the country are also much urbanized, but on the basis of a set of large or medium cities organized in polycentric systems, with contiguous and inter-linked labour pools. So, the province Noord-Brabant appears as strongly polycentric, with four large cities organizing its territory. The Twente district, Arnhem-Nijmegen and the South of Limburg are also characterized by polycentric macro-FUAs. Twente and mainly the South of Limburg also have cross-border contiguities.

The North-East and Zeeland appear to be less urbanized and are also less densely populated.

3.20   Norway

3.20.1   Criticism of the ESPON 1.1.1 FUAs

Using the European-wide criteria and also considering the very low densties of population of many Kommune where the smallest FUAs are located, we have excluded from the ESPON 1.1.1 list of FUAs 17 small FUAs with less than 50 thousand inhabitants, as well as Kongsvinger, with a population of the FUA just at the level of 50 thousand, but a core with only 17 thousand inhabitants. The remaining 18 FUAs are a number very coherent with the population size of the country. For the rest, the populations proposed by ESPON 1.1.1 for the FUAs seem to be likely.

3.20.2   The Norwegian urban pattern: population data

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Metropolis						
Oslo	1037	1037	Oslo	712	NO011, NO012	975
Large cities						
Bergen	335	335	Bergen	231		
Stavanger	259	259	Stavanger	163		
Medium cities						
Trondheim	224	224	Trondheim	150		
Drammen	143	143	Drammen	55		
Frederikstad	127	127	Frederikstad	68		
Skien	121	121	Skien	83		
Kristiansand	116	116	Kristiansand	73		
Tonsberg	106	106	Tonsberg	35		
Small cities						
Haugesund	94	94	Haugesund	31		
Hamar	84	84	Hamar	27		
Larvik	83	83	Larvik	41		
Alesund	76	76	Alesund	39		
Arendal	72	72	Arendal	40		
Gjovik	67	67	Gjovik	27		
Tromsö	63	63	Tromsö	60		
Molde	53	53	Molde	24		
Moss	51	51	Moss	27		

3.20.3   Conclusions

The urban system of Norway is dominated by Oslo metropolitan area and the urban system of South-Eastern Norway. Outside this region, only three cities are important on the Western coast, Bergen, Stavanger and Trondheim. This does not mean that smaller municipalities, even with FUAs under 50 thousand inhabitants, do not play important roles in providing services to local populations in regions with very low densities.

3.21 Poland

3.21.1   Criticism of the ESPON 1.1.1 FUAs

The precise identification and delineation of FUAs in Poland is hampered by the lack of current journey-to-work statistics (the last comprehensive survey was conducted in 1988 and those data are no longer relevant). Hence, any delineation of the FUAs has to be based on proxy variabilities, in addition to expert knowledge.

The procedures adopted in the framework of the ESPON 1.1.1 project were inadequate, to say the least. The main fault was oversimplification. FUAs' identification and delineation were based on *poviats* – administrative districts of subregional level. These spatial units are too large (and too few) to capture city- hinterland relations. *Poviats* are formally classified as NUTS-4 units, while their statistical aggregates – the 45 subregions –, are NUTs-3 units. The cities that for the purpose of ESPON 1.1.1 were selected as FUA cores were the *city-poviats*. There are 66 such cities in Poland (out of a total of 373 *poviats*), but some of them are territorially contiguous with (bordering on) other cities (this concerns in particular the Upper Silesian conurbation). As a result, only 48 FUA cores were identified. To each of the cores the neighbouring, or surrounding *poviats* were subordinated automatically as functionally linked zones. Such an assumption might have been defendable (though still representing an oversimplification) in the case of the large cities only. For the middle-sized towns the FUA areas are generally much overbounded. These rules applied, the resulting FUA population statistics still contain some errors. Thus, the city (*city-poviat*) of Tarnobrzeg (51 thousand inhabitants), together with the surrounding landed *Tarnobrzeski poviat* (56 thousand), 107 thousand altogether, is omitted from the list. The Częstochowa FUA gives population figures for the city (*city-poviat)* only: 256 thousand. Together with the *Częstochowski poviat* (135 thousand inhabitants), its population figures amount to 390 thousand inhabitants. Similarly, the Wałbrzych FUA is represented by the city (*city-poviat)* population only. When adding the landed *Wałbrzyski poviat,* the FUA population figures amount to 197 thousand inhabitants.

A completely new identification and delineation of FUAs has been conducted here. Most importantly, *gmina* were adopted as the basic spatial units. *Gmina* (townships, municipalities) are the local administrative units, classified as NUTS-5 units. There are 2486 *gmina* in Poland, among which 306 are *city-gmina* (or urban *gmina*). All the large cities and middle-sized towns (306 out of the total number of 880) have in fact the administrative status of *gmina*. In the case of the 66 major cities, this status is combined with the status of *poviat*. Among the remaining *gmina,* 564 are urban-rural, i.e. there are incorporated (small) towns situated within their territory, while 1606 are rural *gmina*.

To bring the set of FUAs for Poland in line with those identified for most of the other countries in the ESPON 1.1.1 project, all towns above 20,000 inhabitants were considered as potential FUA cores. Spatially contiguous territory composed of two or more towns (cities), i.e. *urban gmina*, was considered a single FUA core. Such a core area included also other neighbouring *gmina* which met the population density criterion of at least 650 inhabitants per km², possibly adapted using Google Earth images. These were typically suburban *gmina*, formally of rural, or urban-rural status. In the absence of recent, comprehensive data on journey-to-work, proxy variables were used in the delineation of the commuting areas related to individual FUA cores. These variables included in particular: the share of non-agricultural employment and an index of local business activity (number of firms per 1000 inhabitants). The data were dawn from the *Population and Housing Census of 2002*. In addition, expert knowledge of the team members concerning functional linkages, travel-to-work patterns and local transportation networks, was extensively used. The lack of journey-to-work data inside the Katowice area did not allow isolating possible different employment cores inside this morphological area. Therefore, Katowice's data are

quite comparable to those for a region like the German Ruhr area as a whole. The only secondary cores identified in the Katowice FUA are isolated in the external part of the FUA.

As a result 88 FUAs with more than 50 thousand inhabitants were identified, all of them having cores with more than 20,000 inhabitants. Two more cities, Zgorzelec and Slubice, have been taken into consideration, as parts of transborder FUAs.

N.B.: 1) MUAs' population data are computed on the ESPON 1.1.1 NUTS-5 database (2001). Conversely, our FUAs' population data are based on 2002 data.

2) NUTS-3 units are not very good proxys for the metropolises of Lodz, Krakow, Gdansk and Poznan where they are too small (adding the surrounding NUTS-3 units should inversely lead to much too large areas). On the contrary, the NUTS-3 proxy is much too large in the case of Szczecin (and to a lesser extent for Wroclaw). A more in-depth analysis should be achieved in the future using NUTS 4 data.

3.21.2   The Polish urban pattern: population data

The lines in yellow show the FUAs that are integrated in the poly-fua described in the preceding white line, so every white line preceding a yellow one describes a poly-FUA.

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Metropolitan and polynuclear metropolitan areas						
Upper Silesian polycentric metropolitan area (a)	4311	n.c.	Katowice (b) Bielsko-Biala Rybnik Jastrebie-Zdroj Zory Raciborz Zawiercie Olkusz Chrzanow Wodzislaw Sl. Oswiecim Knurow Cieszyn Laziska Gorne Pyskowice	2279 223 187 101 66 63 55 52 51 49 43 42 38 23 21	PL225, PL226, PL227	4230
Katowice	3029	2593	Katowice (b) Zawiercie Olkusz Chrzanow Oswiecim Knurow Laziska Gorne Pyskowice	2279 (a) 55 52 51 43 42 23 21	PL226	2940
Bielsko-Biala	584	327	Bielsko-Biala	223	PL225	641
Rybnik	526	545	Rybnik Jastrebie-Zdroj Zory Wodzislaw Sl.	187 101 66 49	PL227	649

Raciborz	109	n.c.	Raciborz	63	included in PL227	
Cieszyn (a)	63	n.c.	Cieszyn	38	included in PL225	
Warszawa	2785	2394	Warszawa Zyrardow Minsk Mazow. Nowy Dwor	2004 44 37 27	PL073,PL075	2898
Lodz	1165	1170	Lodz	919	PL053	797
Krakow	1236	1076	Krakow Bochnia	807 30	PL063	738
Gdansk	993	1002	Gdansk Gdynia	519 300	PL0B3	755
Poznan	919	828	Poznan	679	PL0F5	576
Wroclaw	861	729	Wroclaw Olawa	634 32	PL013,PL014	1071
Szczecin	610	474	Szczecin Swinoujscie	416 43	PLOG1	1118
Large cities						
Bydgoszcz	485	472	Bydgoszcz	383		
Lublin	451	566	Lublin	354		
Bialystok	403	427	Bialystok	286		
Czestochowa	365	256	Czestochowa	254		
Kielce	319	407	Kielce	210		
Rzeszow	314	330	Rzeszow	162		
Radom	287	376	Radom	231		
Opole	285	268	Opole	129		
Tarnow	269	302	Tarnow	121		
Medium cities						
Walbrzych	248	135	Walbrzych	176		
Torun	236	289	Torun	205		
Olsztyn	222	287	Olsztyn	174		
Plock	162	238	Plock	131		
Gorzow Wielkopolski	153	190	Gorzow Wielkopolski	126		
Zielona Gora	153	205	Zielona Gora	119		
Koszalin	152	176	Koszalin	111		
Konin	148	204	Konin	83		
Pila	147	n.c.	Pila	77		
Slupsk	145	197	Slupsk	102		
Elblag	144	188	Elblag	130		

Wloclawek	138	211	Wloclawek	123		
Kalisz	134	187	Kalisz	108		
Jelenia Gora	131	198	Jelenia Gora	92		
Nowy Sacz	131	277	Nowy Sacz	84		
Stalowa Wola	128	n.c.	Stalowa Wola	71		
Ostrow Wielkopolski	127	n.c.	Ostrow Wielkopolski	75		
Legnica	125	110	Legnica	109		
Tarnobrzeg-Sandomierz	120	n.c.	Tarnobrzeg Sandomierz	51 27		
Grudziadz	117	141	Grudziadz	102		
Kiedzierzyn-Kozle	116	n.c.	Kiedzierzyn-Kozle	69		
Lubin	114	n.c.	Lubin	82		
Inowroclaw	112	n.c.	Inowroclaw	79		
Piotrkow Trybunalski	108	173	Piotrkow Trybunalski	81		
Krosno	108	159	Krosno	49		
Leszno	101	111	Leszno	63		
Pulawy	100	n.c.	Pulawy	54		
Przemysl	100	141	Przemysl	68		
Small cities						
Bielawa-Dzierzoniow	98	n.c.	Dzierzoniow Bielawa	37 33		
Ostrowiec Swietokrzyski	98	n.c.	Ostrowiec Swietokrzyski	78		
Tomaszow Mazowiecki	96	n.c.	Tomaszow Mazowiecki	69		
Siedlce	93	158	Siedlce	77		
Chelm	93	147	Chelm	71		
Zamosc	87	175	Zamosc	69		
Lomza	84	116	Lomza	65		
Stargard Szczecinski	82	n.c.	Stargard Szczecinski	74		
Gniezno	78	n.c.	Gniezno	72		
Glogow	78	n.c.	Glogow	74		
Swidnica	76	n.c.	Swidnica	65		
Skarzysko-Kamienna	76	n.c.	Skarzysko-Kamienna	53		
Suwalki	76	105	Suwalki	69		
Mielec	73	n.c.	Mielec	64		

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Ostroleka	72	140	Ostroleka	56		
Starachowice	72	n.c.	Starachowice	56		
Belchatow	71	n.c.	Belchatow	61		
Tczew	71	n.c.	Tczew	61		
Debica	71	n.c.	Debica	49		
Biala Podlaska	70	177	Biala Podlaska	59		
Elk	66	n.c.	Elk	57		
Nowy Targ	65	n.c.	Nowy Targ	35		
Nysa	64	n.c.	Nysa	61		
Skierniewice	62	88	Skierniewice	49		
Starogard Gdanski	62	n.c.	Starogard Gdanski	51		
Jaroslaw	61	n.c.	Jaroslaw	42		
Sanok	61	n.c.	Sanok	41		
Zdunska Wola	61	n.c.	Zdunska Wola	46		
Radomsko	59	n.c.	Radomsko	51		
Kolobrzeg	57	n.c.	Kolobrzeg	48		
Kutno	57	n.c.	Kutno	50		
Chojnice	55	n.c.	Chojnice	41		
Brzeg	54	n.c.	Brzeg	40		
Sieradz	54	n.c.	Sieradz	46		
Jaslo	54	n.c.	Jaslo	39		
Boleslawiec	53	n.c.	Boleslawiec	44		
Nowa Sol	53	n.c.	Nowa Sol	42		
Ciechanow	52	n.c.	Ciechanow	47		
Zary	51	n.c.	Zary	40		
Görlitz	41	n.c.	Zgorzelec (c)	35		
Frankfurt an der Oder	20	n.c.	Slubice (c)	20		

(a) Polish side only. See further "transborder FUAs" chapter for the links with the Ostrava's basin.
(b) If one considers individual places inside the Katowice morphological area, the main municipalities are Katowice (338), Sosnowiec (240), Gliwice (208), Bytom (200), Zabrze (196), Ruda Slaska (153), Tychy (130), Dabrowa Gornicza (130), Chorzow (120). Nine other municipalities have less than 100 thousand inhabitants.
(c) Data for the Polish side. See further "transborder FUAs" chapter.

3.21.3   Conclusions

Owing to history and despite a rapid process of urbanization during the 50s and the 70s, the urban system of Poland is characterized by a regular spacing of towns, as well at the upper as at the lower levels of the urban hierarchy. The main cities are however smaller in the Eastern part of the country. The partition of Poland by the three neighbouring Empires

(Russia, Austria and Germany) at the end of the 18th Century and the development of the Upper Silesian coal basin during the 19th Century explain why Warszawa's FUA contains only 7% of the Polish population and is exceeded by the Upper Silesian metropolis, at least from a demographic point of view, but not from a functional point of view. In the same way, the main links between the nodes of the Polish urban system do not describe radiuses around the capital. If the main West-East axis goes through Warsaw, it crosses the main North-South axis, from Gdansk to Katowice, in Lodz.

Outside the Upper Silesian basin, the other metropolises, or even a bit smaller cities like Bydgoszcz, Lublin or Byalistok, form a balanced network of high-level administrative and economic centres. During the last decade, Warszawa strongly reinforced its economic hierarchical position, as well as at a lower level, Poznan, Krakow, Wroclaw, Gdansk, Sczeecin and Bydgoszcz. The situation was worse for the Katowice area, where heavyy industry reconversion is difficult and the upper-level tertiary sector weaker. The old industrial textile city of Lodz is undergoing a strong process of industrial reconversion: it has recently become a major centre for export-oriented household equipment industries.

3.22 Portugal

3.22.1   Criticism of the ESPON 1.1.1 FUAs

For the two metropolises, ESPON 1.1.1 used as a proxy for their FUAs the limits of the metropolitan regions of Lisbon and Porto, association of municipalities created in the late 80s and mainly inspired by daily commuting flows. For the other FUAs, ESPON 1.1.1 used a study published in 1991 by Quaternaire Portugal. All these estimations appear in general to be quite good proxys of the reality, at least for isolated cities. However, difficulties arise in the northern regions around Porto and Braga. The surroundings of these two cities present a very exceptional structure: a mix of agricultural and industrial activities, very high population densities (often more than 650 inhab./ km²), scattered residential and industrial settlements, dominance of small and medium enterprises mainly employing local manpower. Such a situation is very difficult to describe using our criteria and is also badly described by ESPON 1.1.1. Using our criteria, a morphological agglomeration is developed around Guimaraes, not very far from Braga, reaching as much as 203 thousand inhab., which is nearly twice the population attributed to this FUA by ESPON 1.1.1, but without any true urban centrality like that of the historical city of Braga. Another morphological agglomeration of 131 thousand inhab. appears, following our criteria in the Rebardosa-Freamunde region, east of Porto, but these two places are not even mentioned as forming a FUA by ESPON 1.1.1, which only mentions a small FUA of 41 thousand inhab. (Pacos de Ferreira) inside this big loose agglomeration. We have chosen the debatable solution to identify as secondary cores the contiguous sets of NUTS5 units with more than 650 inhab./km², even if they do not constitute true "cities", and to consider as population for their FUAs the population of the corresponding "concelhos", taking into account the local character of the manpower used and lacking any other information. We have thus also maintained the two neighbour FUAs of Paredes and Penafiel proposed by ESPON 1.1.1, with their spatial structure not very different from that of the Rebordosa-Freamunde area, but here without any morphological core reaching our criteria, as well as, in the same conditions, the FUAs of Ovar and Santa Maria de Feira. All those concelhos are in a radius of less than 30 km from Porto.

As for the rest, we have suppressed many small FUAs proposed by ESPON 1.1.1 but with less than 50 thousand inhab. (Agueda, Torres Vedras, Evora, Portimao, Viana do Castelo, Figueira da Foz, Felgueiras, Oliveira de Azemeis, Vila Real, Fafe, Santarem, Covilha, Castelo Branco, Caldas da Rainha, Guarda, Albufeira, Peniche, Beja, Silves, Torres Novas, Chaves, Sao Joao da Madeira, Braganca).

3.22.2 The Portuguese urban pattern: population data

The lines in yellow show the FUAs that are integrated in the poly-fua described in the preceding white line, so every white line preceding a yellow one describes a poly-FUA.

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Metropolitan and polynuclear metropolitan areas						
Lisboa	2591	2591	Lisboa Setubal	2315 75	PT171, PT172	2574
Porto's region	1778	n.c.	Porto Rebordosa-Pacos de Ferreira-Freamunde Povoa de Varzim Feira Santo Tirso Famalicao	1163 131 82 75 40 30	PT114 (a)	1235
Porto	1245 (b)	1231 (b)	Porto Povoa de Varzim	1163 82	PT114	1235
Rebordosa-Pacos de Ferreira-Freamunde	131	41 (c)	Rebordosa-Pacos de Ferreira-Freamunde	131		
Santa Maria de Feira	136	115	Santa Maria de Feira	75		
Paredes-Penafiel	155	87 (d)	-	-		
Santo Tirso	56	56	Santo Tirso	40		
Ovar	55	55	-	-		
Medium cities						
Guimaraes	235 (e)	127	Guimaraes	203		
Funchal	168 (f)	103	Funchal	139		
Braga	153	153	Braga	122		
Coimbra	139	139	Coimbra	93		
Faro	126	126 (g)	Faro Loulé	47 21		
Barcelos	122	64	Barcelos	28		
Leiria-Marinha Grande	117	83	Leiria Marinha	34 28		

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			Grande			
Aveiro-Ilhavo	103	103 (h)	Aveiro	43		
Vila Nova de Famalicao	100	100	Vila Nova de Famalicao	30		
Small cities						
Ponta Delgada	66	66	Ponta Delgada	25		
Viseu	63	63	Viseu	34		

(a) At the level of the concelhos, a better proxy of the Porto's metropolitan region should be to add to the Porto's NUTS-3 unit the concelhos of Santo Tirso (72 thousand inhab.), Pacos de Ferreira and Lousada (53 and 45 thousand), Paredes and Penafiel (83 and 72 thousand), Santa Maria de Feira (136 thousand) and Ovar (55 thousand). The total proxy population of Porto's metropolitan region should then be 1761 thousand inhab.
(b) Povoa de Varzim is included in Porto's FUA.
(c) ESPON 1.1.1 considers Pacos de Ferreira only.
(d) ESPON 1.1.1 considers Paredes and Penafiel as two separate FUAs, with respectively 63 and 24 thousand inhab.
(e) Total of the three concelhos of Guimaraes, Fafe and Vizela.
(f) ESPON 1.1.1 considers only the concelho of Funchal as the FUA. The morphological agglomeration is in fact bigger. Therefore, we have considered as a proxy of the FUA the three concelhos of Funchal, Camara de Lobos and Santa Cruz.
(g) ESPON 1.1.1 considers Faro, Loulé and Olhao as three separate FUAs, with respectively 47, 46 and 33 thousand inhab.
(h) ESPON 1.1.1 considers Aveiro and Ilhavo as two separate FUAs, with respectively 67 and 36 thousand inhab. Ilhavo is very close to Aveiro but doesn't reach the threshold of 20 thousand inhab. to be considered as a MUA in itself.

3.22.3   Conclusions

It is clear that the Portuguese urban network is strongly dominated by two metropolitan areas, Lisbon and Porto. For the rest, any precise description is quite difficult. Around Porto and Braga, and to a lesser extent along the central coastal region, densities of population are very high, semi-rural landscapes associate agriculture and a dense network of scattered settlements and industries, without strong historical urban cores (except for Leiria, Coimbra, Aveiro). A linear process of loose urbanisation is developed along the coastal region, from Braga to Lisbon, along the main highway and railway corridor. Inversely, some small historical cities in the empty interior and the south of the country have a well defined morphological and historical core with more than 20 thousand inhab., but are excluded from our list, due to the absence of FUA important enough to reach the threshold of 50 thousand inhab. It is for instance the case of Braganca, Viseu, Castelo Branco, Evora, Beja.

3.23 Romania

3.23.1   Criticism of the ESPON 1.1.1 FUAs

It appears clearly that Espon 1.1.1 data are only the data for the MUAs, and even only for the core municipality of the MUA in the case of the (rare, only four, Bucuresti, Constanta, and two industrial agglomerations, Petrosani and Vulcan) MUAs gathering more than one municipality. We have slightly rectified the population of the MUAs (for example including Voluntari in the Bucuresti's MUA, and not considering it as ESPON 1.1.1 as a separate FUA). Fortunately, data for the MUAs possibly do not underestimate too much the data for the FUAs, since suburbanisation was nearly unknown in Romania until the last decade. However, it is possible that some MUAs just under the 50 thousand inhab. threshold, and thus not taken into account, are in fact the core of FUAs just above this threshold and that, globally, data are a bit underestimated. On the contrary, due to the lack of consolidation of municipal data, ESPON 1.1.1 has not considered Vulcan, an industrial agglomeration, as a FUA.

3.23.2   The Romanian urban pattern: population data

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Metropolis						
Bucuresti	2064	1922	Bucuresti	2064	RO081	2003
Large cities						
Constanta	364	311	Constanta	364		
Iasi	349	322	Iasi	349		
Cluj-Napoca	332	318	Cluj-Napoca	332		
Timisoara	328	318	Timisoara	328		
Galati	325	299	Galati	325		
Craiova	311	303	Craiova	311		
Brasov	307	284	Brasov	307		
Medium cities						
Ploiesti	248	232	Ploiesti	248		
Braila	231	217	Braila	231		
Oradea	221	207	Oradea	221		
Bacau	207	176	Bacau	207		
Pitesti	186	169	Pitesti	186		
Arad	183	173	Arad	183		
Sibiu	167	155	Sibiu	167		
Tirgu Mures	163	150	Tirgu Mures	163		
Baia Mare	150	138	Baia Mare	150		

Buzau	145	133	Buzau	145		
Satu Mare	130	116	Satu Mare	130		
Botosani	127	115	Botosani	127		
Piatra Neamt	124	105	Piatra Neamt	124		
Rimnicu Vilcea	120	108	Rimnicu Vilcea	120		
Suceava	117	106	Suceava	117		
Drobeta-Turnu Severin	116	104	Drobeta-Turnu Severin	116		
Small cities						
Tirgu Jiu	98	97	Tirgu Jiu	98		
Tirgoviste	98	89	Tirgoviste	98		
Focsani	97	103	Focsani	97		
Tulcea	95	93	Tulcea	95		
Resita	93	84	Resita	93		
Bistrita	86	81	Bistrita	86		
Slatina	86	79	Slatina	86		
Roman	81	69	Roman	81		
Hunedoara	78	71	Hunedoara	78		
Vaslui	78	70	Vaslui	78		
Birlad	78	69	Birlad	78		
Petroseni	78	45	Petroseni	78		
Calarasi (b)	77	70	Calarasi	77		
Deva	75	69	Deva	75		
Giurgiu (c)	72	70	Giurgiu	72		
Alba Iulia	72	66	Alba Iulia	72		
Zalau	70	63	Zalau	70		
Sfintu Gheorghe	66	62	Sfintu Gheorghe	66		
Vulcan	63	n.c.	Vulcan	63		
Medias	62	55	Medias	62		
Turda	60	56	Turda	60		
Onesti	60	52	Onesti	60		
Alexandria	57	51	Alexandria	57		
Slobozia	55	53	Slobozia	55		

(a) Data based on MUAs' populations.
(b) Due to the lack of a bridge, we have not considered Calarasi-Silistra as a transborder FUA.
(c) Romanian side only. See "transborder FUAs" chapter for the transborder FUA with Rousse.

3.23.3   Conclusions

Except the strong primacy of Bucuresti, the other main Romanian cities design a quite equilibrated urban pattern, inherited from the communist period, when the planned economy wanted to disperse industry onto the country, following the hierarchy of the administrative pattern. At the third and the lower levels of the hierarchy, the urban pattern remains weak.

3.24 Slovak Republic

3.24.1   Criticism of the ESPON 1.1.1 FUAs

The identification of FUAs in Slovakia by ESPON 1.1.1 seems to be haphazard and lacking rationality. The population size of administrative districts was sometimes taken as the basis, but not systematically. As a result, ESPON 1.1.1's list of FUAs includes some units focused on small urban places, lacking major functions. At the same time, several relatively important centres, even if only small cities, attracting commuting flows, have been omitted. Due to the lack of good commuting data and considering the importance of the administrative structures for the management of the economy in the former socialist period, we have taken the same rule as for the Czech Republic, also following a paper by P. Hurbanek, using the administrative districts as proxys for the FUAs, with the exception of small MUAs surrounded by too large districts, and thus limiting the population's proxy of the FUA to twice the population of the morphological core.
We have excluded the small cities of Topolcany, Ziar nad Hronom, Bardejov, Trebisov, Tvrdosin, Skalica, Svidnik, to which ESPON 1.1.1 attributes a FUA with less than 50 thousand inhabitants. Neither have we taken into consideration the small city of Partizanske (less than 50 thousand inhab. for its district). Conversely, we have added six small cities, not considered by ESPON 1.1.1, for which the FUA could be more than 50 thousand inhab. using the rule of twice the population of the MUA (Spisska Nova Ves, Zvolen, Humenne, Komarno, Ruzomberok, Piestany).
Our corrections provide a rough view of the Slovakian urban pattern, but this image should be further refined if good commuting data were available.

3.24.2   The Slovak urban pattern: population data

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Metropolises						
Bratislava (a,f)	711	599	Bratislava	444	SK010	617
Large cities						
Kosice (b)	343	343	Kosice	239		
Medium cities						
Nitra (c)	164	219	Nitra	88		
Presov (c)	162	162	Presov	91		
Zilina (c)	156	156	Zilina	90		
Trencin (d)	151	271	Trencin Banovce nad Bebravo	58 20		
Trnava (c)	127	127	Trnava	69		
Banska Bystrica (c)	112	249	Banska Bystrica	84		
Poprad (c)	104	189	Poprad	60		
Prievidza (e)	104	108	Prievidza	52		

Small cities						
Martin (c)	98	98	Martin	67		
Nove Zamky (e)	84	148	Nove Zamky	42		
Michalovce (e)	80	161	Michalovce	40		
Spisska Nova Ves (e)	76	n.c.	Spisska Nova Ves	38		
Levice (e)	72	53	Levice	36		
Zvolen (c)	68	n.c.	Zvolen	36		
Povazska Bystrica (c)	65	78	Povazska Bystrica	43		
Humenne (c)	65	n.c.	Humenne	35		
Liptovsky Mikulas (e)	64	134	Liptovsky Mikulas	32		
Komarno (e,f)	58	n.c.	Komarno	29		
Lucenec (e)	56	90	Lucenec	28		
Ruzomberok (e)	56	n.c.	Ruzomberok	28		
Piestany (e)	54	n.c.	Piestany	27		
Esztergom	22	22	Sturovo (e,f)	11		

(a) Proxy for the FUA: Region of Bratislava and district of Dunajska Streda
(b) Proxy for the FUA: Districts of Kosice-city and Kosice-land.
(c) Proxy for the FUA: the corresponding district.
(d) Proxy for the FUA, according to Slovak expert Dr. Vladimir Szekely, the two districts of Trencin and Banovce nad Bebravo, the latter small city being considered as a separate FUA by ESPON 1.1.1.
(e) Proxy for the FUA: limited to twice the population of the MUA.
(f) Slovakian side only. See also chapter on "transborder FUAs".

3.24.3   Conclusions

Slovakia remains a country of medium and small cities. The only two important cities, even if not very big at the European scale, are Bratislava and Kosice. However, being located about 60 km from Vienna, and partly using the same airport, Bratislava could be considered as forming an (at least potential) transborder polynuclear metropolis with the Austrian capital.

3.25 Slovenia

3.25.1   Criticism of the ESPON 1.1.1 FUAs

The main cities, Ljubljana, Maribor and Celje, seem to have been overestimated by ESPON 1.1.1 report, by comparison to data provided by Slovenian experts on the basis of our criteria (cf. D. Bole, D. Josipovic, GIAM, GURS, 2005). This is due to the fact that ESPON 1.1.1 report linked the FUA of Kranj with Ljubljana, Ptuj with Maribor and Velenje with Celje. Novo Mesto, with a FUA of 50 thousand inhab., reaches the threshold with our data (47 thousand, according to ESPON 1.1.1). Domzale can be identified as a secondary centre in the FUAs of Ljubljana. Even if Ljubljana is just under the threshold to be considered as a metropolis, we have given its proxy, due to its particular status of capital city.

3.25.2   The Slovenian urban pattern: population data

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Large city						
Ljubljana	468	522 (a)	Ljubljana Domzale	270 30	SI00E	490
Medium cities						
Maribor	189	219	Maribor	115		
Celje	129	169	Celje	49		
Small cities						
Kranj	80	(a)	Kranj	52		
Koper	80	77	Koper	48		
Nova Gorica (b)	63	61	Nova Gorica	36		
Novo Mesto	50	47	Novo Mesto	41		

(a) Kranj seems to have been included in Ljubljana's FUA by ESPON 1.1.1.
(b) Slovenian side only. See "transborder FUAs" chapter for Gorizia-Nova Gorica.

3.25.3   Conclusions

Slovenia is characterized by a balanced network of cities, even if these are small by comparison to European standards, including the capital city, just under the threshold to be considered fully as a metropolis. Ljubljana, Maribor, but also Koper, due to its importance as a maritime gateway for Central Europe, are the three cities identified at the upper level of the urban network by the Slovenian literature and in the planning documents. Celje is also an important central place on one of the two main corridors crossing at Ljubljana, the Koper-Maribor corridor to Austria and Hungary. The other corridor is the Villach/Klagenfurt-Ljubljana-Zagreb corridor. Nova Gorica is a part of a transborder core, with more or less the same importance on both sides of the border, which was quite closed until some years ago but with now a more and more integrated labour pool, the Slovenian workers commuting to

the Italian side. The other cities identified as central places in the Slovenian planning documents, like Velenje, Ptuj and Murska Sobota, are surely polarizing cities at the Slovenian level, but too small to be included in a European-wide list.

3.26 Spain

3.26.1   Criticism of the ESPON 1.1.1 FUAs

ESPON 1.1.1 defined the Spanish FUAs using some case studies based on commuting flows and even sometimes provinces (or mancomunidades in Catalonia) or municipalities as proxys. Globally, FUAs proposed by ESPON 1.1.1 seems to fit quite well the data given by the literature and are coherent with our cores' populations, even if the definition used for the FUAs seems to be a bit too restrictive when only municipal territories are considered (but it must be taken into account that some Spanish municipalities have a big size – so that their FUAs are more or less limited to the territory of the municipality itself - and that they are sometimes surrounded by quite empty areas). Corrections consist mainly in merging some so-called FUAs which are in fact suburbs of Madrid or Barcelona with the main FUA, taking into account the polycentric pattern of the Asturian FUA around Oviedo.

3.26.2   The Spanish urban pattern: population data

The lines in yellow show the FUAs that are integrated in the poly-fua described in the preceding white line, so every white line preceding a yellow one describes a poly-FUA.

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Metropolitan and polynuclear metropolitan areas						
Madrid	5263	5263 (a)	Madrid	4955	ES300	5151
Barcelona metropolitan region	4251	n.c.	Barcelona Mataro	3659 107	ES511	4667
Barcelona	4082	4082 (b)	Barcelona	3659		
Mataro	169	169	Mataro	107		
Valencia-Sagunto	1499	n.c.	Valencia Sagunto	1365 60	ES523	2158
Valencia	1398	1398	Valencia	1318		
Sagunto	101	101	Sagunto	60		
Sevilla	1262	n.c.	Sevilla Utrera	1082 46	ES618	1687
Sevilla	1180	1180	Sevilla	1082		
Utrera	82	82	Utrera	46		
Bilbao	947	947	Bilbao	822	ES213	1113
Malaga	844	n.c.	Malaga	753	ES617	1271

			Velez Malaga	56		
Malaga	775	775	Malaga	534		
Velez Malaga	69	69	Velez Malaga	56		
Oviedo-Gijon-Aviles (c)	844	n.c.	Gijon Oviedo Aviles Langreo Mieres	269 254 106 69 49	ES120	1053
Oviedo	426	426	Oviedo Langreo Mieres	254 69 49		
Gijon	280	280	Gijon	269		
Aviles	139	139	Aviles	106		
Alicanta-Elche (d)	793	n.c.	Alicanta Elche Elda	339 198 81	ES521 (e)	1417
Alicanta	380	380	Alicanta	339		
Elche	265	265	Elche	198		
Elda	148	148	Elda	81		
Las Palmas de Gran Canarias	640 (f)	588	Las Palmas de Gran Canarias	365	ES701	884
Zaragoza	639	639	Zaragoza	611	ES243	828
Murcia-Orihuela	623	n.c.	Murcia Orihuela	476 56	ES620 (g)	1125
Murcia	504	504	Murcia	476		
Orihuela	119	119	Orihuela	56		
Large cities						
Granada	440	440	Granada	330		
Palma de Mallorca	433 (f)	432	Palma de Mallorca	433		
Vigo	413	413	Vigo	287		
Cadiz	400	400	Cadiz	288		
Santa Cruz de Tenerife	399	399	Santa Cruz de Tenerife	357		
Donostia-San Sebastian (h)	393	393	Donostia-San Sebastian Irun (h) Zarautz	260 84 21		
La Coruna	376	376	La Coruna	311		
Valladolid	369	369	Valladolid	318		
Tarragona	325	325	Tarragona	205		
Cordoba	314	314	Cordoba	314		

Pamplona	286	286	Pamplona	263		
Castellon de la Plana	259	259	Castellon de la Plana	147		
Medium cities						
Santander	249	249	Santander	222		
Alzira	241	241	Alzira	87		
Cartagena	231	231	Cartagena	199		
Vitoria-Gasteiz	226	226	Vitoria-Gasteiz	219		
Algeciras	206	206	Algeciras Linea de la Concepcion	105 84		
Huelva	193	193	Huelva	141		
Salamanca	192	192	Salamanca	170		
Almeria	192	192	Almeria	171		
Jerez de la Frontera	189	189	Jerez de la Frontera	196		
Leon	187	187	Leon	162		
Jaen	180	180	Jaen	111		
Burgos	176	176	Burgos	166		
Logrono	156	156	Logrono	132		
Albacete	155	155	Albacete	150		
Ferrol	155	155	Ferrol	80		
Lerida	147	147	Lerida	113		
Girona	144	144	Girona	101		
Pontevedra	142	142	Pontevedra	101		
Badajoz	141	141	Badajoz	136		
La Orotava-Puerto de la Cruz	140	140	La Orotava-Puerto de la Cruz	69		
Santiago de Compostella	138	138	Santiago de Compostella	93		
Orense	137	137	Orense	109		
Benidorm	134	134	Benidorm	72		
Gandia	132	132	Gandia	68		
Blanes	131	131	Blanes	67		
Manresa	122	122	Manresa	64		
Marbella	116	116	Marbella	111		
Torrelavega	116	116	Torrelavega	56		
Vic	111	111	Vic	33		
Guadalajara	104	104	Guadalajara	68		

Small cities						
Lugo	99	99	Lugo	32		
Palencia	99	99	Palencia	81		
Toledo	95	95	Toledo	69		
Denia	93	93	Denia	32		
Caceres	93	93	Caceres	82		
Motril	91	91	Motril	51		
Lorca	88	88	Lorca	77		
Arrecife	88	88	Arrecife	46		
Torrevieja	86	86	Torrevieja	59		
Talavera de la Reina	84	84	Talavera de la Reina	76		
Linares	84	84	Linares	58		
Ponferrada	84	84	Ponferrada	63		
Vilagarcia de Arousa	83	83	Vilagarcia de Arousa	34		
Alcoy	80	80	Alcoy	60		
Igualada	80	80	Igualada	43		
Sanlucar de Barramed	79	79	Sanlucar de Barramed	62		
Santa Lucia de Tirajana	79	79	Santa Lucia de Tirajana	48		
Ciudad Real	78	78	Ciudad Real	61		
Xativa	77	77	Xativa	26		
Zamora	76	76	Zamora	66		
Ibiza	74	74	Ibiza	35		
Ceuta	72	72	Ceuta	74		
Roquetas de Mar	71	71	Roquetas de Mar	48		
Eibar	70	70	Eibar	46		
Segovia	67	67	Segovia	54		
Melilla	66	66	Melilla	69		
Vilafranca del Penedès	65	65	Vilafranca del Penedès	31		
Ubeda	65	65	Ubeda	33		
Puertollano	65	65	Puertollano	50		
Merida	62	62	Merida	57		
Mondragon o Arrasate	61	61	Mondragon o Arrasate	23		
Don Benito	61	61	Don Benito	32		

Lucena	60	60	Lucena	37		
El Ejido	59	59	El Ejido	56		
La Vall d'Uixo	59	59	La Vall d'Uixo	29		
Ontinyent	59	59	Ontinyent	33		
Vinaros	59	59	Vinaros	23		
Andujar	57	57	Andujar	38		
Figueres	57	57	Figueres	34		
Durango	53	53	Durango	25		
Cieza	53	53	Cieza	33		
Alcazar de San Juan	53	53	Alcazar de San Juan	26		
Aranjuez	52	52	Aranjuez	40		
Montilla	52	52	Montilla	23		
Avila	51	51	Avila	48		

(a) Incl. the FUA of Collado Villado (176 thousand inhab.), considered as a separate FUA by ESPON 1.1.1, but included in the morphological area of Madrid.
(b) Incl. the FUAs of Granollers (160 thousand inhab.) and Vilanova i La Geltru (156 thousand), considered as separate FUAs by ESPON 1.1.1, but included in the morphological area of Barcelona.
(c) ESPON 1.1.1 considers as separate FUAs Oviedo (426 thousand inhab.), Gijon (279 thousand) and Aviles (139 thousand), but, using our criteria, these cities form a common polycentric FUA and strongly cooperate.
(d) ESPON 1.1.1 considers Alicanta and Elche as two separate FUAs, with respectively 380 and 265 thousand inhab. Elda is another FUA, but less than 30 km from Elche, with a contiguous labour pool.
(e) For Alicanta, the population of the FUA is less than 60% of the population of the proxy.
(f) At least the population of the MUA.
(g) For Murcia, the population of the FUA is less than 60% of the population of the proxy. Moreover, Orihuela is not located in the province of Murcia.
(h) Spanish side only. See "transborder FUAs" chapter for adding Hendaye on the French side.

3.26.3   Conclusions

Spain has two very large metropolises, each with a strong functional weight, Madrid and Barcelona, and a set of nine regional metropolises. For the rest, the urban network is well developed on the whole country, with a strong concentration along the coasts, reflecting the population concentration pattern. More or less three quarters of the country's population live in FUAs.

3.27 Sweden

3.27.1 Criticism of the ESPON 1.1.1 FUAs

When examining the accuracy of FUAs in Sweden, it is always necessary to take into account the very big size of the Swedish municipalities, often much larger than the area occupied by the morphological core. But at the same time, the municiplaity reform of 1974 has formed the new municipalities on the basis of each local labour market, so that they fit very well with most of the FUAs. Therefore, peripheral municipalities with more than 20,000 inhabitants but less than 50,000 should not be examined as possible centres of FUAs. But surely in many other cases, the agglomerated population should be quite less than the so-called core population given below. We have thus excluded from our list 14 FUAs proposed by ESPON 1.1.1 but with FUA's populations between 48 and 23 thousand inhabitants only. We have also excluded as FUA the island of Visby, with more than 50 thousand inhabitants, but a density of population of only 18 inhab./ km², because the whole area of the island is only one municipality of 3145 km², the very city of Visby counting only 24 thousand inhabitants. Södertälje and Norrtälje can be considered as secondary cores inside Stockholm's FUA, and this is also true of Lund, inside Malmö's FUA. Varberg, which is considered as an independent FUA by ESPON 1.1.1, looks more like a secondary centre inside a bigger Göteborg (-Varberg) FUA. The situation is a bit more difficult for Helsingborg, which seems to be a FUA independent from Malmö, but at a transborder scale; Helsingborg and Malmö can be considered as two parts of the Swedish side of a transborder metropolitan area Copenhague-Malmö, even if Helsingborg is only directly linked by ferry to the Danish bank. The small municipality of Haparanda can be considered as the Swedish bridge-head of the Finnish FUA of Kemi-Tornio.

3.27.2 The Swedish urban pattern: population data

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Metropolises						
Stockholm	2171	1890	Stockholm Uppsala Södertälje Norrtälje	1479 191 79 53	SE011	1823
Göteborg	956	956	Göteborg Varberg	627 53	SE0A2a (a)	759
Malmö (b)	961	667	Malmö Helsingborg Lund	278 119 100	SE044a (c)	824
Large cities						
Medium cities						
Linköping	241	241	Linköping	134		
Örebrö	211	211	Örebrö	125		
Vaesteraas	173	173	Vaesteraas	128		
Kristianstad	172	172	Kristianstad	75		

Nörrköping	166	166	Nörrköping	123		
Boraas	159	159	Boraas	97		
Luleaa	150	150	Luleaa	72		
Falun	149	149	Falun	55		
Skövde	147	147	Skövde	49		
Jönköping	146	146	Jönköping	118		
Gävle	143	143	Gävle	91		
Umeaa	137	137	Umeaa	105		
Karlstad	128	128	Karlstad	81		
Växjö	124	124	Växjö	74		
Kalmar	111	111	Kalmar	60		
Sundsvall	111	111	Sundsvall	93		
Halmstad	108	108	Halmstad	86		
Trollhättan	105	105	Trollhättan	53		
Eskilstuna	105	105	Eskilstuna	89		
Small cities						
Karlskrona	89	89	Karlskrona	61		
Östersund	94	94	Östersund	58		
Uddevalla	79	79	Uddevalla	49		
Skelleftaa	77	77	Skelleftaa	72		
Nyköping	60	60	Nyköping	49		
Örnsköldsvik	56	56	Örnsköldsvik	55		
Lidköping	50	50	Lidköping	37		
Kemi - Tornio	10	10	Haparanda (d)	10		

(a) As a proxy, we haven't taken the whole NUTS-3 unit Västra Götaland, but only the Swedish county of Bohus.
(b) Swedish FUAs only. See further the "transborder FUAs" chapter for considering the transborder metropolitan area with Kobenhavn.
(c) As a proxy, we haven't taken the whole NUTS-3 unit Skana län, but only the Swedish county of Malmö.
(d) Swedish side only. See also the "transborder FUAs" chapter Finland for considering the transborder FUA.

3.27.3   Conclusions

Stockholm, Göteborg and Malmö are by far the most important cities in the Swedish urban network, two other FUAs only having more than 250 thousand inhab. (Linköping nearly reaches this level). Malmö and Helsingborg are parts of a transborder metropolitan area, on the two banks of the Öresund, with now an easy link by bridge to Copenhague. In the southern part of the country and also along the coast of the Gulf of Bothnia, the Swedish urban network can be considered as an archipelago of urban-islands, well-equipped service centres, each with its own differentiated labour markets.

3.28 Switzerland

3.28.1   Criticism of the ESPON 1.1.1 FUAs

If data provided by ESPON 1.1.1 for Swiss FUAs are coherent by comparison to our own estimation of the MUAs' populations (but these are from the 1990s), ESPON 1.1.1 report considers however the FUA concept in a very restrictive understanding. ESPON 1.1.1 has considered very small cores as centres of individual FUAs, which are in fact only secondary subcentres inside metropolitan basins, considered as such in the Swiss planning documents, like the "Monitoring de l'espace urbain suisse". Some of the so-called centres of the ESPON 1.1.1 report are not even true employment cores, as they send more workers outside than they receive from their so-called FUA. We have thus aggregated the populations given for some small FUAs to the population of the metropolitan FUA to which they pertain.

On the basis of our criteria, we can however not entirely follow some choices made by the "Monitoring de l'espace urbain suisse" when they consider as single metropolitan areas some non- contiguous FUAs (like Bern-Biel, Bern-Thun, Zürich-Schaffhausen, Genève-Lausanne...), when they use commuting *between* agglomerations (with a low thereshold of 8.3%) to define the metropolitan areas and when they don't consider the level and the first direction of commuting in the areas *surrounding* the agglomerations. Meanwhile, the "Monitoring de l'espace urbain suisse" was a very useful basis for preparing our table.

Some small cores proposed as FUAs by ESPON 1.1.1 or by the "Monitoring de l'espace urbain suisse" have been excluded, since they neither reach the threshold of 50 thousand inhabitants for the FUA, nor the threshold of 20 thousand inhabitants for the core (La Chaux-de-Fonds, Brig-Visp, Yverdon, Grenchen, Wil, Amriswil, Monthey, Interlaken, Davos, St. Moritz, Bulle, Délémont, Langenthal, Martigny, Schwyz). We have not followed the "Monitoring de l'espace urbain suisse", which considers Buchs – Schaans – Vaduz as a transborder FUA of 54 thousand inhab. with Liechtenstein, since there is no MUA of at least 20 thousand inhab. in that area.

3.28.2   The Swiss urban pattern: population data

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Metropolitan and polynuclear metropolitan areas						
Zürich	1615	940 (b)	Zürich Wintherthur Zug Baden Wadenswill-Freienbach Brugg Rapperswill-Jona	718 100 64 52 49 32 24 22	CH040, CH066	1304

			Frauenfeld Bremgarten	21		
Large cities						
Genève (c)	475	424	Genève	388	CH013	406
Basel (c)	471	406 (d)	Basel Liestal	381 46	CH031, CH032	447
Bern	376	332 (e)	Bern	225		
Lausanne	309	295	Lausanne	244		
Medium cities						
Sankt-Gallen	228	135 (f)	Sankt-Gallen Rorschach	73 27		
Luzern	224	178 (g)	Luzern	173		
Lugano	136	105	Lugano	73		
Olten-Zofingen	102	51 (h)	Olten Zofingen	43 38		
Biel	100	88	Biel	74		
Small cities						
Locarno- Bellinzona	99	45 (i)	Locarno Bellinzona	45 41		
Fribourg	95	80	Fribourg	60		
Thun	90	84	Thun	66		
Sion-Sierre	85	48 (j)	Sion	27		
Vevey- Montreux	81	71	Vevey- Montreux	51		
Aarau	80	74	Aarau	59		
Neuchâtel	78	71	Neuchâtel	60		
Solothurn	73	68	Solothurn	61		
Chur	66	58	Chur	33		
Schaffhausen	63	60	Schaffhausen	48		
Milano - Busto Arsizio - Como	48	43	Chiasso- Mendrisio (k)	30		
Dornbirn - Lustenau	46	35	Heerbrugg- Altstätten (l)	37		
Konstanz	25	24	Kreuzlingen (m)	18		

(a) By comparison with ESPON 1.1.1, revised with 2000 data provided by the "Recensement fédéral de la population". Also incorporating the agglomerations of Einsiedeln, Wohlen and Lenzburg to the Zürich metropolitan area's FUA and Lyss to Biel's FUA.

(b) ESPON 1.1.1 considers as specific FUAs Wintherthur (115 thousand inhab. in the FUA for ESPON 1.1.1), Baden (81 thousand), Zug (71 thousand), Wetzikon-Pfaffikon (48 thousand), Pfäffikon-Lachen (36 thousand), Brugg (25 thousand), Frauenfeld (25 thousand), Lenzburg (24 thousand), Rapperswil-Jona (23 thousand).

(c) Swiss side only. Basel and Geneva are only large cities, considering the Swiss side alone. But, including the transborder developments, they are metropolises, and even for Basel a part of a transborder metropolitan system including Mulhouse (see further chapter on "transborder FUAs").

(d) ESPON 1.1.1 considers Liestal as a specific FUA (38 thousand inhab. in the FUA). The "Monitoring de l'espace urbain suisse" clearly identifies Liestal as a part of the FUA of Basel. If not, Liestal alone doesn't reach the threshold of 50 thousand inhab.
(e) ESPON 1.1.1 considers Burgdorf as a specific FUA (27 thousand inhab. in the FUA). It can be included in the FUA of Bern, as done by the "Monitoring de l'espace urbain suisse". If not, Burgdorf alone doesn't reach the threshold of 50 thousand inhab.
(f) ESPON 1.1.1 considers as a specific FUA Arbon Rorschach (42 thousand inhab. in the FUA). It can be included in the FUA of St. Gallen. If not, Arbon Rorschach alone doesn't reach the threshold of 50 thousand inhab.
(g) ESPON 1.1.1 considers as a specific FUA Stans (22 thousand inhab. in the FUA). It can be included in the FUA of Luzern, as done by the "Monitoring de l'espace urbain suisse". If not, Stans alone doesn't reach the threshold of 50 thousand inhab.
(h) ESPON 1.1.1 considers Zofingen as a specific FUA (39 thousand inhab. in the FUA). The "Monitoring de l'espace urbain suisse" identifies the twin cities as forming a single FUA.
(i) ESPON 1.1.1 considers Bellinzona as a specific FUA (41 thousand inhab. in the FUA). The "Monitoring de l'espace urbain suisse" identifies the twin cities as forming a single FUA. If not, Locarno's FUA alone doesn't reach the threshold of 50 thousand inhab.
(j) ESPON 1.1.1 considers as a specific FUA Sierre (23 thousand inhab. in the FUA). The "Monitoring de l'espace urbain suisse" identifies the twin cities as forming a single FUA. If not, Sion's FUA alone doesn't reach the threshold of 50 thousand inhab.
(k) Swiss side of the FUA of Como only. See further the "transborder FUAs" chapter. Neither Chiasso, nor Mendrisio reach the threshold of 20,000 inhab. for their MUA.
(l) Swiss side of a common FUA with Dornbirn-Lustenau only. See further the "transborder FUAs" chapter.
(m) Swiss side of the FUA of Konstanz only. See further the "transborder FUAs" chapter. Kreuzlingen itself does not reach the threshold of 20,000 inhab. for its MUA.

3.28.3   Conclusions

Despite of our substantial process of aggregation, the image of a polycentric Swiss urban network remains strong, very coherent with the one described in the "Monitoring de l'espace urbain suisse". The Swiss urban network is organized along a range of urban centres, most of them medium or small cities, along the *Plateau suisse* – Mittelland from Genève to Sankt-Gallen and Basel. Even the most important metropolitan region, Zürich, has a quite modest size compared to European standards for most of the centres of such worldwide scope. Two of the three main cities are at the centre of transborder metropolitan regions. The transport system appears to be very efficient along this row and inside the main urbanised triangle Base-Zürich-Bern, as well as along the so-called "métropole lémanique", between Genève and Vevey-Montreux. As a consequence, commuting and the main cores of the urban system (Zürich, Basel, Bern, Genève-Lausanne, South of Ticino) are more and more reinforced. Outside this main range of cities, the number of FUAs is small in the mountainous part of the country, except for the urbanised south of Ticino, where Locarno-Bellinzona and Lugano are strongly turned toward Milano's metropolitan area. Even Chiasso and Mendrisio form the Swiss part of the FUA of Como, which is incorporated into the big Milano polynuclear metropolitan area.

3.29   United Kingdom

3.29.1   Criticism of the ESPON 1.1.1 FUAs

Delineating and even defining the British urban areas is a very difficult exercise, insofar as statistical divisions often change, and even sometimes the names of the units. Moreover, it is also due to the nature of the British urbanisation: not only a matter of (historical) cities, but mainly a pattern of former industrial conurbations and more recent residential estates, organised in suburban dense housing districts more or less isolated and very strictly separated from each other by small rural tracks, not to mention the suburbanisation around London where big cities with their own labour pool are also included in the commuting area of the capital. However, ESPON 1.1.1 data seem to be very inaccurate. The report generally strongly underestimates the population of the FUAs, which are often even less than the MUA only and possibly limited to a central administrative unit of the latter. Many MUAs aren't either identified by ESPON 1.1.1 (even those with more than 100 thousand inhabitants, or secondary centres inside bigger FUAs, or those with their own labour pool).

To delineate the MUAs, we have used, as usual, the basic statistical NUTS-5 units, but since wards are often very small, their population densities need to be interpreted by means of an in-depth examination of the Google Earth images. For the FUAs, we used the official TTWA (Travel-to-Work Areas), and we sometimes merged some TTWAs around the main metropolitan areas. However, TTWAs are not exactly FUAs according to our criteria, as they cover the whole territory. Therefore, we have limited to twice the population of the MUA the population of some large TTWAs around small cities. In Northern Ireland, TTWAs do not exist. We have estimated the FUAs on the basis of the population of the administrative units surrounding the MUAs.

Due to the lack of true commuting data (it could be possible to get them, but with a specific query to the Statistical Office), it was not possible to define sub-pools inside the main metropolitan areas.

3.29.2   British urban pattern: population data

FUAs and poly-FUAs	Population	Espon 1.1.1 Population	MUAs	MUA's population	NUTS-3 proxys	Population
Metropolitan and polynuclear metropolitan areas						
London	13709	London 7652 Bracknell 289 Luton/Dunstable 221 Reading 213 Southend 159 Guildford 117 Slough 111 Maidstone 91 Crawley 88 Basingstoke 78 Stevenage 76 Harlow 75 Aylesbury 58	London Southend Chatham Luton/Dunstable Reading Aldershot/ Farnborough Woking Basildon Slough High Wycombe Crawley Bracknell/Ascot Harlow Chelmsford Hemel Hampstead Maidstone Maidenhead St. Albans Basingstoke Aylesbury Stevenage Sittingbourne Wokingham Turnbridge Wells Sandhurst/Yateley Guildford Windsor Bishop's Stortford Letchworth Horsham East Grinstead Burgess Hill Sevenoaks Haywards Hitchin Tonbridge	8265 291 231 216 216 174 124 113 112 100 99 96 87 76 68 65 59 59 55 49 49 42 42 39 37 34 33 31 28 27 26 24 24 22 21 20	UKI11, UKI12, UKI21, UKI22, UKI23, UKJ11, UKJ13, UKJ23, UKJ41, UKJ42, UKH21, UKH23, UKH31, UKH32, UKH33	14121
Birmingham	3683	Birmingham	Birmingham-	2363	UKG13, UKG31,	3148

metropolitan area		966 Wolverhamp-ton 433 Coventry 299 Warwick 78 Dudley 192 Cannock 96 Kidderminster 55	Wolverhampton Coventry Nuneaton Warwick/ Leamington Redditch Bromsgrove Tamworth	308 87 71 61 25 21	UKG32, UKG33, UKG34, UKG35	
Manchester metropolitan area	2556	Manchester 2207 Bolton 139 Rochdale 94	Manchester Macclesfield	2207 59 31	UKD31, UKD32	2585
Leeds-Bradford metropolitan area	2302	Leeds 424 Bradford 289 Huddersfield 144 Wakefield 74 Harrogate 66	Leeds Bradford Huddersfield Halifax/ Queensbury Wakefield Castleford/ Pontefract Harrogate Dewsbury	534 341 219 155 111 102 60 36	UKE41, UKE42, UKE43	2124
Liverpool/ Birkenhead metropolitan area	2241	Liverpool 482 Wigan 192 Warrington 83 Chester 80	Liverpool/ Birkenhead Wigan/Ashton Warrington Widness/Runcorn Chester Southport Port Ellesmere Ormskirk Skelmersdale	1170 220 168 121 58 44 40 24 20	UKD21, UKD22, UKD51, UKD52, UKD53, UKD54	2398
Tyneside metropolitan area	1599	Newcastle 886 Sunderland 183	Newcastle Sunderland Blyth/Cramlington Peterlee Ashington Seaham Chester-le-Street	814 270 55 42 27 24 23	UKC22, UKC23	1113
Sheffield metropolitan area	1569	Sheffield 553 Barnsley 75 Doncaster 72	Sheffield Rotherham Doncaster Darfield Chesterfield Barnsley	693 150 80 73 73 56	UKE31, UKE32	1308
Portsmouth/ Southampton metropolitan	1547	Southampton 210 Portsmouth	Portsmouth Southampton Bognor Regis	500 376 66	UKJ31, UKJ32, UKJ33	1660

area		175	Salisbury Winchester Andover	29 27 26		
Nottingham- Derby metropolitan area	1534	Nottingham 270 Derby 224 Mansfield 72	Nottingham Derby Mansfield Ilkeston Newark Alfreton	532 217 185 53 25 23	UKF11, UKF13, UKF14, UKF15, UKF16	1746
Glasgow	1395	Glasgow 1323 Kilmarnock 81	Glasgow Kilbride Cumbernauld Kilmarnock Dumbarton	1228 59 45 39 23	UKM31, UKM34, UKM35, UKM36	1520
Cardiff and South Wales valleys metropolitan area	1097	Cardiff 272 Newport 116	Cardiff Newport Merthyr Tydfil Pontypridd Caerphilly Bridgend Ebbw Vale	353 192 35 28 26 24 22	UKL15, UKL16, UKL21, UKL22	1306
Bristol metropolitan area	1041	Bristol 408 Bath 85 Weston-super- Mare 69	Bristol Weston-super- Mare Bath Clevedon	568 70 65 25	UKK11, UKK12	1013
Belfast	799	Belfast 675 Lisburn 111 Bangor 64	Belfast Bangor	501 15	UKN01, UKN02	658
Edinburgh	782	Edinburgh 533	Edinburgh Livingston	478 46	UKM23, UKM25, UKM28	784
Brighton/ Worthing/Little hampton	769	Brighton 221 Eastbourne 95	Brighton/Worth ing Eastbourne Littlehampton	410 74 40	UKJ21, UKJ24	1023
Leicester	745	Leicester 319	Leicester Loughborough Coalville Hinckley	442 53 39 20	UKF21, UKF22	939
Middles- borough	656	Middles- borough 231 Hartlepool 87 Darlington 87	Middlesborough Darlington Hartlepool	389 58 53	UKC11, UKC12, UKC13	661
Bournemouth/ Poole	531	Bournemouth 155 Poole 138	Bournemouth/ Poole	390	UKK21,UKK22	696
Large cities						
Swansea	462	171	Swansea Port Talbot/Neath	219 51		

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Stoke	456	267	Stoke	359	
Hull	419	311	Hull	284	
Blackburn/Burnley	391	Blackburn 106 Burnley 75	Blackburn Burnley	182 125	
Norwich	364	171	Norwich	193	
Preston	354	178	Preston/ Leyland	249	
Plymouth	343	245	Plymouth	228	
Aberdeen	332	212	Aberdeen	183	
Blackpool	304	146	Blackpool	239	
Northampton	288	180	Northampton	220	
Cambridge	283	96	Cambridge	142	
Milton Keynes	271	156	Milton Keynes	136	
Swindon	260	145	Swindon	144	
Exeter	259	95	Exeter Exmouth	105 25	
Medium cities					
Oxford	244	119	Oxford	122	
Ipswich	240	130	Ipswich	120	
York	234	125	York	135	
Torbay	231	60	Torbay	178	
Peterborough	219	135	Peterborough	127	
Dundee	211	145	Dundee	150	
Telford	209	119	Telford	105	
Bedford	202	74	Bedford	108	
Colchester	191	96	Colchester	95	
Lincoln	176	80	Lincoln	99	
Grimsby	174	n.c.	Grimsby	123	
Gloucester	166	126	Gloucester	134	
Hastings/ Bexhill	164	81	Hastings/ Bexhill	103	
Cheltenham	164	91	Cheltenham	82	
Kirkcaldy	161	149	Kirkcaldy Glenrothes Buckhaven	43 39 23	
Worcester	159	83	Worcester	82	
Scunthorpe	150	76	Scunthorpe Hatfield/ Welwyn	60 44	
Lancaster	148	n.c.	Lancaster/ Morecombe	88	

			Bay			
Falkirk	145	145	Falkirk	141		
Kettering-Corby	140	n.c.	Kettering Corby	44 41		
Londonderry	137	107	Londonderry	77		
Dunfermline	137	55	Dunfermline	75		
Irvine	136	56	Irvine	71		
Rushden	135	n.c.	Rushden	67		
Thanet	127	117	Thanet	105		
Crewe/ Nantwich	118	63	Crewe/ Nantwich	59		
Burton on Trent	117	61	Burton on Trent Swadlincote/ Ashby-de-la-Zouche	31 28		
Lowestoft	115	63	Lowestoft	58		
Canterbury	110	n.c.	Canterbury	55		
Portland/ Weymouth	104	n.c.	Portland/ Weymouth	55		
Ayr	101	100	Ayr	51		
Small cities						
Great Yarmouth	92	56	Great Yarmouth	46		
Taunton	91	56	Taunton	46		
Shrewsbury	90	64	Shrewsbury	45		
Alloa-Stirling	90	61	Alloa Stirling	24 22		
Newbury	90	n.c.	Newbury	45		
Ashford	88	52	Ashford	44		
Inverness	87	63	Inverness	47		
Clacton	86	n.c.	Clacton	49		
Greenock	84	84	Greenock	67		
Scarborough	84	n.c.	Scarborough	43		
Rugby	84	61	Rugby	49		
Lurgan/ Portadown	81	80	Lurgan/ Portadown	62		
Perth	80	n.c.	Perth Stanley	39 26		
Folkestone	75	n.c.	Folkestone	38		
Carlisle	75	72	Carlisle	38		
Braintree	72	n.c.	Braintree	36		

Stafford	70	62	Stafford	35		
Dover	66	n.c.	Dover	33		
Barrow-in-Furness	61	n.c.	Barrow-in-Furness	31		
Dumfries	60	n.c.	Dumfries	30		
St. Austell	60	n.c.	St. Austell	30		
Whitehaven	54	n.c.	Whitehaven	27		
Hereford	54	n.c.	Hereford	27		
Ballymena	51	n.c.	Ballymena	26		

3.29.3   Conclusions

Britain is a much urbanised country. The urban pattern densely covers the whole country, with the exception of the (very) few densely populated peripheral regions: Highlands, Southern Uplands of Scotland, far-north of England, Wales, with the exception of the southern coast. The urban network is also weaker in East Anglia and in the south-west. As for the rest, densities of population and urbanisation are strong in the London basin and along two axes from London to the north: from London to Liverpool and Lancaster on the west, from London to Tyneside east of the Pennines. The other much urbanised region is the Scottish Lowlands.

In spite of its dense urbanisation and the importance of as much as 12 metropolitan areas with more than 1 million inhab., Britain is quite monocentric from a functional point of view, an important part of the command functions remaining concentrated in London's area.

London's metropolitan area is the main European metropolitan region, around a very strong core, like the Paris area. But a difference with Paris is that a network of strong peripheral cities describes a circle inside the FUA: though included in London's FUA, those cities are more autonomous and concentrate more high level functions than the Parisian new towns toward Paris. Moreover, another circle of FUAs, external to London's FUA, completes the pattern: Cambridge, Milton Keynes, Oxford, Portsmouth-Southampton, Brighton, Ashford.

From a morphological point of view, British polycentricity can be observed on two scales: on a small scale, metropolitan areas, large, small and medium cities are very numerous; on a large scale, inside metropolitan areas and large cities, urbanisation is often organised in residential estates, sometimes even separated from each other by rural tracts. Paradoxically for a country as urbanised as Britain, the central cores are quite weak by comparison to the size of such urban areas and often lack a strong urban character, with the exception of some historical cities (but urbanisation was weak in Britain before the industrial revolution, which explains these characteristics of the British urban pattern).

As a conclusion, on a small scale, British polycentricity is hampered by the functional primacy of London. On a large scale, inside metropolitan regions (outside London metropolitan area), polycentricity reflects some weaknesses of the urban heritage.

3.30 Maps of the European FUAs from the morphological point of view

Functional Urban Areas
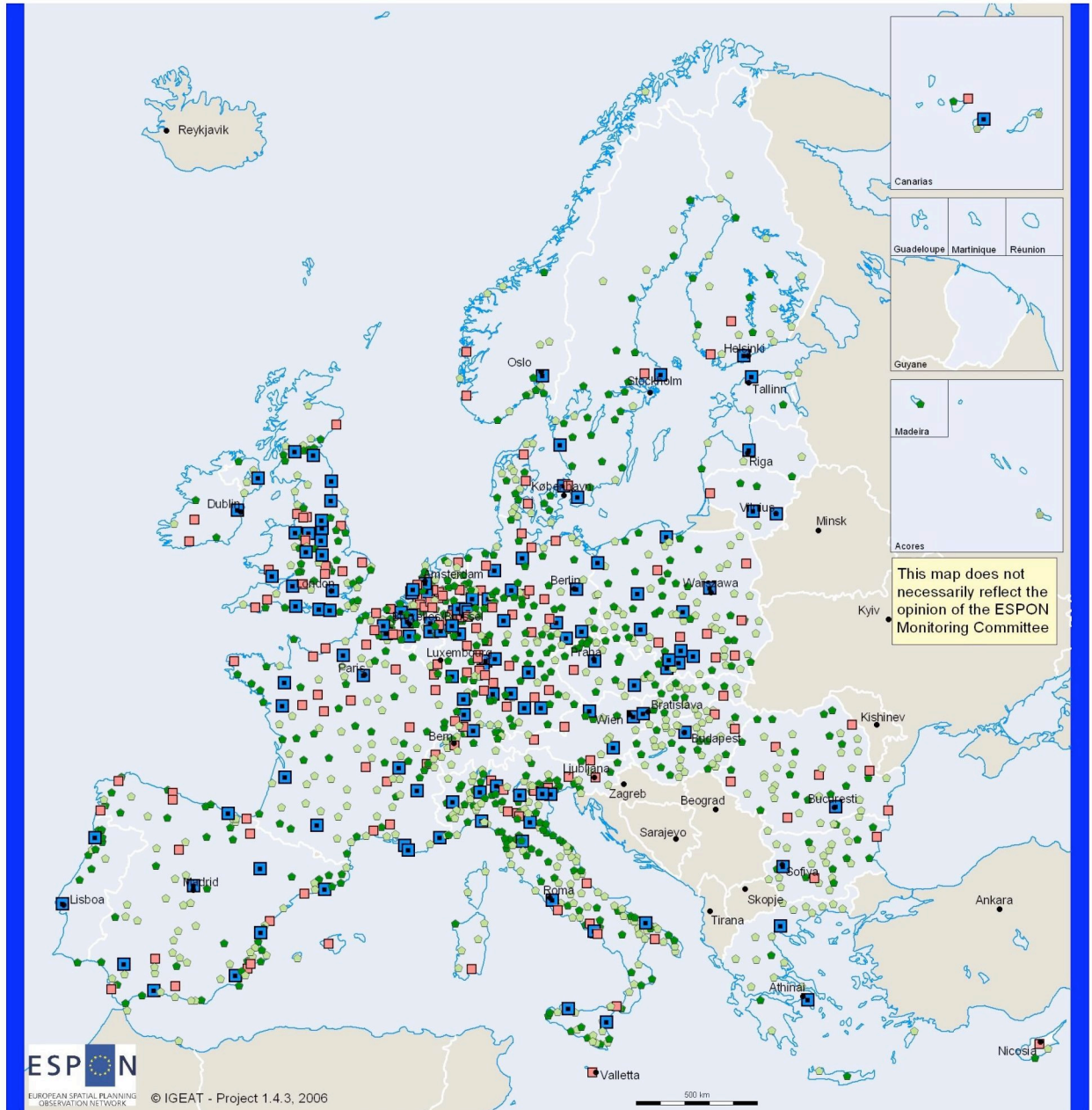
■ **Metropolitan FUAs**
■ **Large FUAs**
● **Medium FUAs**
○ **Small FUAs**

Figure 1   Functional Urban Areas according to their population

FUA distribution inside and outside the poly-FUA structure, 2002
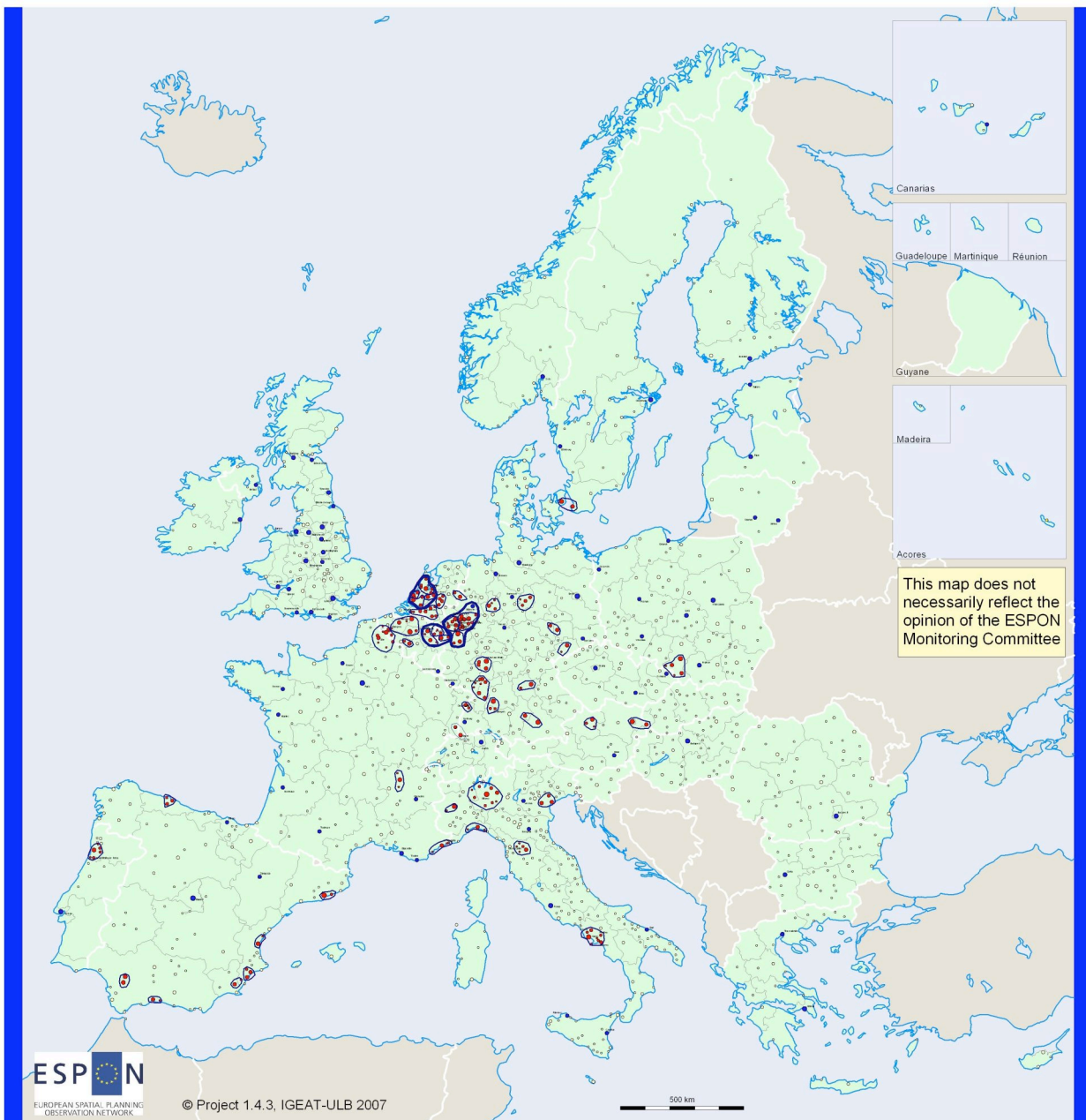
Population (1000 inhab.)

   ○ > 4000
   ○ 2000 - 4000
   ○ 1000 - 2000
   ○ 500 - 1000
   ○ 250 - 500
   ○ 125 - 250
   ∘ 50-125

  ● FUA inside a poly-FUA
  ● FUA outside a poly-FUA more than 250000 inhab.
  ○ FUA outside a poly-FUA less than 250000 inhab.
  ⬡ Poly-FUA
  ⬡ Super-poly-FUA

Figure 2   **FUA distribution inside and outside the poly-fua**

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FUA distribution inside and outside the poly-FUA structure, 2002

Population (1000 inhab.)

- ○ > 4000
- ○ 2000 - 4000
- ○ 1000 - 2000
- ○ 500 - 1000
- ○ 250 - 500
- ○ 125 - 250
- ○ 50-125

- ● FUA inside a poly-FUA
- ● FUA outside a poly-FUA more than 250000 inhab.
- ○ FUA outside a poly-FUA less than 250000 inhab.
- ⬡ Poly-FUA
- ⬡ Super-poly-FUA

200 Km

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Origin of data: EU 27, CC's and CH, NO : Eurostat, National Statistical Offices.

ESPON
EUROPEAN SPATIAL PLANNING
OBSERVATION NETWORK
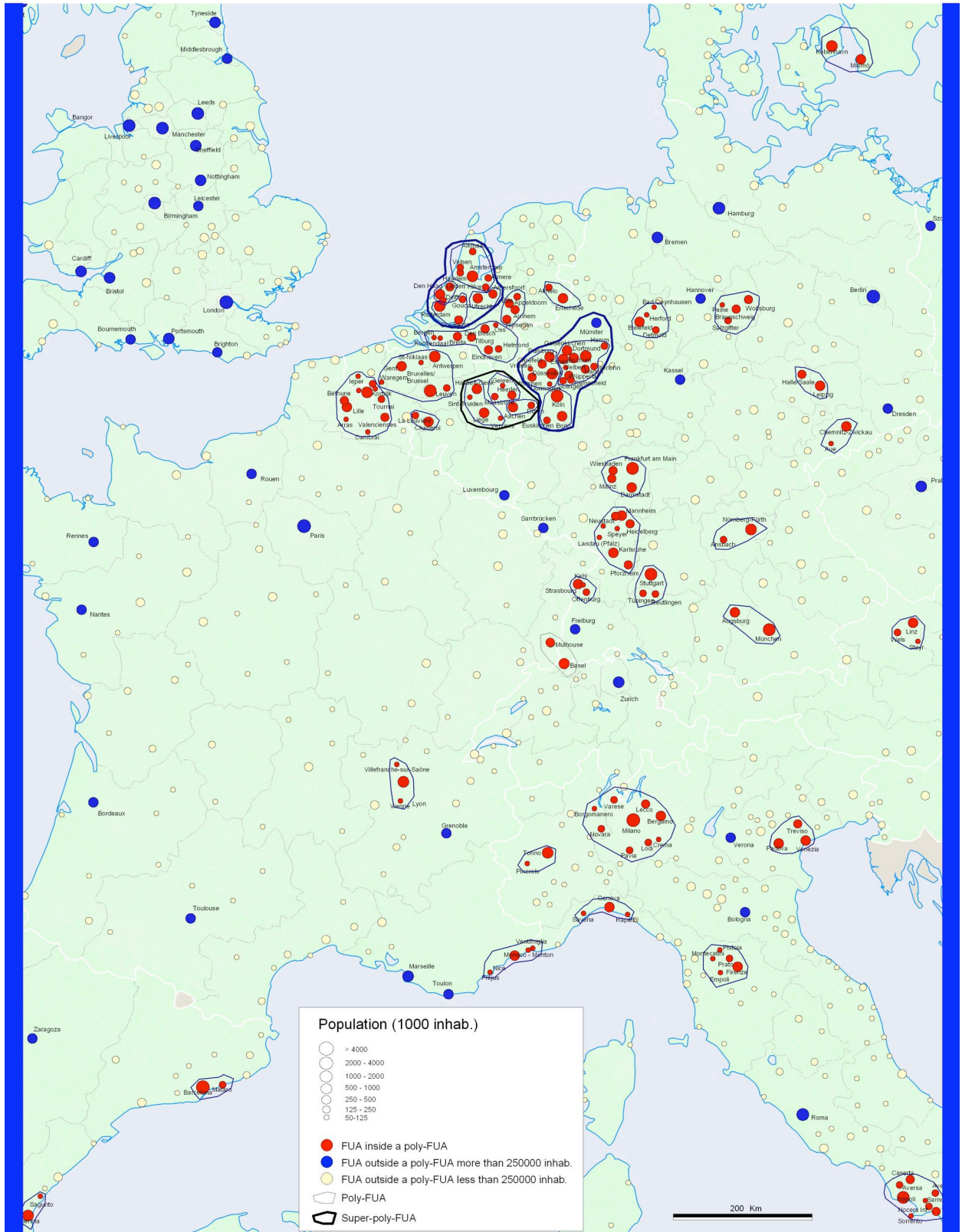
Figure 3   FUA distribution inside and outside the poly-fua (zoom)

4. Transborder FUAs

4.1   Typology of the transborder FUAs

Type 1: twin-cities, generally quite small, sometimes a former single city, cut by a border, each with their own FUA even if some transborder commuting is present.
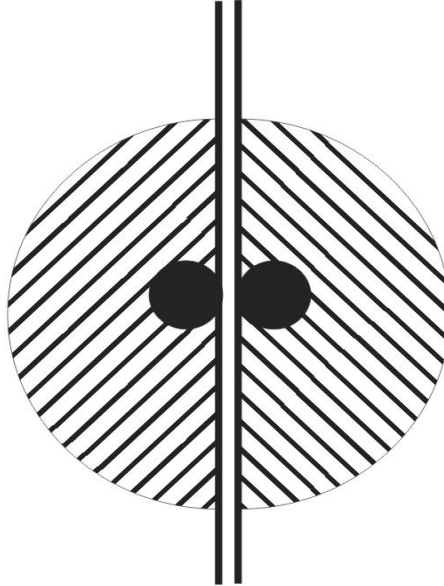
Figure 4   type 1 transborder FUA

Type 2: a metropolis or large city, with a morphological area extending across the border in the neighbour country, through suburban areas or small cities, more included in the FUA of the main city.
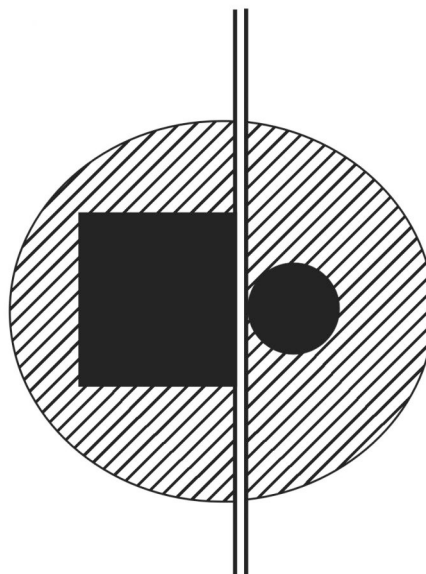
Figure 5   type 2 transborder FUA

Type 3: a metropolis or large city, with a contiguity in the neighbour country to smaller cities with their own FUA or sending quite few commuters to the main city in the other country.
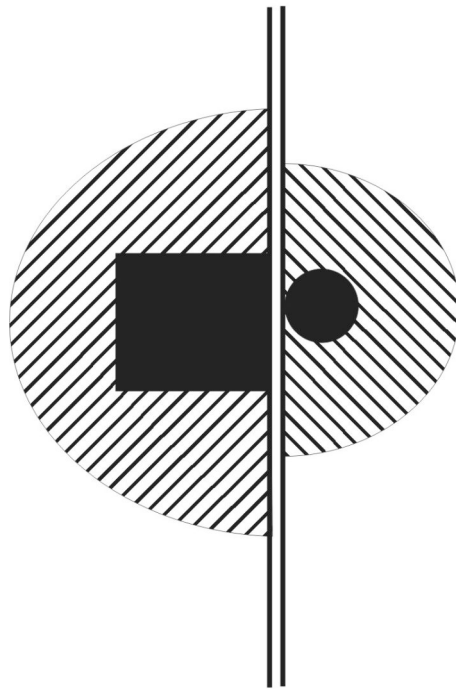
Figure 6   type 3 transborder FUA

Type 4: a small transborder urban area with a quite well integrated common commuting basin.
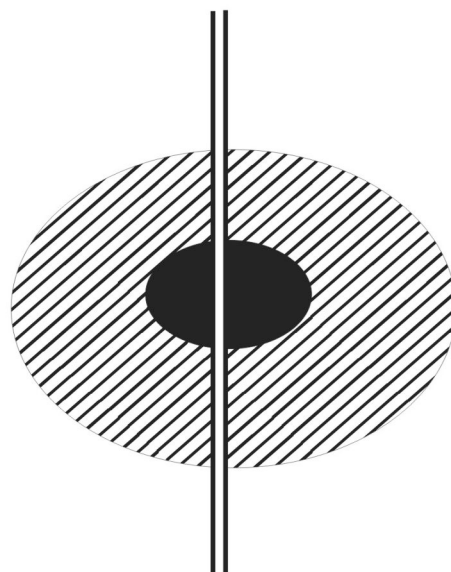
Figure 7   type 4 transborder FUA

Type 5: a metropolis or a large city, with its FUA extending in the neighbour country, possibly with a scattered network of secondary centres.
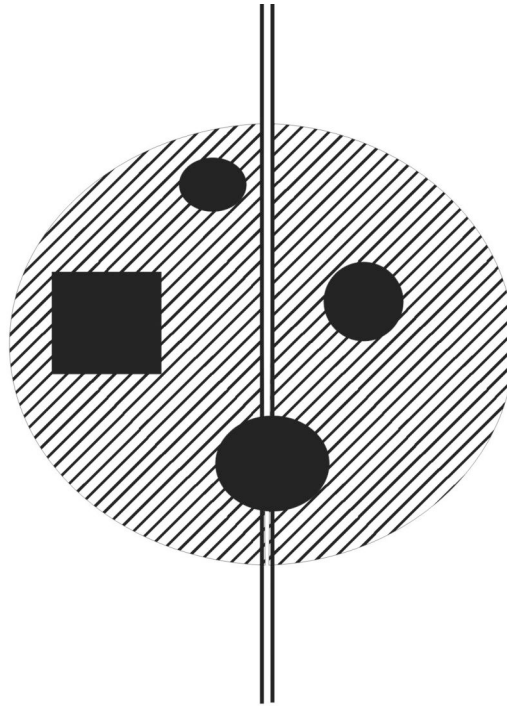
Figure 8   type 5 transborder FUA

Type 6: two metropolises or large cities, on each side of the border, with tangential MUAs.
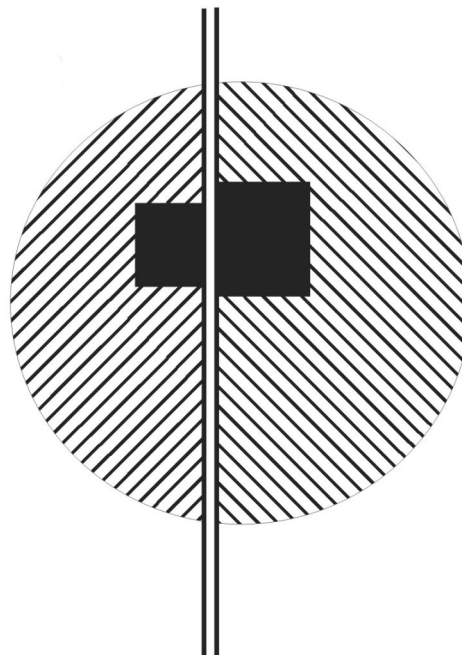
Figure 9   type 6 transborder FUA

Type 7: two or more metropolises or large cities, on each side of the border, with tangential FUAs.
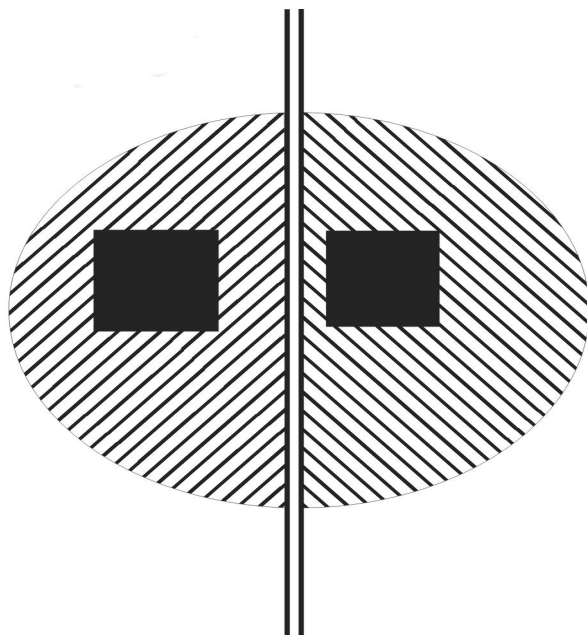
Figure 10   type 7 transborder FUA

Two other types are not considered here: first the case of a city divided by a border, without or with very few contacts between the two sides of the border, so without any transborder functionality. It was the case of Berlin before the reunification or Nicosia today. Second, the case of metropolises or large cities quite close to each other and cooperating possibly across the border, but without contiguity between their FUAs.
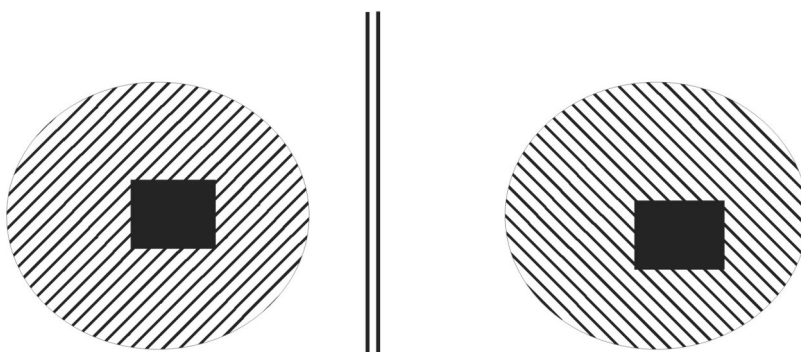
Figure 11   A transborder FUA type without contiguity
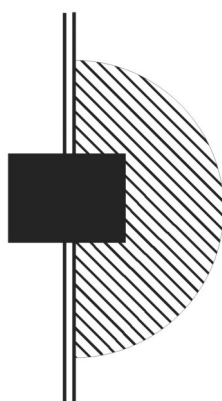
Figure 12   A "city divided by a border" transborder type

4.2   The European transborder FUAs

The lines in yellow show the FUAs that are integrated in the transborder FUAs described in the preceding white line, so every white line preceding a yellow one describes a transborder FUA.

FUAs	Population	Type of transborder aera (classifica-tion attempt)	MUAs	MUA's population	NUTS-3 proxys	Population
Metropolitan and polynuclear metropolitan areas						
Milano polycentric metropolitan area (IT-CH)	6011	5	see beneath		ITC15,ITC41, ITC42,ITC43, ITC45,ITC46, ITC48,ITC49	7465
of which Italian side	5963					7465
of which Swiss side	48					-
Milano – Busto Arsizio – Como (IT-CH)	4136	5	Milano Busto Arsizio Como Gallarate-Sestocalende Vigevano Abbiategrasso Chiasso - Mendrisio	3698 301 160 183 55 29 30	ITC42,ITC45	4317
Bergamo (IT)	662	-	Bergamo Palazzolo sull'Oglio Treviglio	438 34 26	ITC46	974
Lecco (IT)	251	-	Lecco	112	ITC43	312

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Varese (IT)	226	-	Varese	194	ITC41	821
Novara (IT)	191	-	Novara	102	ITC15	345
Pavia (IT)	157	-	Pavia	71	ITC48	499
Lodi (IT)	181	-	Lodi	40	ITC49	197
Crema (IT)	118	-	Crema	33	not included in the proxy	
Borgomanero (IT)	89	-	Borgomanero	22	not included in the proxy	
Silesian-Moravian polycentric metropolitan area (PL-CZ)	5294	7	see beneath		PL225,PL226,PL227, CZ080	5510
of which Polish side	4311					4230
of which Czech side	983					1280
Katowice (PL)	3029	-	Katowice Zawiercie Olkusz Chrzanow Oswiecim Knurow Laziska Gorne Pyskowice	2279 55 52 51 43 42 23 21	PL226	2940
Ostrava-Cieszyn (CZ-PL)	1046	1	Ostrava (CZ) Karvina (CZ) Cieszyn-Cesky Tesin (PL-CZ) Frydek-Mistek (CZ) Trinec (CZ) Orlova (CZ) Novy Jicin (CZ) Koprivnice (CZ)	365 65 64 64 39 35 27 24	CZ080	1280
Bielsko-Biala (PL)	584	-	Bielsko-Biala	223	PL225	641
Rybnik (PL)	526	-	Rybnik Jastrebie-Zdroj Zory Wodzislaw Sl.	187 101 66 49	PL227	649
Raciborz (PL)	109	-	Raciborz	63	included in PL227	
Wien-Bratislava metropolitan area (AT-SK-HU)	3368	7	see beneath		AT112,AT122,AT125 , AT126,AT127, AT130, SK010	3299
of which Austrian side	2584					2682
of which Slovak side	711					617
of which Hungarian side	73					-
Wien (AT)	2584	7	Wien Baden Wiener	1674 77 38	AT112,AT122,AT125 , AT126,AT127,	2682

			Neustadt		AT130	
Bratislava (SK)	711	7	Bratislava	444	SK010	617
Mosonmagyarovar (HU)	73	1	Mosonmagyaro var	30	not included in the proxy	
Lille transborder metropolitan area	3115	7	see beneath		FR301 (partim, arrondissements of Cambrai, Douai, Lille, Valenciennes), FR302 (partim arrondissements of Arras, Béthune,Lens),BE253, BE254,BE324,BE327	3447
of which French side	2591					2854
of which Belgian side	524					593
Lille (FR-BE)	1161	5/7	Lille	953	FR 301 (arr. Lille)	1186
Douai-Lens (FR)	550	-	Lens Douai Somain-Aniche	374 142 27	FR 301 (arr. Douai), FR302 (arr. Lens)	576
Valenciennes (FR)	400	-	Valenciennes Denain	155 49	FR 301 (arr. Valenciennes)	350
Béthune (FR)	258	-	Bruay-la-Buissière Béthune	70 59	FR302 (arr. Béthune)	281
Kortrijk (BE)	218	7	Kortrijk	151	BE254	278
Tournai (BE)	139	7	Tournai	67	BE327	141
Arras (FR)	123	-	Arras	77	FR302 (arr. Arras)	302
Ieper (BE)	87	7	Ieper	35	BE253	104
Mouscron (BE)	62	5/7	Mouscron	52	BE324	70
Armentières (FR)	59	(4)	Armentières	41	included in FR301 (arr. Lille)	
Cambrai (FR)	58	-	Cambrai	45	FR301 (arr. Cambrai)	159
Euroregio MAHL (BE-DE-NL)	3060	7	see beneath		DEA21,DEA25,DEA29, DEA26,NL423,BE331, BE332,BE333,BE334, BE221,BE222,BE223	3529
of which Belgian side	1538					1815
of which German side	907					1066
of which Dutch side	615					648
Liège (BE)	750	-	Liège	451	BE331,BE332,BE334	754
Aachen (DE-BE)	724	5/6/7	Aachen Herzogenrath Eschweiler	283 93 55	DEA21,DEA25,DEA29	799
Hasselt-Genk (BE)	520	7	Hasselt-Genk	131	BE221,BE222,BE223	795
Heerlen (NL)	308	6/7	Heerlen	218	NL423	648
Düren (DE)	235	-	Düren	92	DEA26	267

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Maastricht (NL-BE)	230	6/7	Maastricht	142	included in NL423	
Geleen-Sittard (NL)	121	-	Geleen	89	included in NL423	
Verviers (BE)	106	(6)	Verviers	67	BE333	266
Sint-Truiden (BE)	66	-	Sint-Truiden	37	included in Hasselt-Genk	
Öresund metropolitan area (DK-SE)	2842	6/7	see beneath		DK001,DK002,DK003, DK004,SE044 (partim county Malmö)	2624
of which Danish side	1881					1800
of which Swedish side	961					824
Kobenhavn (DK)	1881	6/7	Kobenhavn Helsingor Koge Hillerod	1360 61 39 37	DK001,DK002, DK003,DK004	1800
Malmö (SE)	667	6/7	Malmö Lund	278 100	SE044 (partim county Malmö)	824
Helsingborg (SE)	294	7	Helsingborg	119	included in SE044 (partim county Malmö)	
Noord-Brabant polycentric metropolitan area (NL-BE)	2083	-	see beneath		NL411,NL412,NL413 NL414	2366
of which Dutch side	2040					2366
of which Belgian side	43					-
Tilburg (NL-BE)	467	(5)	Tilburg Waalwijk Boxtel Dongen	215 45 29 25	NL412	442
Eindhoven (NL-BE)	482	5	Eindhoven Valkenswaard	312 31	NL414	712
Den Bosch (NL)	360	-	Den Bosch Sint-Michielsgestel Vught	130 28 25	NL413	618
Breda (NL)	357	-	Breda Oosterhout Zevenbergen	161 53 36	NL411	594
Helmond (NL)	211	-	Helmond Deurne Nuenen c.a.	81 32 24	included in NL414	
Roosendaal (NL)	75	-	Roosendaal	75	included in NL411	
Oss (NL)	66	-	Oss	66	included in NL413	
Bergen op Zoom (NL)	65	-	Bergen op Zoom	65	included in NL411	
Gelderland polycentric metropolitan area (NL-DE)	1257	7	see beneath		NL223,DEA1B	991
of which Dutch side	1110					693
of which German side	147					298

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Arnhem (NL)	323	-	Arnhem Rheden Renkum	206 44 32	NL223	693
Nijmegen (NL)	315	7	Nijmegen	216	included in NL223	
Ede (NL)	264	-	Ede Veenendaal Barneveld Wageningen	102 60 48 33	included in NL223	
Appeldoorn (NL)	208	-	Appeldoorn Epe	154 33	n.a.	
Kleve (DE)	147	7	Kleve	49	DEA1B (a)	298
Nice-Côte d'Azur-San Remo (FR-IT-MC)	1189	3	see beneath		FR823,ITC31	1234 (b)
of which French side (+Monaco)	1082					1018
of which Italian side	107					216
Nice (FR)	932	-	Nice Cannes Antibes	495 237 119	FR823	1018
San Remo-Ventimiglia (IT)	107	1	San Remo-Ventimiglia	101	ITC31 (a)	216
Monaco-Menton (FR-MC)	67	1	Monaco Menton	32 29	included in FR823	
Fréjus (FR)	83	-	Fréjus	77	included in FR823	
Saarbrücken - Forbach (DE-FR)	1102	2/5	Saarbrücken Forbach	552 76	DEC01,DEC02,DEC03, DEC04,DEC05,DEC06, FR413(partim arr. Forbach)	1089
of which German side	959					912
of which French side	143					177
Luxembourg metropolitan area (LU-DE-FR-BE)	983	7			LU000,BE341,BE342, BE345,FR411(partim arr. Briey), FR413(partim arr. Thionville est et ouest),DEB21,DEB25	1222
of which Luxembourg side	376					439
of which German side	245					237
of which French side	216					404
of which Belgian side	146					142
Luxembourg (LU-BE-FR)	582	5	Luxembourg (LU) "Trois frontières" agglomeration (FR-BE-LU) Esch-sur-Alzette-Villerupt (LU) Arlon	99 64 45 25	LU000,BE341,BE342, BE345,FR411(partim arr. Briey)	738
Trier (DE)	245	5/7	Trier	100	DEB21,DEB25	237
Thionville (FR)	156	5/7	Thionville	138	FR413(partim arr. Thionville est et ouest)	247

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Basel-Mulhouse metropolitan area (CH-FR-DE)	982	7	see beneath		CH031,CH032,DE139, FR422(partim arr. Mulhouse et Thann)	1046
of which Swiss side	471					447
of which French side	384					382
of which German side	127					217
Basel (CH-DE-FR)	680	2/7	Basel-Lörrach-St. Louis Liestal	520 46	CH031,CH032,DE139	664
Mulhouse-Thann (FR)	302	7	Mulhouse	211	FR422 (partim arr. Mulhouse et Thann)	382
Strasbourg-Offenburg (FR-DE)	807	7			FR421 (a), DE134 (a)	1446
of which French side	607					1039
of which German side	200					407
Strasbourg-Kehl	661	3/7	Strasbourg (FR)-Kehl (DE)	451	FR421 (a)	1039
Offenburg	146	7	Offenburg (DE)	58	DE134 (a)	407
Genève-Annemasse (CH-FR)	692	2	Genève-Annemasse	456	CH013, FR718 (partim, arr. St. Julien)	539
of which Swiss side	475					406
of which French side	217					133
Twente-Nordhorn metropolitan area (NL-DE)	619	7	see beneath		NL213,DE948	747
of which Dutch side	473					598
of which German side	146					149
Enschede-Hengelo (NL) - Gronau (DE)	327	3	Enschede Gronau Oldenzaal Borne	150 45 31 21	NL213	598
Almelo (NL)	191	-	Almelo	90	included in NL213	
Nordhorn (DE)	101	7	Nordhorn	52	DE948	149
Large cities						
Salzburg (AT-DE)	447	5	Salzburg	154		
of which Austrian side	366					
of which German side	81					
Donostia-San Sebastian-Hendaye (ES-FR)	406	1 (for Irun-Hendaye)	Donostia-San Sebastian (ES) Irun-Hendaye (ES-FR) Zarautz (ES)	260 85 21		
of which Spanish side	393					
of which French side	13					
Ruse-Giurgiu (BG-RO)	254	1	Ruse(BG)-Giurgiu (RO)	254		
of which Bulgarian side	182					

of which Romanian side	72					
Medium cities						
Dornbirn-Heerbrugg (AT-CH)	145	4	Dornbirn (AT) Heerbrugg-Alstätten (CH) Lustenau (AT)	42 37 20		
of which Austrian side	99					
of which Swiss side	46					
Görlitz-Zgorzelec (DE-PL)	140	1		95		
of which German side	99			60		
of which Polish side	41			35		
Gorizia-Nova Gorica (IT-SI)	135	1/4	Gorizia(IT)-Nova Gorica(SI)	71		
of which Italian side	72					
of which Slovenian side	63					
Bregenz-Lindau (AT-DE)	131	4	Bregenz (AT) Lindau (DE)	60 32		
of which Austrian side	117					
of which German side						
Frankfurt an der Oder-Slubice (DE-PL)	106	1	Frankfurt an der Oder (DE)-Slubice (PL)	90		
of which German side	86			70		
of which Polish side	20			20		
Konstanz (DE-CH)	104	4	Konstanz (DE)	79		
of which German side	79					
of which Swiss side	25					

Small cities						
Komarno-Komarom (SK-HU)	98	1	Komarno (SK) -Komarom (HU)	49		
of which Slovak side	58					
of which Hungarian side	40					
Narva-Ivangorod (EE-RU)	84	4	Narva-Ivangorod (EE-RU)	79		
of which Estonian side	73					
of which Russian side	11 (c)					
Esztergom-Sturovo (HU-SK)	78	1	Esztergom (HU)-Sturovo (SK)	49		
of which Hungarian side	56					

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of which Slovak side	22					
Kemi-Tornio-Haparanda (FI-SE)	71	4	Kemi (FI) Tornio- Haparanda (FI-SE)	23 22 10		
of which Finnish side	61					
of Swedish side	10					

(a) The NUTS-3 unit is too large (the FUA is less than 60% of the population of the NUTS-3 unit)
(b) 1266 including data for Monaco.
(c) MUA only.

4.3   Map of the transborder FUAs

Transborder Functional Urban Areas
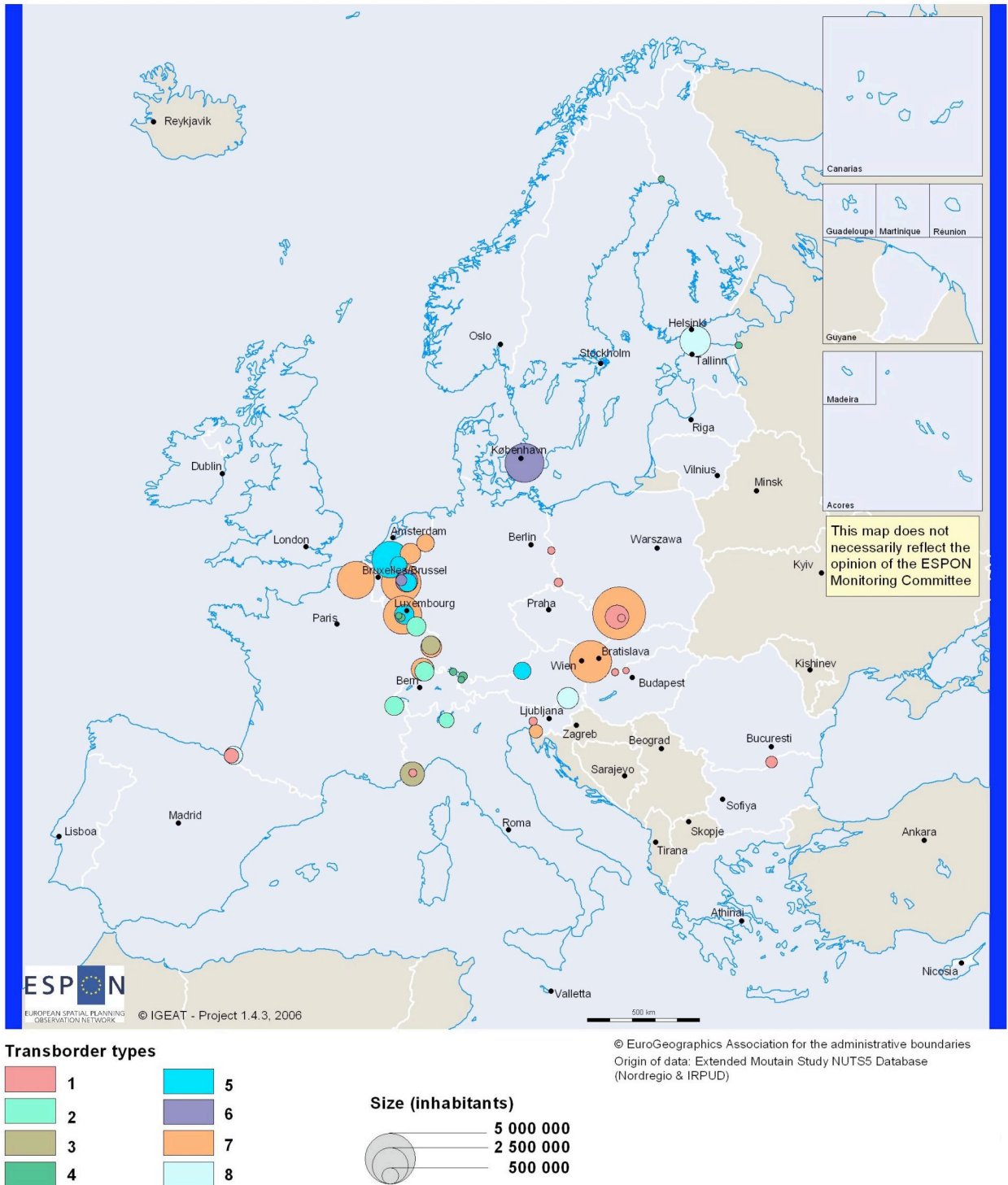
Figure 13   Transborder FUAs and their types

5. The Morphological Polycentricity

For this part we have taken into account only the FUAs of more than 500.000 inhabitants as the data are available at the NUTS-3 level which is usable to qualify these metropolises (see the morphological descriptions above). For smaller FUAs (i.e. more than 250.000 inhabitants) this analyse could be done too for punctual data but not for the structural indices for the NUTS-3 are too disaggregated. This should be done in the future if EUROSTAT can provide data at a lower level than in the present time.

5.1 Measuring the morphological polycentricity of the European urban pattern

A more polycentric urban network, as opposed to monocentrism, is a central objective of the official European policies of planning and dominates its rhetoric (ESDP, 1999). The ESPON report 1.1.1 aims to investigate it in depth. More polycentrism - the concept being used as well at the intra-metropolitan level, at the intra-national level and at the European level as a whole - is supposed to help containing urban sprawl, to favour cooperative strategies and networking between the cities, and, at the upper scale, which we intend to examine here, to lead to more efficient economies and at the same time to more equitable regional developments. The polycentric project is now so present in the official documents that questioning the content and the validity of the concept could seems out of place. However, we intend to show that this concept is often unsubstantial, ambiguous, badly defined, used as well from a morphological (the urban pattern) as from a functional point of view (the flows, the effective networks), confusing the geographical scales and more a normative than a scientific one (see also S. Davoudi, 2003).

Our main question is thus to examine if it is true, looking at the empiric evidences – *i.e.* morphological polycentrism as a measurable scientific object, and not as a territorial planning political goal -, that more polycentric national and European structures could lead simultaneously to more equity and effective regional development, to less inequalities between the regions and to a more effective, competitive and better integrated European economy, favouring also the sustainable development.

As for us, we have computed two measures of the polycentrism on the basis of a sole methodology, the one at the level of the States, the other at the level of more or less similar sized units, i.e. the small and medium-sized countries considered as a single unit, and the biggest countries divided into macro-regions of about 10 millions inhabitants.

Our index is computed on the basis of a simple and purely morphological methodology (as approached by the proxies of population data). We have used the cardinal ranking of the following indicators:
*   Part of the main FUA in the total population of the country
*   Part of the main FUA in the population of the whole set of FUAs with more than 250 thousands inhab.

- Part of the main FUA in the population of the whole set of FUAs with more than 50 thousands inhab.
- Standard deviation of the population of the FUAs with more than 50 thousands inhab.
- Average of the differences between the ranked populations of the FUAs until the threshold of 50 thousands inhab.

The value of each of these five indicators has been distributed on a scale bounded from 100 (the highest value for the indicator) and 0 (the lowest one). The arithmetic average of these seven indicators gives the cardinal global index (Table 1). We stress that we compute here (the proxy of) an exclusively morphological index of polycentrism, and not a measure of functional polycentrism, decisional functions appearing to be much more concentrated in most countries than the urban populations (C. Vandermotten & *al.*, 1999).

Macro-region our country	value	Macro-region our country	value
Italy (NorthEast)	94,6	Poland (North)	67,8
Germany	93,4	**Norway**	66,4
Netherlands	90,8	France (CentralEast)	64,6
Poland (East)	89,6	**United Kingdom**	63,8
Germany (RhinelandWestfalia)	88	**Finland**	63,6
Germany (Saxony-Thuringia)	87,8	Poland (SouthWest)	63,6
Spain (North)	87,4	United Kingdom (Scotland)	63,6
France (West)	86,6	**France**	62,4
Italy	86,2	Italy (NorthWest)	58,2
Spain (South)	86	Italy (Centre,incl.Abruzze-Molise)	57,8
Poland	85,6	**Austria**	56,8
France (NorthEast)	83,8	**Slovenia**	56,8
United Kingdom (North of England)	80,2	**Denmark**	56,6
Spain	77,6	**Hungary**	54,8
Romania	77,2	**Portugal**	54,4
Switzerland	75,4	**Cyprus**	51,4
Slovakia	74,8	Spain (East)	50,8
Czech Republic	74,2	Poland (SouthEast)	49,8
Italy (South)	74,2	United Kingdom (Midlands)	48,8
France (SouthWest)	73,8	**Ireland**	45,8
Bulgaria	73,2	Poland (Centre)	45,8
Lituania	72	**Estonia**	45,6
Sweden	71,8	**Greece**	38,6
France (SouthEast)	71,6	United Kingdom (Wales)	34,8
Poland (NorthWest)	71,6	**Latvia**	32,2
Germany (Baden-Wurtemberg)	70	United Kingdom (NorthernIreland)	31,2
Germany (North)	70	Spain (Centre)	21,4
Belgium	69,6	United Kingdom (South)	20,2
Germany (Hessen-Pfalz-Saarland)	68,4	Germany (NorthEast)	17,8
Germany (Bavaria)	68	France (Parisian basin)	16,8
France (North)	67,8		

Table 2   Level of polycentricity in the European macro-regions and countries

The sole surprise arising from our ranking regarding a qualitative knowledge of the European urban patterns is the position of Hungary, which appears a priori to be very monocentric due to the weight of Budapest.

Our index of polycentrism is not linked to the results of any territorial planning policy. It aims first at showing the product of national histories and territorial building, in a very long time perspective. The economic and political developments, sometimes from the Middle

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Ages, gave rise to different urban patterns, with a whole range of situations between monocentricity and polycentricity:

- a monocentric pattern combined with a relative sterilization of the rest of the country, for a long time characterised by out migration (ex.: Ireland, for a long time in a quasi-colonial context ; Greece, with the exception of Thessalonica, located at the top of an international corridor) ;
- a restrained monocentricity, linked to an early national building, but without sterilization of the development outside the capital region (ex.: Denmark and Sweden, where the agrarian revolution played an important role in the initial phases of access to modernity);
- a strong monocentrism, yet more decisional than morphological, in countries with a very early territorial formation, where the powers are strongly concentrated in the capital, but however with other important cities, possibly also with their own strong historical weight. These cities can have been reinforced, as well as other medium-sized cities and intermediate areas, by regional and equilibrium metropolises policies during the last half-century, even if they remain under the control of the capital. France pertains to this type, which doesn't exclude macro-regional polycentrism, like in the East or the West of the country;
- a more or less similar situation, but where the decisional supremacy of the capital doesn't exclude big manufacturing conurbations, born during the early phases of a very intense industrial revolution, implying locations on the coalfields or on the proto-industrial manpower basins, or even allows more recent urban-regional developments (ex.: Great-Britain) ;
- a more or less equilibrated bicephalous pattern, possibly with a more political and a more private economic head (ex.: Spain or Italy, with in this last country very strong inter-regional economic inequalities and more, in the South, regional more or less parasitic primacies, like Napoli or to a certain extent Sevilla, which reflect the long-lasting survival of aristocratic and archaic structures in their rural environment);
- a mid-European strongly polycentric pattern, with a very dense urbanisation and a very open urban hierarchy, from millionaire cities to a dense network of medium-sized cities, in the context of old urban autonomy tradition. This model includes polynuclear conurbations, even if these don't recover necessarily truly lived identities or spaces of strong planning and economic cooperation (Delta Metropolis in the Netherlands; Rhine-Ruhr; Rhine-Main; the Walloon industrial axis). This polycentrism can be the result of late national unifications and federal systems. However, the German polycentrism doesn't exclude the extreme monocentrism of the North-East of the country, besides not a part of the medieval Germany of cities and merchants ;
- finally, Switzerland is characterised by a typical mid-European polycentrism, but without big millionaire cities nor conurbations born during the coal based industrialisation period.

Indicator of Polycentricity - by country

32 - 48	No data / Occupied area
48 - 59	
59 - 69	
69 - 80	
80 - 93	

© EuroGeographics Association for the administrative boundaries
Origin of data: Extended Moutain Study NUTS5 Database
(Nordregio & IRPUD)
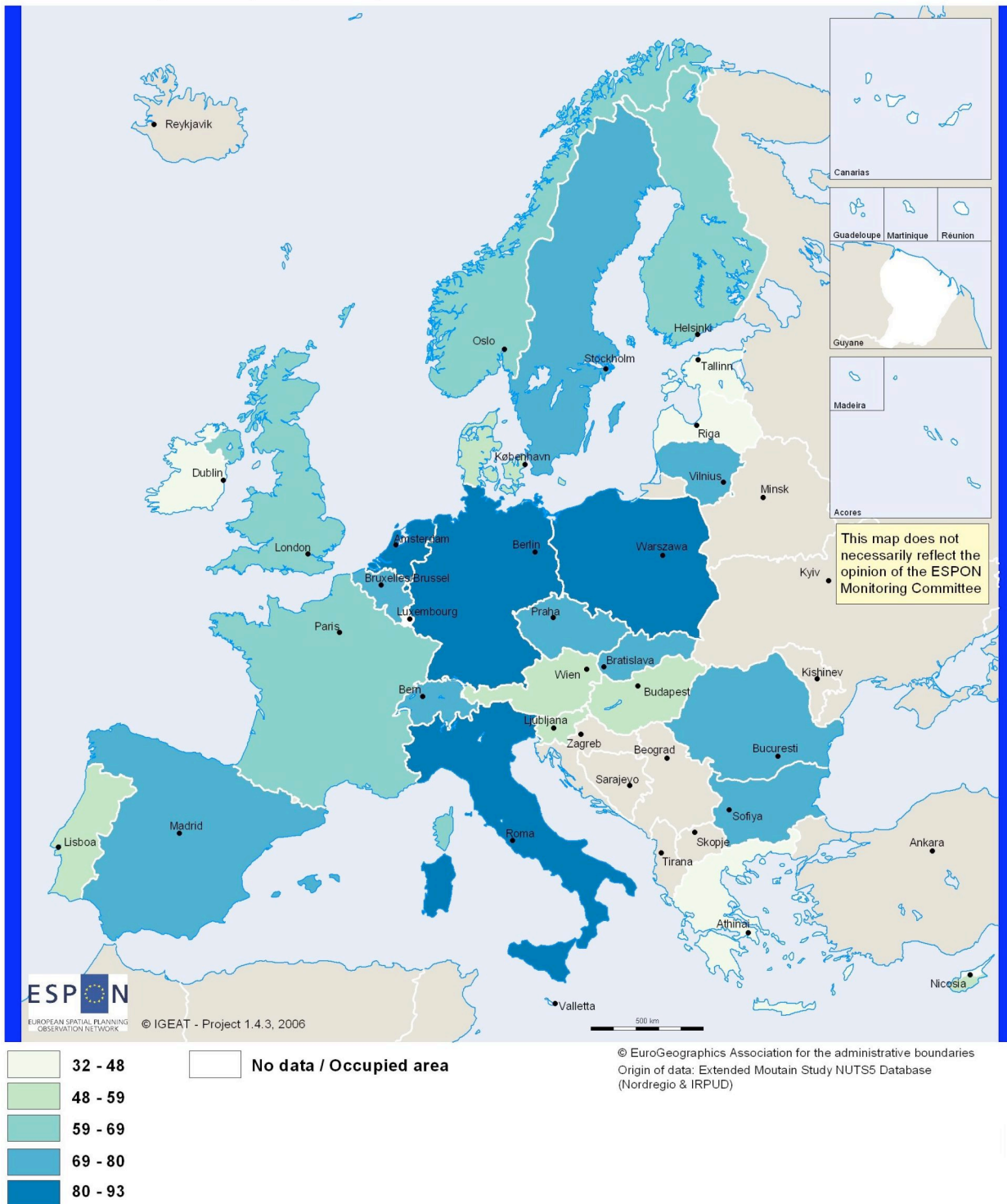
Figure 14   Indicator of morphological polycentricity – by country

Indicator of Polycentricity - by regions
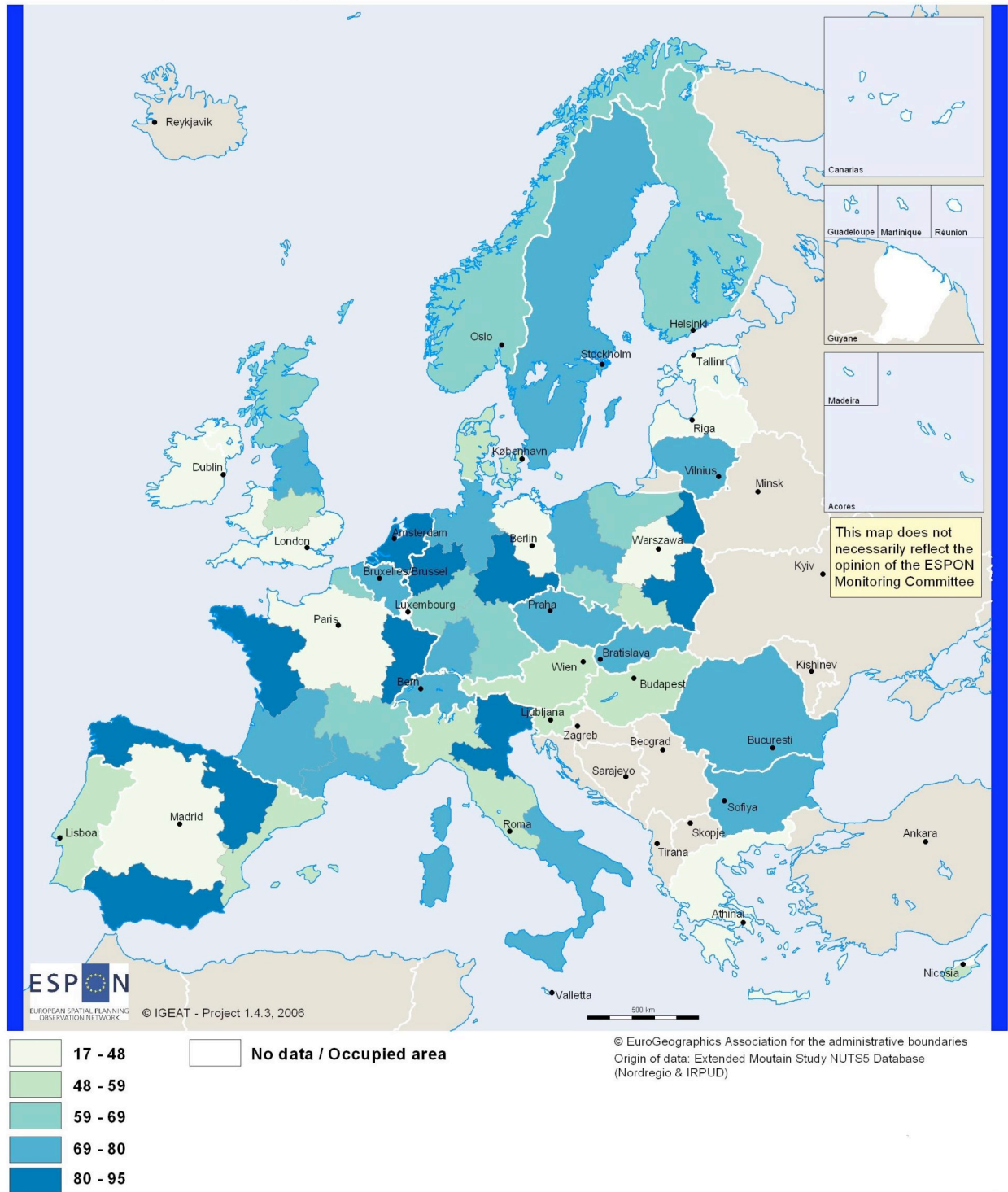
Figure 15   Indicator of morphological polycentricity – by region

5.2   Polycentricity and economic efficiency

As we have already seen, European policies assign to polycentricity a normative value of efficiency: it is supposed to favour regional and, through this one, global development, either by adding more performing regional growths or by avoiding diseconomies supposed to affect the biggest agglomerations.

What is the evidence?

We have computed the correlation between level of polycentricity and three indices of relative dynamics as shown beneath.

If it is any, but not significant or slight correlation, it is between the level of development and more monocentrism.

Relation	Period	Correlation coefficient r
Relative dynamics of the GDP/inhab. vs. European average 1980-2002 (2002 index – 1980 index, EU15 = 100)	1980-2002	-0,39
Relative dynamics of the GDP by inhab. vs. European (2002 index – 1995 index, EU15 = 100)	1995-2002	-0,24
Relative dynamics of the GDP./inhab. vs. National average (2002 index – 1995 index, national average = 100)	1995-2002	-0,10

Table 3   Coefficient of correlation between monocentrism and economic growth
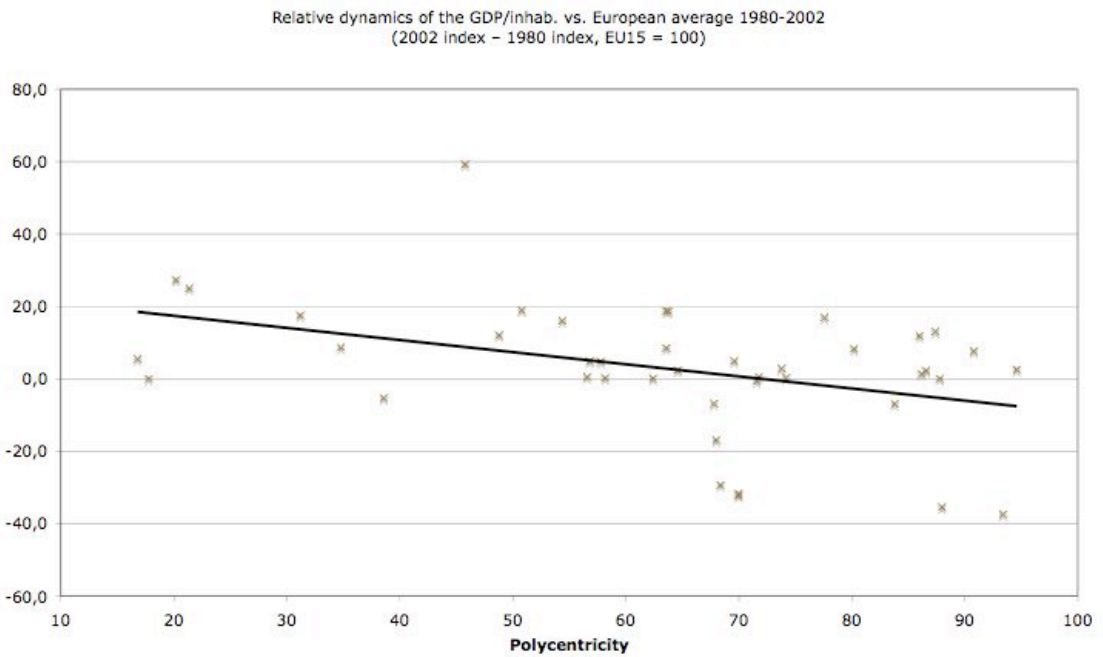
Figure 16   Economic growth and monocentrism at the scale of the macro-regions (1980-2002).
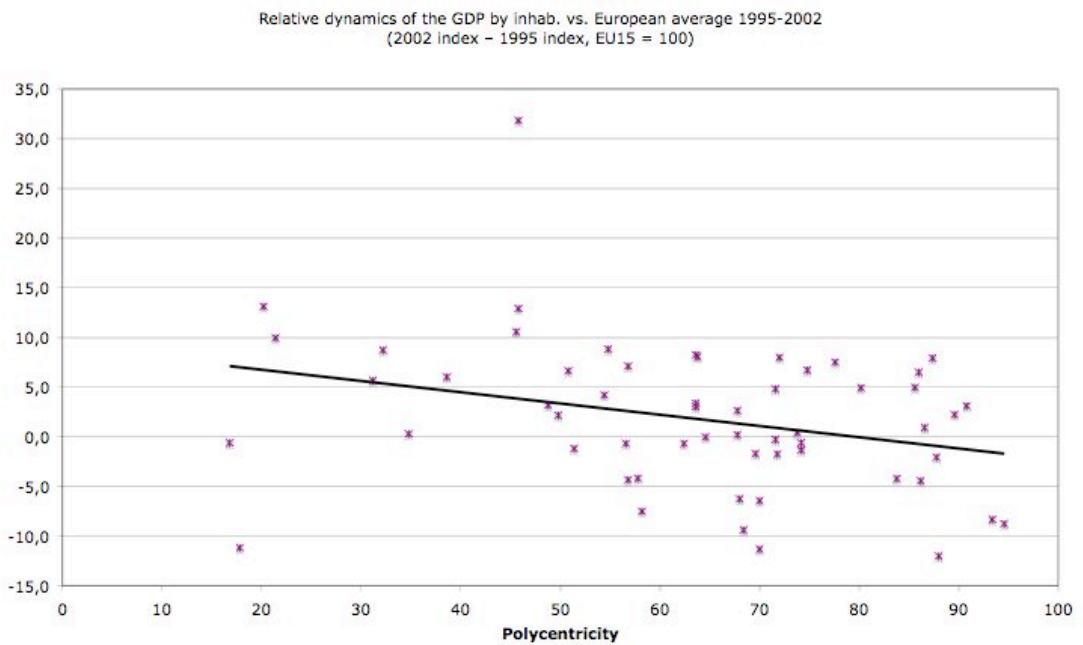
Figure 17   Economic growth and monocentrism at the scale of the macro-regions (1995-2002).
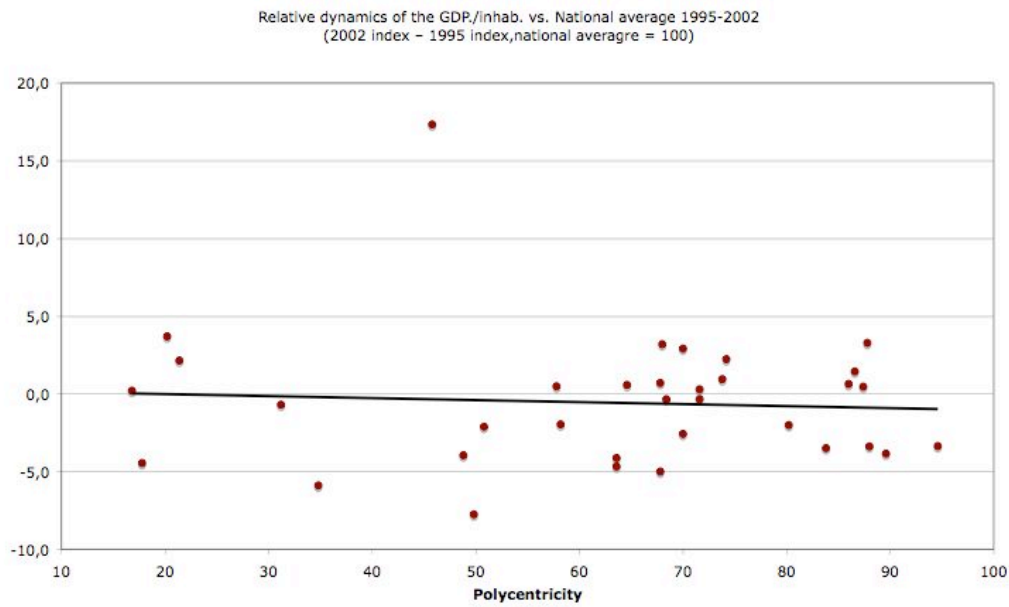
Figure 18   Economic growth by comparison to the national performances in each country and monocentrism at the scale of the macro-regions (1980-2002)

To conclude, this statistical link between monocentrism and economic efficiency seems to be consistent with the main present trends towards more globalisation, which favour the main advanced services nodes of the world-wide economy.

5.2.1   The maps

**The large cities and the metropolises
(FUAs with more than 250,000 inhab.) according to their population**
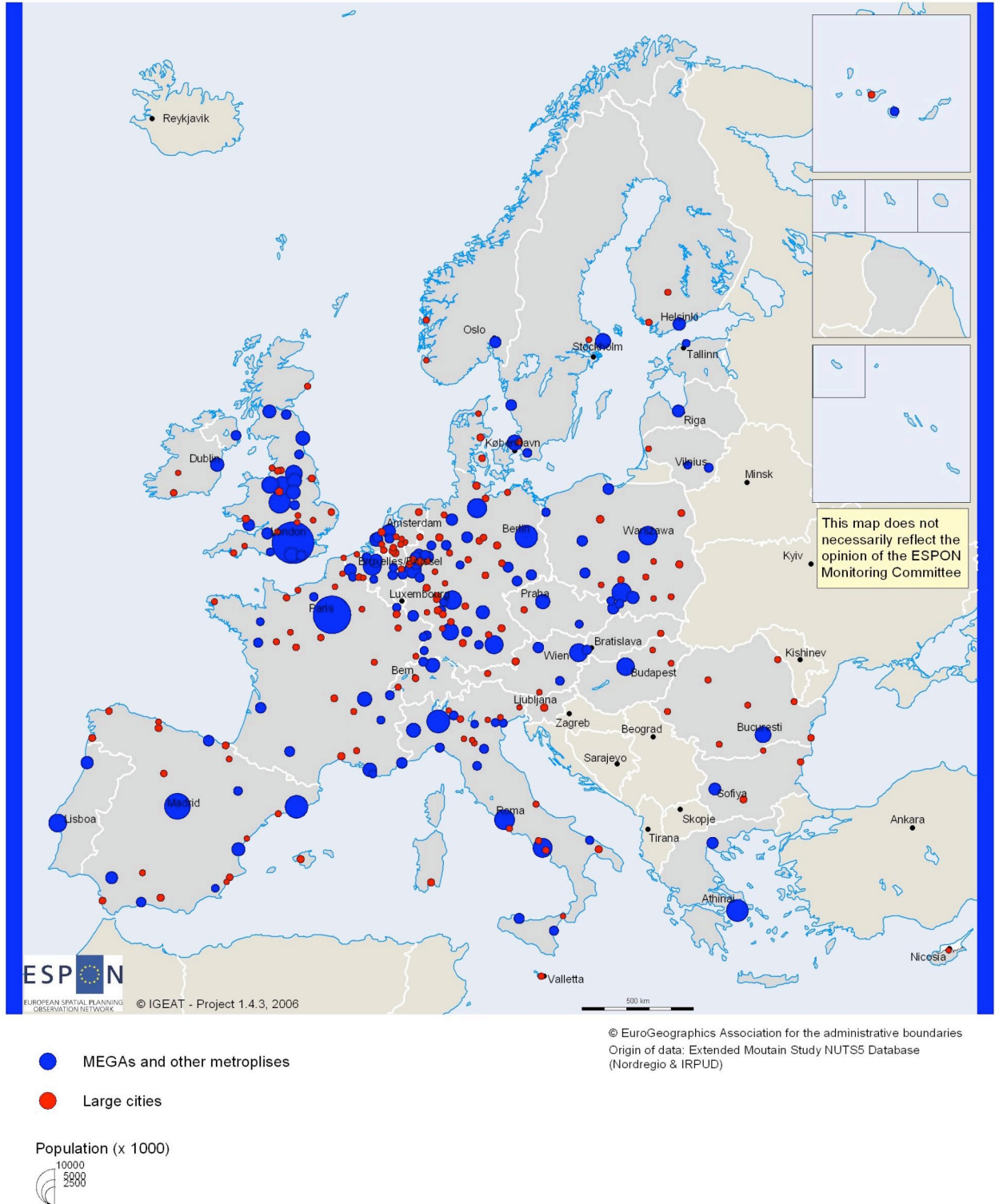
Figure 19   The large cities, the metropolises and the MEGAs according to their population

The large cities and the metropolises
(cities gathered inside the polycentric areas) according to their population

Figure 20　The large cities and the metropolises (cities gathered inside the polycentric areas) according to their population

**The large cities and the metropolises
(FUAs with more than 250,000 inhab.) according to their GDP**
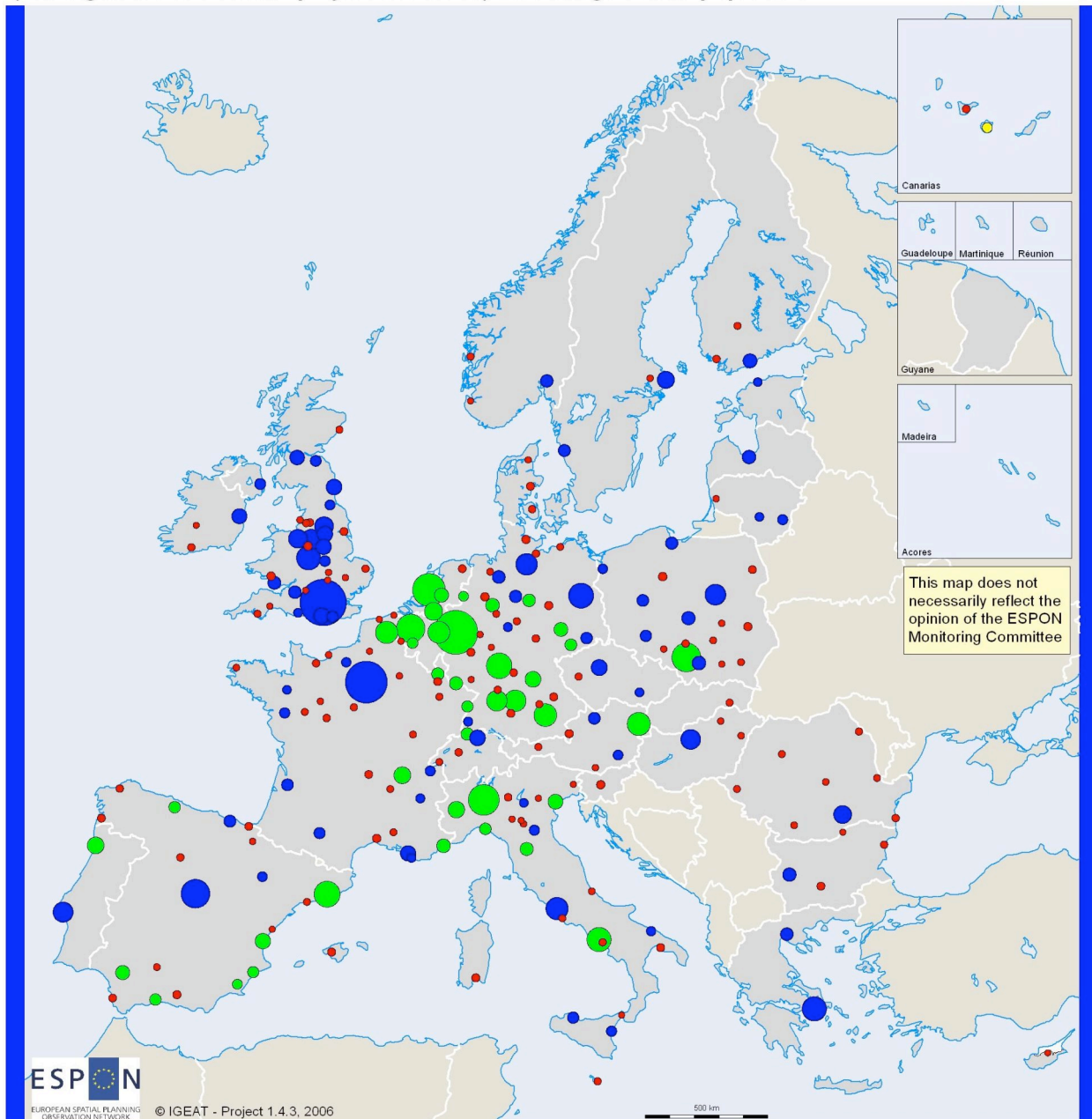
This map does not
necessarily reflect the
opinion of the ESPON
Monitoring Committee

© EuroGeographics Association for the administrative boundaries
Origin of data: Extended Moutain Study NUTS5 Database
(Nordregio & IRPUD)

🔵 MEGAs and other metroplises

🔴 Large cities

GDP (millions euro)

400000
200000
100000
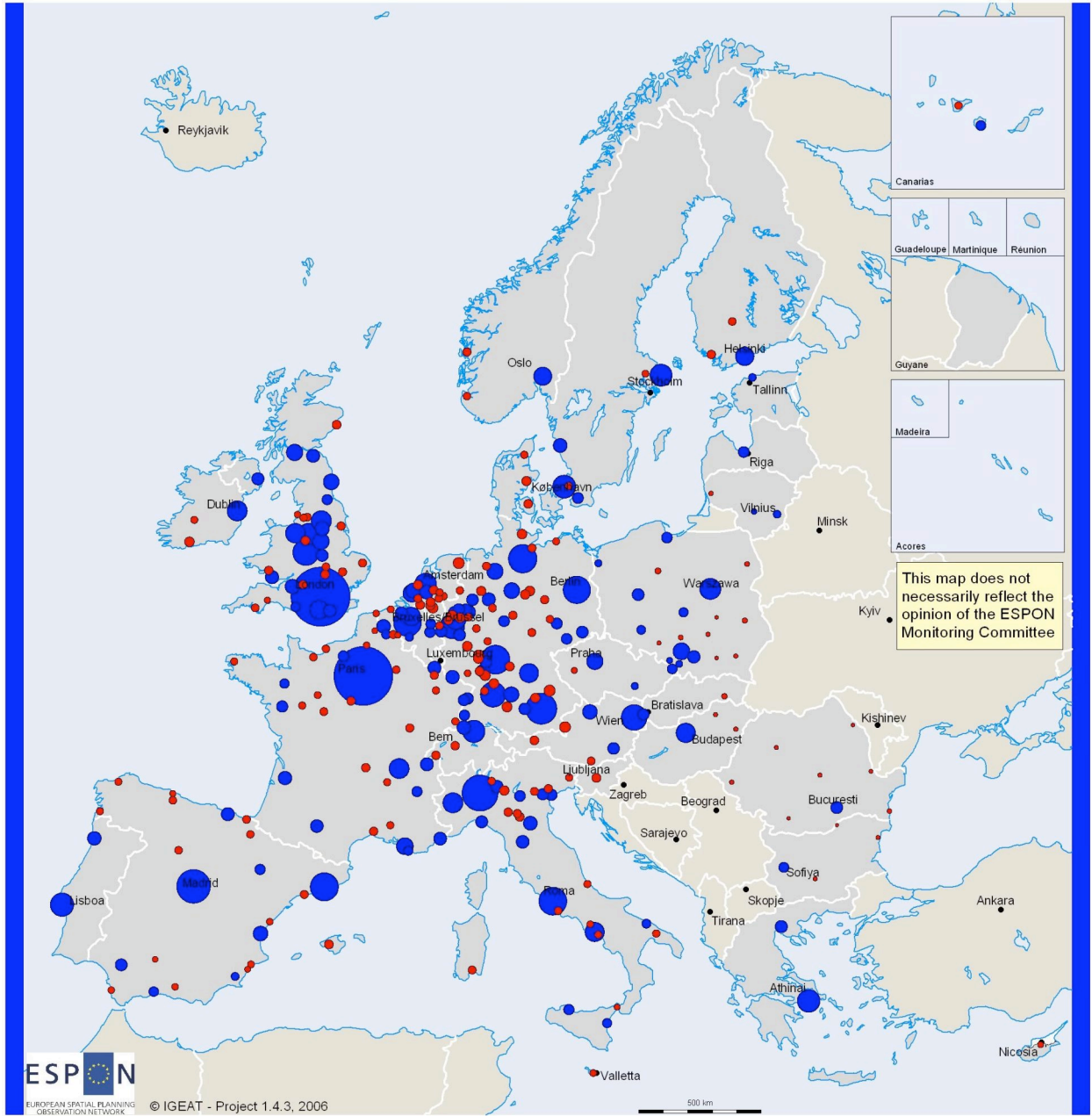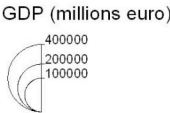
Figure 21   The large cities, the metropolises and the MEGAs according to their GDP

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**The large cities and the metropolises
(cities gathered inside the polycentric areas) according to their GDP**

Figure 22   The large cities and the metropolises (cities gathered inside the polycentric areas) according to their GDP

6. The Functional measures of the FUAs

As explained in chapter 2 we have studied the functional aspects of all the FUAs defined by the morphological study. We have studied 5 functions for which we could gather enough data:

- the administrative functions, consisting of the national functions (capital city, chief towns, etc) and the international functions (cities hosting headquarters of important european and international institutions)

- the decision functions, consisting of the localisation of the heaquarters and their subsidiaries of national and international important companies

- the transport functions that measure the connectivity of a city with the others, consisting of the road and rail connectivity as well as the air traffic and the sea transport

- the knowledge functions, consisting of the localisation of the most important universities, research centres and high-technology production

- the tourism functions, consisting of a measure of the touristic activities estimated by the number of beds available and the number of nights spent in the touristic facilities, and by the appreciation reflected by the touristic guides (we did it only with Michelin but it should be done as well with other tourist guides). This criterion should also be completed by other cultural criteria such as the congress cities, and other cultural activities (museums, theatres, festivals, etc).

Unfortunately we couldn't find relevant data for the industrial activities at the city level. We have then used the data provided by Espon 1.1.1 but these were missing for France, UK and Switzerland, so that we didn't use them to compute our global functional index.

Global score: Average of all the scores, except industry.
Functional score: Average of all the scores, except industry and population.
Global score including industry: Average of the 7 scores.

Then we have calculated a specificity value for our 5 function scores by dividing each of these by the Functional score in order to highlight the cities that would have a specific function. The results are shown in the maps below.

The results are shown on next pages in alphabetical order of the country code.

6.1   The functional data

Austria (AT)										
fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Amstetten	0,56	0,46	1,09	1	0	0	1,44	0,63	0	4
Bregenz	1,96	2,17	2,27	1	4	0	3,11	1,25	3,4	4
Dornbirn - Lustenau	1,25	1,08	1,67	2	0	0,5	3,11	1,25	0	4
Feldkirch	0,97	0,97	1,44	1	0	0	3,11	1,25	0	4
Graz	3,82	3,78	4,15	4	4	0,5	2,67	5,42	6,4	6
Innsbruck	3,14	3,17	3,27	3	4	0,5	2,89	3,96	4,9	4
Kapfenberg/Brück an der Mur	0,67	0,6	1,18	1	0	0	1,44	1,25	0	4
Klagenfurt	1,93	1,69	2,25	3	4	0	1,69	3,13	0,8	4
Leoben	0,67	0,6	1,18	1	0	0	1,44	1,25	0	4
Linz	4,06	4,08	4,36	4	4	4	2,42	5,42	4,5	6
Salzburg	3,25	3,3	3,36	3	4	1	4,11	1,25	6,5	4
Sankt-Pölten	1,15	0,96	1,28	2	4	0	1,67	0,63	0	2
Steyr	0,67	0,6	1,18	1	0	0	1,44	1,25	0	4
Villach	1,05	0,84	1,5	2	0	1	1,44	0,63	0,7	4
Wels	1,08	0,87	1,83	2	0	0,5	2,17	1,25	0	6
Wien	8,07	7,87	8,06	9	9,5	8,5	5,61	8,54	8	8
Wolfsberg	0,56	0,46	0,78	1	0	0	1,44	0,63	0	2

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fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
				Belgium (BE)						
Antwerpen	5,47	5,12	5,86	7	1	5,5	6,28	4,38	6,4	8
Brugge	2,97	2,97	3,13	3	1	0	4,58	1,88	6,4	4
Bruxelles/Brussel	8,23	8,05	7,88	9	10	9	6,53	7,71	8	6
Charleroi	1,92	1,24	2,55	5	0	0	4,31	1,25	0	6
Gent	3,83	3,57	4,16	5	1	1	3,56	5,21	5,8	6
Hasselt-Genk	1,81	1,32	2,45	4	1	0	3,56	1,88	0	6
Ieper	1,13	1,16	1,26	1	0	0	3,33	1,88	0	2
Kortrijk	1,44	1,32	2,14	2	0	0,5	3,56	1,88	0	6
La Louvière	1,24	1,07	1,36	2	0	0	3,56	1,25	0	2
Leuven	2,96	3,18	3,12	2	1	0,5	3,56	6,04	3,7	4
Liège	3,54	3,21	3,92	5	1	1,5	3,78	4,58	4,1	6
Mons-Borinage	1,51	1,18	1,59	3	1	0	3,56	1,25	0	2
Mouscron	1,06	1,07	1,2	1	0	0	3,56	1,25	0	2
Namur	2,58	2,71	2,49	2	4	0	3,56	2,92	3,7	2
Oostende	1,36	1,21	1,46	2	0	0	3,58	1,88	0	2
Roeselare	1,31	1,16	1,72	2	0	0	3,33	1,88	0	4
Sint-Niklaas	1,17	1,21	1,61	1	0	0	3,56	1,88	0	4
Sint-Truiden	1,17	1,21	0,99	1	0	0	3,56	1,88	0	0
Tournai	1,95	1,94	1,96	2	0	0	3,78	1,25	3,7	2
Turnhout	1,35	1,21	1,14	2	0	0	3,56	1,88	0	0
Verviers	1,06	1,07	1,51	1	0	0	3,56	1,25	0	4
Waregem	1,17	1,21	0,99	1	0	0	3,56	1,88	0	0

Bulgaria (BG)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Asenovgrad	0,41	0,28	0,65	1	0	0	0,61	0,63	0	2
Blagoevgrad	0,61	0,52	0,82	1	0	0,5	0,61	1,25	0	2
Burgas	1,24	1,08	1,36	2	1	1	1,11	0,63	1,6	2
Dimitrovgrad	0,41	0,28	0,65	1	0	0	0,61	0,63	0	2
Dobrich	0,29	0,14	0,56	1	0	0	0,61	0	0	2
Doupnitsa	0,52	0,41	0,44	1	0	0	0,61	1,25	0	0
Gabrovo	0,79	0,74	0,98	1	0	0	0,61	0,63	2,1	2
Gorna Oriahovitsa	0,43	0,3	0,36	1	0	0	0,72	0,63	0	0
Haskovo	0,77	0,72	0,96	1	1	1,5	0,61	0,63	0	2
Kardzhali	0,41	0,28	0,65	1	0	0	0,61	0,63	0	2
Karlovo	0,53	0,43	0,76	1	0	0	0,61	0,63	0,7	2
Kazanlak	0,53	0,43	0,76	1	0	0	0,61	0,63	0,7	2
Kyustendil	0,52	0,41	0,75	1	0	0	0,61	1,25	0	2
Lovech	0,68	0,61	0,88	1	1	1	0,61	0,63	0	2
Montana	0,59	0,5	0,81	1	1	0,5	0,61	0,63	0	2
Pazardzhik	0,59	0,28	0,81	2	0	0	0,61	0,63	0	2
Pernik	0,52	0,41	0,75	1	0	0	0,61	1,25	0	2
Petrich	0,52	0,41	0,75	1	0	0	0,61	1,25	0	2
Pleven	0,59	0,28	0,81	2	0	0	0,61	0,63	0	2
Plovdiv	2,1	1,68	2,08	4	1	1	0,61	0,63	4,8	2
Razgrad	0,31	0,16	0,57	1	0	0	0,72	0	0	2
Ruse	0,7	0,41	0,9	2	1	0	0,72	0,63	0	2
Shumen	0,31	0,16	0,57	1	0	0	0,72	0	0	2
Silistra	0,31	0,16	0,57	1	0	0	0,72	0	0	2
Sliven	0,59	0,28	0,81	2	0	0	0,61	0,63	0	2
Sofia	5,32	4,72	5,12	8	7	6	1,61	3,75	6,4	4
Stara Zagora	0,59	0,28	0,81	2	0	0	0,61	0,63	0	2
Targovishte	0,31	0,16	0,57	1	0	0	0,72	0	0	2
Varna	1,76	1,26	1,79	4	1	1,5	1,36	0	2,3	2
Veliko Tarnovo	1,19	1,23	1,32	1	0	0	0,72	0,63	4,2	2
Vidin	0,43	0,3	0,67	1	0	0	0,72	0,63	0	2
Vraca	0,41	0,28	0,65	1	0	0	0,61	0,63	0	2
Yambol	0,41	0,28	0,65	1	0	0	0,61	0,63	0	2

Switzerland (CH)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Aarau	1,49	1,6	NA	1	4	0	3,33	1,88	0	NA
Basel	5,67	5,82	NA	5	5	7,5	4,36	5,21	6,6	NA
Bern	4,68	5,05	NA	3	8	4,5	3,11	5,42	5,7	NA
Biel	1,16	1,19	NA	1	0	1	3,11	1,25	0	NA
Chur	1,21	1,25	NA	1	4	0	2,39	1,25	0	NA
Fribourg	2,23	2,5	NA	1	4	0,5	2,89	3,75	2,1	NA
Genève	5,74	6,13	NA	4	7	6,5	5,33	6,04	6,2	NA
Lausanne	4,58	4,93	NA	3	5	5	2,89	6,88	4,9	NA
Locarno - Bellinzona	1,69	1,84	NA	1	0	0,5	3,11	1,88	2,8	NA
Lugano	2,2	2,24	NA	2	0	0,5	3,11	1,88	4,6	NA
Luzern	2,85	3,04	NA	2	4	2	3,11	1,25	5,3	NA
Neuchâtel	2,22	2,49	NA	1	4	0	2,89	2,92	3,4	NA
Olten - Zofingen	1,07	1,08	NA	1	0	0,5	3,11	1,25	0	NA
Sankt-Gallen	2,16	2,19	NA	2	4	1	3,11	3,75	0	NA
Schaffhausen	1,34	1,41	NA	1	4	0	3,11	1,25	0	NA
Sion - Sierre	1,32	1,39	NA	1	4	0	2,39	1,88	0	NA
Solothurn	1,34	1,41	NA	1	4	0	3,11	1,25	0	NA
Thun	0,97	0,97	NA	1	0	0	3,11	1,25	0	NA
Vevey-Montreux	1,32	1,39	NA	1	0	1,5	2,89	1,88	0	NA
Zürich	7,25	7,3	NA	7	4	8,5	6,33	8,54	7,5	NA

Cyprus (CY)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Larnaka	1,21	1,25	1,33	1	1	2	1,25	1,88	0	2
Lefkosia	2,95	2,94	2,49	3	6	6	0	2,71	1,5	0
Lemessos	1,89	1,86	1,9	2	1	5,5	0,5	1,88	0	2

CZECH REPUBLIC (CZ)

fua name	global score	functional score	Functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Brno	3,79	3,52	3,51	5	1	1,5	2,39	5,63	5,8	2
Ceska Lipa	0,6	0,51	0,51	1	0	0	1,67	0,63	0	0
Ceske Budejovice	1,65	1,58	1,71	2	1	0	1,44	1,46	3,7	2
Cheb	0,98	0,98	0,83	1	0	0	1,67	0,63	2,1	0
Chomutov	0,91	0,67	1,08	2	0	0	2,39	0,63	0	2
Decin	0,91	0,67	1,08	2	0	0	2,39	0,63	0	2
Hradec Kralove	0,96	0,73	1,12	2	1	0	2,17	0,63	0	2
Jihlava	0,69	0,62	0,89	1	1	0	1,67	0,63	0	2
Karlovy Vary	1,55	1,44	1,62	2	1	0	1,67	0,63	3,7	2
Liberec	1,11	0,92	1,25	2	1	0,5	1,67	1,46	0	2
Mlada Boleslav	0,69	0,62	0,89	1	0	0	2,17	0,63	0	2
Most	0,73	0,67	0,93	1	0	0	2,39	0,63	0	2
Olomouc	1,42	1,29	1,51	2	1	0	2,39	0,63	2,3	2
Opava	1,03	0,81	1,18	2	0	0	2,39	1,25	0	2
Ostrava	2,66	2,14	2,56	5	1	2	2,39	3,75	1	2
Pardubice	1,1	0,9	1,24	2	1	0	2,92	0,63	0	2
Plzen	2,02	1,8	2,02	3	1	0,5	1,67	3,13	2,3	2
Praha	7,39	7,26	6,56	8	7	7,5	5,36	7,29	9	2
Prerov	0,73	0,67	0,93	1	0	0	2,39	0,63	0	2
Pribram	0,69	0,62	0,58	1	0	0	2,17	0,63	0	0
Prostejov	0,73	0,67	0,93	1	0	0	2,39	0,63	0	2
Tabor	0,94	0,93	0,8	1	0	0	1,44	0,63	2,1	0
Teplice	0,91	0,67	1,08	2	0	0	2,39	0,63	0	2
Trebic	0,6	0,51	0,51	1	0	0	1,67	0,63	0	0
Usti nad Labem	1,28	1,34	1,39	1	1	1,5	2,39	0,63	1	2
Zlin	1,04	0,83	1,19	2	1	0	1,89	0,63	0,7	2
Znojmo	0,73	0,67	0,62	1	0	0	2,39	0,63	0	0
Aachen	3,11	2,69	3,25	5	0	2,5	3,56	6,04	0	4

Germany (DE)									
fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Altenburg	1,09	1,11	1,23	1	0	0	3,11	1,88	0	2
Amberg (Oberpfalz)	1,07	0,86	1,21	2	0	0	2,61	1,25	0	2
Ansbach	1,31	1,16	1,42	2	1	0	2,83	1,88	0	2
Arnsberg	1,17	1,21	1,91	1	1	0	3,06	1,88	0	6
Aue	0,88	0,86	1,06	1	0	0	2,61	1,25	0	2
Augsburg	2,91	2,45	3,39	5	1	0	3,11	5,42	2	6
Bad Hersfeld	1,08	1,1	1,22	1	0	0	3,06	1,88	0	2
Bad Kreuznach	1,04	1,05	1,19	1	0	0	2,83	1,88	0	2
Bad Oeynhausen	1,13	1,16	1,57	1	0	0	3,33	1,88	0	4
Baden-Baden	1,51	1,62	1,59	1	0	0	3,33	1,88	2,1	2
Bamberg	2,12	2,15	2,41	2	0	0	3,06	2,92	3,7	4
Bautzen	0,93	0,7	1,1	2	0	0	1,89	1,25	0	2
Bayreuth	2,35	2,42	2,29	2	1	0	2,83	4,58	3	2
Berlin	8,24	7,85	8,2	10	8	7,5	6,08	8,75	9	8
Bielefeld	3,14	2,73	3,27	5	0	2,5	3,56	5,21	1	4
Bocholt	1,17	1,21	1,91	1	0	0	3,56	1,88	0	6
Bochum-Herne	3,27	2,66	3,69	6	0	1,5	4,28	5,21	1	6
Bonn	4,85	4,81	4,72	5	4	4	5,78	6,88	3	4
Brandenburg	0,88	0,86	1,06	1	0	0	2,61	1,25	0	2
Braunschweig	1,76	1,48	2,1	3	1	0	4,28	1,88	0	4
Bremen	4,72	4,21	4,92	7	4	1	4,81	6,04	5,1	6
Bremerhaven	1,86	1,83	1,88	2	0	0	3,92	2,71	1,6	2
Celle	1,17	0,99	1,3	2	0	0,5	3,33	0,63	0	2
Chemnitz-Zwickau	2,91	2,44	3,08	5	1	0,5	3,11	6,88	0	4
Coburg	1,03	0,81	1,18	2	0	0	2,39	1,25	0	2
Cottbus	1,29	1,13	1,4	2	0	0	2,17	2,92	0	2
Cuxhaven	0,6	0,51	0,82	1	0	0	1,67	0,63	0	2
Darmstadt	3,63	3,33	3,69	5	1	2	3,78	7,71	1	4
Deggendorf	0,69	0,62	0,89	1	0	0	2,17	0,63	0	2
Dessau	1,16	0,97	1,29	2	1	0	2,61	1,25	0	2
Detmold	1,44	1,32	2,14	2	1	0	3,56	1,88	0	6
Dillenburg	1,17	1,21	1,61	1	0	0	3,56	1,88	0	4
Dormagen	1,21	1,26	1,02	1	0	0	3,78	1,88	0	0
Dortmund	4,3	3,7	4,56	7	0	2,5	5,28	6,88	2	6
Dresden	4,76	4,48	4,95	6	4	2,5	3,86	5,42	6,4	6
Duisburg	2,69	1,96	3,2	6	0	1	4,28	3,54	0	6
Düren	1,35	1,21	1,76	2	0	0	3,56	1,88	0	4
Düsseldorf	6,1	5,68	6,09	8	5	8,5	6,53	6,04	2	6

Germany (DE)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Erfurt	3,35	3,43	3,45	3	4	0,5	3,61	6,04	3,3	4
Essen-Oberhausen	3,21	2,59	3,64	6	0	3,5	4,28	1,88	2	6
Euskirchen	1,35	1,21	1,45	2	0	0	3,56	1,88	0	2
Flensburg	0,94	0,71	1,11	2	0	0,5	1,44	1,25	0	2
Frankfurt am Main	7,02	6,58	6,86	9	1	9	7,28	6,04	6,8	6
Frankfurt an der Oder	1,2	1,24	1,32	1	0	1	1,67	2,92	0	2
Freiburg im Breisgau	3,17	2,76	3,3	5	1	0,5	3,11	5,42	2,9	4
Fulda	1,44	1,32	1,84	2	0	0,5	3,56	1,88	0	4
Garmisch-Partenkirchen	1,38	1,46	1,47	1	0	0	1,89	1,88	2,8	2
Gelsenkirchen-Bottrop	2,39	1,59	2,02	6	0	1	4,28	1,88	0	0
Gera	1,18	1	1,31	2	0	0	2,61	1,88	0	2
Giessen	2,23	2,06	2,5	3	1	0	3,56	5,21	0	4
Goslar	1,73	1,9	1,78	1	0	0	4,56	1,88	2,1	2
Gotha	1,04	1,05	1,19	1	0	0	2,83	1,88	0	2
Greifswald	0,82	0,78	1	1	0	0	1,22	2,29	0	2
Gˆrlitz	0,89	0,65	1,06	2	0	0	1,67	1,25	0	2
Göttingen	3,09	3,11	3,23	3	0	0	4,28	7,71	2	4
Hagen	1,85	1,37	2,18	4	0	0	4,28	1,88	0	4
Halberstadt	0,88	0,86	1,06	1	0	0	2,61	1,25	0	2
Halle/Saale	1,7	1,41	1,75	3	1	0	4,11	1,25	0,5	2
Hamburg	7,69	7,39	7,73	9	4	7,5	7,83	8,54	7,4	8
Hameln	1,33	1,18	1,74	2	0	0,5	3,56	1,25	0	4
Hamm	1,35	1,21	2,07	2	0	0	3,56	1,88	0	6
Hannover	4,9	4,66	5,07	6	5	5	6,03	5,42	2	6
Heidelberg	3,94	3,93	3,95	4	0	2	3,56	7,71	4,4	4
Heidenheim	1,24	1,29	1,66	1	0	1,5	3,06	1,25	0	4
Heilbronn	1,57	1,25	1,94	3	0	0	3,56	2,08	0	4
Herford	1,17	1,21	1,91	1	0	0	3,56	1,88	0	6
Hildesheim	1,46	1,34	1,85	2	0	0	4,78	1,25	0	4
Hof	1,07	0,86	1,21	2	0	0	2,61	1,25	0	2
Hoyerswerda	0,71	0,65	0,91	1	0	0	1,67	1,25	0	2
Ibbenbüren	1,17	1,21	1,3	1	0	0	3,56	1,88	0	2
Ingolstadt	1,66	1,37	2,33	3	0	0	2,61	3,54	0	6
Iserlohn	1,39	1,26	2,1	2	0	0	3,78	1,88	0	6
Jena	1,79	1,74	1,82	2	0	0	2,61	5,21	0	2
Kaiserslautern	2,44	2,32	2,68	3	0	0	3,56	6,88	0	4
Karlsruhe	3,78	3,5	4,12	5	1	1,5	4,06	7,71	2	6
Kassel	2,91	2,44	3,08	5	1	1,5	3,78	5,21	0	4

Germany (DE)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Kempten (Allgau)	0,93	0,7	1,1	2	0	0	1,89	1,25	0	2
Kiel	2,45	2,1	2,69	4	4	0,5	2,39	4,58	0	4
Kleve	1,35	1,21	1,76	2	0	0	3,56	1,88	0	4
Koblenz	1,93	1,7	1,94	3	1	0	3,56	1,88	1,7	2
Konstanz	1,43	1,52	1,52	1	0	0	3,11	3,75	0	2
Krefeld	1,76	1,26	2,41	4	0	0	3,78	1,88	0	6
Köln	6,74	6,24	6,62	9	1	5,5	6,28	9,38	6,4	6
Landau (Pfalz)	1,08	1,1	1,22	1	0	0	3,06	1,88	0	2
Landshut	1,32	1,16	1,42	2	1	1,5	2,61	0,63	0	2
Leipzig	4,01	3,56	4	6	1	3	4,11	5,42	3	4
Limburg	1,35	1,21	1,45	2	0	0,5	3,06	1,88	0	2
Lingen	0,92	0,91	1,4	1	0	0	2,83	1,25	0	4
Lippstadt	1,35	1,21	2,07	2	0	0	3,56	1,88	0	6
Ludwigshafen am Rhein	1,81	1,32	2,45	4	0	0,5	3,56	1,88	0	6
Lübeck	2,2	2,02	2,48	3	0	0	3,86	1,25	4	4
Lüneburg	1,13	0,94	1,27	2	1	0	3,11	0,63	0	2
Magdeburg	2,94	2,93	2,8	3	4	0	3,11	4,58	3,5	2
Mainz	3,14	3,17	3,27	3	4	2,5	3,56	5,21	1	4
Mannheim	3,51	2,96	3,9	6	0	3,5	3,78	6,04	0	6
Marburg an der Lahn	2,11	2,13	2,4	2	0	0	3,56	6,04	0	4
Memmingen	1,22	1,27	2,26	1	0	0	3,83	1,88	0	8
Menden (Sauerland)	1,21	1,26	1,02	1	0	0	3,78	1,88	0	0
Minden	1,31	1,16	1,72	2	0	0	3,33	1,88	0	4
Mönchen-Gladbach	1,85	1,37	2,18	4	0	0	3,78	1,88	0,5	4
München	7,99	7,77	6,76	9	5	8,5	6,58	9,38	8	0
Münster	3,69	3,4	3,74	5	1	0	4,06	6,04	4,7	4
Naumburg	0,97	0,97	1,13	1	0	0	3,11	1,25	0	2
Neubrandenburg	0,74	0,46	0,93	2	0	0	1,44	0,63	0	2
Neumarkt	0,84	0,81	1,33	1	0	0	2,39	1,25	0	4
Neumünster	1,03	0,81	1,18	2	0	0	2,39	1,25	0	2
Neustadt an der Weinstrasse	1,26	1,32	1,38	1	1	0	3,56	1,88	0	2
Nordhausen	1	1	1,15	1	0	0	2,61	1,88	0	2
Nordhorn	0,92	0,91	1,09	1	0	0	2,83	1,25	0	2
Nürnberg-Fürth	4,94	4,48	5,1	7	0	4	5,03	6,04	5,1	6
Offenburg - Kehl	1,24	1,07	1,97	2	0	0	3,56	1,25	0	6
Oldenburg	1,56	1,24	1,63	3	1	0,5	3,33	1,25	0	2
Osnabrück	2,03	1,81	2,33	3	0	0	3,56	4,58	0	4
Paderborn	2,32	2,17	2,58	3	0	0,5	4,06	5,21	0	4

Germany (DE)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Passau	1,76	1,71	1,8	2	0	0	2,39	2,29	3	2
Peine	1,28	1,34	1,39	1	0	0	4,78	1,25	0	2
Pforzheim	1,53	1,21	1,91	3	0	0	3,56	1,88	0	4
Pirmasens	1,09	1,11	1,23	1	0	0	3,11	1,88	0	2
Plauen	1,18	1	1,31	2	0	0	2,61	1,88	0	2
Ravensburg	1,09	1,11	1,54	1	0	0	3,11	1,88	0	4
Regensburg	2,58	2,49	3,11	3	1	1	3,11	4,58	2	6
Remscheid	1,48	1,37	1,26	2	0	0	4,28	1,88	0	0
Reutlingen	1,27	1,11	2	2	0	0	3,11	1,88	0	6
Rheine	1,35	1,21	1,76	2	0	0	3,56	1,88	0	4
Rosenheim	1,27	1,11	1,38	2	0	0	3,11	1,88	0	2
Rostock	1,97	1,74	1,97	3	0	0	2,19	3,13	2,5	2
Rudolstadt	0,96	0,95	1,12	1	0	0	2,39	1,88	0	2
Saalfeld	0,96	0,95	1,12	1	0	0	2,39	1,88	0	2
Saarbrücken	3,41	2,84	3,5	6	4	1,5	4,06	5,21	0	4
Salzgitter	1,67	1,59	2,02	2	0	0,5	4,78	1,88	0	4
Schweinfurt	1,15	0,96	1,59	2	0	0	3,06	1,25	0	4
Schwerin	1,6	1,51	1,66	2	4	0	2,17	0,63	2	2
Schwäbisch Gmünd	1,31	1,16	1,72	2	0	0	3,33	1,88	0	4
Siegen	1,99	1,76	2,61	3	0	0	3,56	4,38	0	6
Solingen	1,48	1,37	1,26	2	0	0	4,28	1,88	0	0
Speyer	1,17	1,21	1,3	1	0	0	3,56	1,88	0	2
Stendal	0,8	0,76	0,99	1	0	0	2,17	1,25	0	2
Stralsund	0,5	0,39	0,73	1	0	0	1,11	0,63	0	2
Straubing	0,91	0,67	1,08	2	0	0	2,39	0,63	0	2
Stuttgart	5,73	5,01	6,08	9	5	7,5	6,28	6,25	0	8
Suhl	0,96	0,95	1,12	1	0	0	2,39	1,88	0	2
Trier	2,61	2,75	2,52	2	1	0,5	3,06	5,42	2,9	2
Tübingen	2,16	2,19	2,44	2	1	0	3,33	6,04	0	4
Ulm	2,87	2,84	3,04	3	0	1,5	3,56	5,21	2,5	4
Velbert-Heiligenhaus	1,3	1,37	1,1	1	0	0	4,28	1,88	0	0
Viersen	1,21	1,26	1,02	1	0	0	3,78	1,88	0	0
Villingen-Schwenningen	1,01	1,02	1,47	1	0	0	3,33	1,25	0	4
Weiden (Oberpfalz)	1,03	0,81	1,18	2	0	0	2,39	1,25	0	2
Wetzlar	1,35	1,21	1,76	2	0	0	3,56	1,88	0	4
Wiesbaden	3,08	2,88	3,22	4	5	2	3,56	1,88	3	4
Wilhelmshaven	1,16	0,98	1,29	2	0	0	3,14	1,25	0	2
Wismar	0,6	0,51	0,82	1	0	0	1,67	0,63	0	2

Germany (DE)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Wittenberg	0,84	0,81	1,02	1	0	0	2,39	1,25	0	2
Wolfsburg	1,67	1,38	2,34	3	0	1	3,33	1,88	0	6
Wüppertal	2,48	2,15	3,02	4	0	0	4,28	4,38	1	6
Würzburg	2,75	2,7	2,94	3	0	0	3,56	4,58	4	4

Denmark (DK)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Aabenraa	0,75	0,69	0,94	1	0	0	1,22	1,88	0	2
Aalborg	1,93	1,7	2,25	3	1	0	0,75	4,38	2	4
Aarhus	3,36	3,21	3,46	4	0	3	2,58	6,88	2	4
Esbjerg	0,91	0,66	1,38	2	0	0	1,11	1,88	0	4
Frederikshavn	0,61	0,53	0,83	1	0	0	0,5	1,88	0	2
Haderslev	0,75	0,69	0,94	1	0	0	1,22	1,88	0	2
Herning	0,63	0,55	0,84	1	0	0	0,61	1,88	0	2
Hjörring	0,61	0,53	0,83	1	0	0	0,5	1,88	0	2
Holbaek	0,91	0,66	1,38	2	0	0	1,11	1,88	0	4
Holstebro	0,63	0,55	0,84	1	0	0	0,61	1,88	0	2
Horsens	0,75	0,69	0,94	1	0	0	1,22	1,88	0	2
Kobenhavn	7,45	7,33	7,23	8	7,5	8,5	5,81	8,54	6,4	6
Kolding	1,02	0,8	1,48	2	0	0	1,72	1,88	0	4
Naestved	0,75	0,69	1,25	1	0	0	1,22	1,88	0	4
Nyköbing Falste	0,75	0,69	0,94	1	0	0	1,22	1,88	0	2
Odense	1,84	1,58	2,17	3	0	0	1,22	4,38	1,5	4
Randers	0,95	0,71	1,42	2	0	0	1,33	1,88	0	4
Silkeborg	0,77	0,71	0,96	1	0	0	1,33	1,88	0	2
Skive	0,61	0,53	0,83	1	0	0	0,5	1,88	0	2
Slagelse	0,73	0,66	1,23	1	0	0	1,11	1,88	0	4
Svendborg	0,75	0,69	1,25	1	0	0	1,22	1,88	0	4
Sönderborg	0,75	0,69	0,94	1	0	0	1,22	1,88	0	2
Vejle	1,02	0,8	1,48	2	1	0	1,22	1,88	0	4
Viborg	0,71	0,64	1,21	1	1	0	0,5	1,88	0	4

Estonia (EE)									
fua name	**global score**	**functional score**	**functional score with industry**	**population**	**administration**	**decision**	**transport**	**knowledge**	**tourism**	**industry**
Kohtla-Jarve	0,5	0,39	0,73	1	0	0	0,5	1,25	0	2
Narva	0,45	0,33	0,69	1	0	0	0,25	1,25	0	2
Pärnu	0,59	0,5	0,81	1	1	0	0,5	1,25	0	2
Tallinn	4,3	4,15	3,95	5	6	6	2,25	2,92	4,5	2
Tartu	1,23	1,06	1,35	2	1	0	0,5	3,75	0	2

Spain (ES)									
fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Albacete	0,57	0,25	0,79	2	1	0	0,61	0	0	2
Alcazar de San Juan	0,29	0,14	0,56	1	0	0	0,61	0	0	2
Alcoy	0,54	0,44	0,76	1	0	0	1,33	0,63	0	2
Algeciras	1,01	0,78	1,47	2	0	0	2,83	0	0,7	4
Alicanta	2,37	1,79	2,93	5	1,5	0	3,33	3,96	0	6
Elche	1,29	0,92	1,71	3	0	0	1,83	2,29	0	4
Almeria	0,76	0,49	0,95	2	1	0	0,86	0,83	0	2
Alzira	0,72	0,44	1,53	2	0	0	1,33	0,63	0	6
Andujar	0,25	0,08	0,52	1	0	0	0,36	0	0	2
Aranjuez	0,8	0,76	0,99	1	0	0	2,17	1,25	0	2
Arrecife	0,3	0,14	0,87	1	0	0	0	0,63	0	4
Avila	0,38	0,25	0,63	1	1	0	0,61	0	0	2
Aviles	0,52	0,2	0,75	2	0	0	0,25	0,63	0	2
Badajoz	0,95	0,72	1,12	2	1	0	0,25	2,5	0	2
Barcelona	7,35	6,76	7,76	10	5	7,5	6,17	6,25	8	10
Benidorm	0,72	0,44	1,22	2	0	0	1,33	0,63	0	4
Bilbao	3,98	3,53	4,29	6	1,5	4	3,83	5,21	2,1	6
Blanes	0,9	0,66	1,38	2	0	0	1,72	1,25	0	4
Burgos	1,55	1,45	1,93	2	1	0	0,72	0	5,3	4
Caceres	0,32	0,17	0,88	1	1	0	0,25	0	0	4
Cadiz	1,26	0,65	1,99	4	1	0	1,58	0,83	0	6
Cartagena	0,57	0,25	1,09	2	0	0	1,11	0	0	4
Castellon de la Plana	0,97	0,52	1,75	3	1	0	1,22	0,63	0	6
Ceuta	0,48	0,36	0,4	1	2	0	0	0,63	0	0
Cieza	0,25	0,08	0,52	1	0	0	0,36	0	0	2
Ciudad Real	0,38	0,25	0,63	1	1	0	0,61	0	0	2
Cordoba	2,36	2	2,61	4	1	0	0,61	1,67	6,2	4
Denia	0,54	0,44	0,76	1	0	0	1,33	0,63	0	2
Don Benito	0,23	0,06	0,5	1	0	0	0,25	0	0	2
Donostia-San Sebastian	1,98	1,54	2,6	4	1	0	1,83	1,88	2,7	6
Durango	0,77	0,71	0,96	1	0	0	1,33	1,88	0	2
Eibar	0,25	0,08	0,52	1	0	0	0,36	0	0	2
El Ejido	0,25	0,08	0,52	1	0	0	0,36	0	0	2
Elda	0,72	0,44	1,22	2	0	0	1,33	0,63	0	4
Ferrol	0,56	0,24	1,09	2	0	0	1,08	0	0	4
Figueres	0,76	0,7	1,26	1	0	0	1,22	1,25	0,7	4
Gandia	0,86	0,6	1,34	2	0	0	2,08	0,63	0	4
Gijon	1,02	0,36	1,48	4	0	0	1	0,63	0	4

Spain (ES)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Girona	2,06	2,08	2,36	2	1	0	2,22	2,92	3,7	4
Granada	2,76	2,49	2,95	4	1	0	0,36	3,33	7	4
Guadalajara	0,38	0,25	0,63	1	1	0	0,61	0	0	2
Huelva	0,66	0,36	1,17	2	1	0	1,11	0	0	4
Ibiza	0,61	0,53	1,13	1	0	0	0,97	0	1,4	4
Igualada	0,8	0,76	0,99	1	0	0	2,17	1,25	0	2
Jaen	0,52	0,19	1,06	2	1	0	0,36	0	0	4
Jerez de la Frontera	0,79	0,3	1,28	3	0	0	1,33	0	0	4
La Coruna	1,59	1,06	1,96	4	1	1	1,58	1,67	0	4
La Orotava-Puerto de la Cruz	0,48	0,14	1,02	2	0	0	0	0,63	0	4
La Vall d'Uixo	0,43	0,3	0,67	1	0	0	0,72	0,63	0	2
Las Palmas de Gran Canarias	3,04	2,38	3,19	6	1,5	0	3	3,96	3	4
Leon	0,74	0,46	1,24	2	1	0	0,75	0,83	0	4
Lerida	1,1	0,9	1,54	2	1	0	0,61	2,92	0	4
Linares	0,25	0,08	0,52	1	0	0	0,36	0	0	2
Logrono	0,77	0,5	1,27	2	2	0	0,61	0,63	0	4
Lorca	0,25	0,08	0,52	1	0	0	0,36	0	0	2
Lucena	0,29	0,14	0,56	1	0	0	0,61	0	0	2
Lugo	0,59	0,28	0,81	2	1	0	0,75	0	0	2
Madrid	8,53	8,2	8,76	10	9,5	9,5	4,92	8,75	9	10
Malaga	2,66	1,92	3,17	6	1	0	3,33	2,5	2,3	6
Manresa	1,03	1,04	0,87	1	0	0	4,67	0	0	0
Marbella	0,63	0,55	1,15	1	0	0	1,08	0	1,4	4
Mataro	0,99	0,76	1,45	2	0	0	2,17	1,25	0	4
Melilla	0,59	0,5	0,5	1	2	0	0	1,25	0	0
Merida	0,41	0,28	0,65	1	2	0	0,25	0	0	2
Mondragon o Arrasate	0,86	0,82	1,03	1	0	0	1,83	1,88	0	2
Montilla	0,29	0,14	0,56	1	0	0	0,61	0	0	2
Motril	0,25	0,08	0,52	1	0	0	0,36	0	0	2
Murcia	1,18	1,22	1,62	1	2	0	0	2,5	2	4
Ontinyent	0,54	0,44	0,76	1	0	0	1,33	0,63	0	2
Orense	0,52	0,19	0,75	2	1	0	0,36	0	0	2
Oviedo	1,93	1,47	2,56	4	2	0,5	1	3,13	1	6
Palencia	0,4	0,27	0,65	1	1	0	0,72	0	0	2
Palma de Mallorca	3,15	2,96	3,28	4	2	0	3,72	2,5	6,1	4
Pamplona	1,93	1,47	2,56	4	2	0	0,86	3,75	1	6
Ponferrada	0,27	0,11	0,54	1	0	0	0,5	0	0	2
Pontevedra	0,65	0,35	1,17	2	1	0	1,08	0	0	4

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Spain (ES)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Puertollano	0,29	0,14	0,56	1	0	0	0,61	0	0	2
Roquetas de Mar	0,25	0,08	0,52	1	0	0	0,36	0	0	2
Salamanca	1,98	1,98	1,99	2	1	0	0,61	2,5	5,3	2
Sanlucar de Barramed	0,38	0,24	0,63	1	0	0	1,08	0	0	2
Santa Cruz de Tenerife	1,78	1,29	2,12	4	1,5	0	2,75	2,29	0	4
Santa Lucia de Tirajana	0,3	0,14	0,25	1	0	0	0	0,63	0	0
Santander	1,55	1,45	1,93	2	2	0	0,86	1,67	3	4
Santiago de Compostella	2,5	2,61	2,73	2	2	0	1,83	2,5	6,4	4
Segovia	1,28	1,34	1,39	1	1	0	0,72	0	4,8	2
Sevilla	4,48	3,7	4,72	8	3	2,5	2,08	4,17	6,4	6
Talavera de la Reina	0,29	0,14	0,56	1	0	0	0,61	0	0	2
Tarragona	2,11	1,92	2,71	3	1	0,5	1,47	1,25	4,9	6
Toledo	1,35	1,42	1,45	1	2	0	0,61	0	4,8	2
Torrelavega	0,25	0,08	0,52	1	0	0	0,36	0	0	2
Torrevieja	0,54	0,44	0,76	1	0	0	1,33	0,63	0	2
Ubeda	0,25	0,08	0,52	1	0	0	0,36	0	0	2
Valencia	4,92	4,24	5,39	8	2	3	4,33	5,63	5,1	8
Valladolid	2,05	1,62	2,35	4	2	0	0,97	3,33	2	4
Vic	0,8	0,76	1,3	1	0	0	2,17	1,25	0	4
Vigo	1,56	1,02	2,24	4	0	0	2,08	2,5	0	6
Vilafranca del PenedËs	0,8	0,76	0,99	1	0	0	2,17	1,25	0	2
Vilagarcia de Arousa	0,38	0,24	0,63	1	0	0	1,08	0	0	2
Vinaros	0,43	0,3	0,67	1	0	0	0,72	0,63	0	2
Vitoria-Gasteiz	1,18	1	1,61	2	4	0	0,61	1,88	0	4
Xativa	0,54	0,44	0,76	1	0	0	1,33	0,63	0	2
Zamora	0,4	0,27	0,65	1	1	0	0,72	0	0	2
Zaragoza	2,56	1,8	3,09	6	2	0	0,97	3,13	3	6
Velez Malaga	0,97	0,96	0,82	1	0	0	3,33	0	1	0
Orihuela	0,91	0	0,77	5	0	0	0	0	0	0
Utrera	0,92	0,91	1,7	1	0	0	2,08	0	2	6

FINLAND (FI)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Hameenlinna	0,66	0,58	0,87	1	1	0	0,25	1,88	0	2
Helsinki	7,32	7,17	7,42	8	7	9	3,97	9,38	6,4	8
Joensuu	1,13	1,16	1,26	1	1	0	0,25	3,75	0,7	2
Jyvaskyla	1,4	1,27	1,8	2	1	0	0	5,21	0	4
Kajaani	0,5	0,39	0,73	1	1	0	0	1,25	0	2
Kemi - Tornio	0,52	0,42	1,06	1	0	0	0	1,88	0	4
Kokkola	0,66	0,58	0,87	1	1	0	0,25	1,88	0	2
Kotka	0,68	0,61	1,19	1	1	0	1	1,25	0	4
Kouvola	0,45	0,33	1	1	0	0	0,25	1,25	0	4
Kuopio	1,06	1,07	1,51	1	1	0	0	2,92	1,4	4
Lahti	0,73	0,44	1,23	2	1	0	0,25	1,25	0	4
Lappeenranta	0,75	0,7	1,25	1	1	0	0,97	1,67	0	4
Mikkeli	0,55	0,44	0,77	1	1	0	0,25	1,25	0	2
Oulu	1,54	1,44	2,22	2	1	0	0,25	5,21	0,5	6
Pori	0,66	0,58	1,17	1	1	0	0,25	1,88	0	4
Rauma	0,61	0,53	0,83	1	0	0	0,5	1,88	0	2
Rovaniemi	1,04	1,05	1,19	1	1	0	0,25	1,88	2,1	2
Salo	0,52	0,42	1,37	1	0	0	0	1,88	0	6
Seinajoki	0,61	0,53	0,83	1	1	0	0	1,88	0	2
Tampere	2,34	1,97	2,9	4	1	0	0,5	6,88	1	6
Turku	1,96	1,73	2,58	3	1	0	0,25	6,04	1	6
Vaasa	1,01	1,01	1,47	1	1	0,5	0	3,54	0	4

France (FR)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Agen	0,7	0,64	NA	1	1	0	1,11	1,25	0	NA
Ajaccio	0,79	0,74	NA	1	2	0	0,25	0	2,1	NA
Albi	1,12	1,15	NA	1	1	0	0,61	1,25	2,8	NA
Alençon	0,8	0,76	NA	1	1	0	1,67	1,25	0	NA
Alès	0,8	0,76	NA	1	0	0	2,17	1,25	0	NA
Amiens	2,11	1,91	NA	3	2	0	3,33	1,25	3	NA
Angers	2,31	2,16	NA	3	1,5	0	2,89	2,08	4	NA
Angoulême	0,88	0,64	NA	2	1	0	1,11	1,25	0	NA
Annecy	1,78	1,73	NA	2	1	0	2,89	2,08	2,3	NA
Annemasse	1,12	0,92	NA	2	0	0	2,89	1,25	0	NA
Arcachon	1,12	1,15	NA	1	0	0	1,83	1,25	2,1	NA
Arles	1,42	1,52	NA	1	0	0	2,17	1,25	3,4	NA
Armentières	1,19	1,23	NA	1	0	0	4,28	1,25	0	NA
Arras	1,53	1,65	NA	1	1	0	3,56	1,25	2,1	NA
Aurillac	0,73	0,66	NA	1	1	0	0,61	1,88	0	NA
Auxerre	0,84	0,81	NA	1	1	0	1,89	1,25	0	NA
Avignon	2,24	2,07	NA	3	1	0	2,67	1,25	4,9	NA
Bastia	0,36	0,22	NA	1	1	0	0,5	0	0	NA
Bayonne	1,26	1,09	NA	2	0	0	1,36	1,25	2,3	NA
Beauvais	1,45	1,55	NA	1	1	0	3,11	1,25	2,1	NA
Belfort	0,93	0,92	NA	1	1	0	2,39	1,25	0	NA
Bergerac	0,61	0,52	NA	1	0	0	1,11	1,25	0	NA
Besançon	1,48	1,36	NA	2	2	0	2,39	1,25	1,5	NA
Blois	1,19	1,23	NA	1	1	0	1,67	1,25	2,1	NA
Bordeaux	3,57	3,03	NA	6	2	2	3,58	1,25	5,8	NA
Boulogne-sur-Mer	1,24	1,07	NA	2	0	0	3,56	1,25	0	NA
Bourg-en-Bresse	0,93	0,92	NA	1	1	0	2,39	1,25	0	NA
Bourges	1,47	1,57	NA	1	1	0	1,92	1,25	3,4	NA
Brest	1,15	0,74	NA	3	0	0	1,25	2,08	0	NA
Brive-la-Gaillarde	0,5	0,39	NA	1	0	0	1,11	0,63	0	NA
Béthune	1,42	1,07	NA	3	0	0	3,56	1,25	0	NA
Béziers	0,99	0,76	NA	2	0	0	2,17	1,25	0	NA
Caen	2,46	2,34	NA	3	2	0	1,67	3,75	4,1	NA
Calais	1,33	1,18	NA	2	0	0	4,06	1,25	0	NA
Cambrai	1,19	1,23	NA	1	0	0	4,28	1,25	0	NA
Carcassonne	1,23	1,28	NA	1	1	0	1,22	1,25	2,8	NA
Chambéry	1,58	1,49	NA	2	1	0	2,64	1,25	2,3	NA
Charleville-Mézières	0,97	0,97	NA	1	1	0	2,61	1,25	0	NA

France (FR)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Chartres	1,16	0,97	NA	2	1	0	2,61	1,25	0	NA
Cherbourg	0,67	0,6	NA	1	0	0	1,44	1,25	0	NA
Cholet	0,93	0,92	NA	1	0	0	2,89	1,25	0	NA
Châlon-sur-Saône	1,12	0,92	NA	2	0	0	2,89	1,25	0	NA
Châlons-en-Champagne	1,07	1,08	NA	1	2	0	2,61	1,25	0	NA
Châteauroux	0,8	0,76	NA	1	1	0	1,67	1,25	0	NA
Châtelleraut	0,76	0,71	NA	1	0	0	1,94	1,25	0	NA
Clermont-Ferrand	2,72	2,43	NA	4	2	0,5	1,94	2,71	4,8	NA
Cluses	0,93	0,92	NA	1	0	0	2,89	1,25	0	NA
Colmar	1,69	1,84	NA	1	1	0	3,11	1,88	2,8	NA
Compiègne	1,13	1,15	NA	1	0	0	3,11	2,08	0	NA
Creil	0,97	0,97	NA	1	0	0	3,11	1,25	0	NA
Dieppe	0,96	0,95	NA	1	0	0	2,39	1,88	0	NA
Dijon	2,26	2,1	NA	3	2	0	2,39	1,25	4,8	NA
Douai-Lens	2,05	1,4	NA	5	0	0	5,03	1,25	0	NA
Dreux	0,88	0,86	NA	1	0	0	2,61	1,25	0	NA
Dunkerque	1,73	1,45	NA	3	0	0	5,28	1,25	0	NA
Epinal	0,93	0,92	NA	1	1	0	2,39	1,25	0	NA
Evreux	0,96	0,95	NA	1	1	0	1,89	1,88	0	NA
Forbach - Saint-Avold	1,24	1,07	NA	2	0	0	3,56	1,25	0	NA
Fréjus	0,74	0,68	NA	1	0	0	1,83	1,25	0	NA
Grenoble	3,57	3,25	NA	5	1	1,5	2,89	6,25	3,5	NA
Haguenau	1,22	1,26	NA	1	0	0	3,81	1,88	0	NA
La Roche-sur-Yon	0,7	0,64	NA	1	1	0	1,11	1,25	0	NA
La Rochelle	0,93	0,69	NA	2	1	0	1,36	1,25	0	NA
Laval	0,8	0,76	NA	1	1	0	1,67	1,25	0	NA
Le Creusot - Montceau-les-Mines	0,84	0,81	NA	1	0	0	2,39	1,25	0	NA
Le Havre	1,92	1,68	NA	3	0	0	3,89	1,88	1,8	NA
Le Mans	1,45	1,1	NA	3	1	0	2,39	2,08	0	NA
Le Puy-en-Velay	1,39	1,47	NA	1	1	0	1,44	1,88	2,8	NA
Lille	4	3,33	NA	7	2,25	2	5,03	2,92	3,9	NA
Limoges	1,38	1,24	NA	2	2	0	1,11	1,46	2	NA
Lons-le-Saunier	0,89	0,87	NA	1	1	0	2,17	1,25	0	NA
Lorient	0,79	0,52	NA	2	0	0	1,11	1,25	0	NA
Lyon	5,54	4,99	NA	8	4	2,5	5,08	7,08	5,8	NA
Macon	1,03	1,03	NA	1	1	0	2,89	1,25	0	NA
Marseille	4,11	3,47	NA	7	2	2	5,42	2,08	5,1	NA
Maubeuge	1,19	1,23	NA	1	0	0	4,28	1,25	0	NA

France (FR)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Metz	2,01	1,79	NA	3	2	0	3,81	1,25	2	NA
Monaco-Menton	1,31	1,38	NA	1	0	0	2,17	1,25	2,8	NA
Mont-de-Marsan	0,72	0,66	NA	1	1	0	1,22	1,25	0	NA
Montargis	0,88	0,86	NA	1	0	0	2,61	1,25	0	NA
Montauban	0,74	0,68	NA	1	1	0	1,33	1,25	0	NA
Montbéliard	1,03	0,81	NA	2	0	0	2,39	1,25	0	NA
Montluçon	0,79	0,74	NA	1	0	0	1,44	1,88	0	NA
Montpellier	2,74	2,46	NA	4	2	0	2,67	2,92	4,5	NA
Montélimar	0,8	0,76	NA	1	0	0	2,17	1,25	0	NA
Moulins	0,88	0,85	NA	1	1	0	1,44	1,88	0	NA
Mulhouse - Thann	2,13	1,94	NA	3	0	0	4,36	1,88	2,5	NA
Nancy	2,3	2,15	NA	3	1	0	3,58	2,08	3,5	NA
Nantes	3,4	2,82	NA	6	2	0	3,69	2,92	5,1	NA
Narbonne	0,63	0,55	NA	1	0	0	1,22	1,25	0	NA
Nevers	0,8	0,76	NA	1	1	0	1,67	1,25	0	NA
Nice	3,45	3,1	NA	5	1	0	4,17	4,58	4,7	NA
Niort	0,9	0,66	NA	2	1	0	1,22	1,25	0	NA
Nîmes	1,62	1,54	NA	2	1	0	2,17	1,25	3	NA
Orléans	2,13	1,93	NA	3	2	0	2,61	2,08	3	NA
Paris	9,57	9,47	NA	10	9,5	10	8,5	9,38	10	NA
Pau	1,03	0,82	NA	2	1	0	1,11	2,08	0	NA
Perpignan	0,9	0,66	NA	2	1	0	1,22	1,25	0	NA
Poitiers	1,82	1,78	NA	2	2	0	1,94	2,08	3	NA
Périgueux	0,7	0,64	NA	1	1	0	1,11	1,25	0	NA
Quimper	1,15	1,19	NA	1	1	0,5	1	1,25	2,1	NA
Reims	2,12	1,92	NA	3	0	0	2,61	1,25	4,8	NA
Rennes	2,85	2,37	NA	5	2	0	2,42	3,75	3,5	NA
Roanne	0,89	0,87	NA	1	0	0	2,67	1,25	0	NA
Rodez	0,61	0,52	NA	1	1	0	0,61	1,25	0	NA
Romans-sur-Isère	0,8	0,76	NA	1	0	0	2,17	1,25	0	NA
Rouen - Elboeuf	2,5	2,17	NA	4	2	0	3,39	1,88	3,5	NA
Saint-Brieuc	0,7	0,64	NA	1	1	0	1,11	1,25	0	NA
Saint-Dizier	0,84	0,81	NA	1	0	0	2,39	1,25	0	NA
Saint-Etienne	1,62	1,09	NA	4	1	0	2,67	1,25	0,5	NA
Saint-Malo	1,42	1,52	NA	1	0	0	2,17	1,25	3,4	NA
Saint-Nazaire	0,94	0,71	NA	2	0	0	1,94	1,25	0	NA
Saint-Omer	1,06	1,07	NA	1	0	0	3,56	1,25	0	NA
Saint-Quentin	0,92	0,91	NA	1	0	0	2,83	1,25	0	NA
Saintes	0,61	0,52	NA	1	0	0	1,11	1,25	0	NA

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France (FR)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Salon-de-Provence	0,8	0,76	NA	1	0	0	2,17	1,25	0	NA
Sens	0,75	0,7	NA	1	0	0	1,89	1,25	0	NA
Soissons	0,92	0,91	NA	1	0	0	2,83	1,25	0	NA
Strasbourg	3,87	3,62	NA	5	5	2	4,81	1,88	5,1	NA
Sète	0,8	0,76	NA	1	0	0	2,17	1,25	0	NA
Tarbes	0,63	0,55	NA	1	1	0	0,72	1,25	0	NA
Thionville	1,24	1,07	NA	2	0	0	3,56	1,25	0	NA
Thonon-les-Bains	0,93	0,92	NA	1	0	0	2,89	1,25	0	NA
Toulon	1,62	0,87	NA	5	0	0	1,83	2,08	0	NA
Toulouse	3,6	3,06	NA	6	2	0,5	3,44	3,75	5,1	NA
Tours	2,01	1,79	NA	3	1	0	2,17	2,08	3,3	NA
Troyes	1,53	1,43	NA	2	1	0	2,39	1,25	2,3	NA
Valence	1,08	0,87	NA	2	1	0	2,17	1,25	0	NA
Valenciennes	1,57	1,26	NA	3	0,25	0	4,28	1,25	0	NA
Vannes	1,08	1,1	NA	1	1	0	1,11	1,25	2,1	NA
Vichy	0,79	0,74	NA	1	0	0	1,44	1,88	0	NA
Vienne	0,93	0,92	NA	1	0	0	2,89	1,25	0	NA
Villefranche-sur-Saône	1,01	1,02	NA	1	0	0	3,33	1,25	0	NA

Greece (GR)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Agrinion	0,23	0,06	0,5	1	0	0	0,25	0	0	2
Alexandroupolis	0,23	0,06	0,5	1	0	0	0,25	0	0	2
Athinai	7,69	7,4	7,74	9	7	9	5,06	6,25	9,5	8
Drama	0,23	0,06	0,5	1	0	0	0,25	0	0	2
Ioannina	0,47	0,35	0,7	1	1	0	0,25	0,83	0	2
Iraklion	1,27	1,1	1,38	2	1,5	0	0,25	1,67	2,3	2
Kalamata	0,2	0,02	0,48	1	0	0	0,11	0	0	2
Katerini	0,23	0,06	0,5	1	0	0	0,25	0	0	2
Kavalla	0,23	0,06	0,5	1	0	0	0,25	0	0	2
Khalkis	0,25	0,08	0,52	1	0	0	0,36	0	0	2
Khania	0,18	0	0,46	1	0	0	0	0	0	2
Komotini	0,47	0,35	0,7	1	1	0	0,25	0,83	0	2
Kozani	0,32	0,17	0,58	1	1	0	0,25	0	0	2
Lamia	0,34	0,19	0,59	1	1	0	0,36	0	0	2
Larisa	0,5	0,17	0,73	2	1	0	0,25	0	0	2
Patrai	0,91	0,67	1,08	2	1	0	0,86	1,67	0	2
Rhodos	1,24	1,29	1,35	1	1	0	0,5	0	4,8	2
Serrai	0,25	0,08	0,52	1	0	0	0,36	0	0	2
Thessaloniki	2,69	1,73	2,58	7	2	0	3,47	3,33	0	2
Trikala	0,23	0,06	0,5	1	0	0	0,25	0	0	2
Volos	0,27	0,11	0,54	1	0	0	0,5	0	0	2
Xanthi	0,23	0,06	1,12	1	0	0	0,25	0	0	6

Hungary (HU)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Ajka	0,52	0,41	0,75	1	0	0	1,22	0,63	0	2
Baja	0,52	0,41	0,75	1	0	0	1,22	0,63	0	2
Bekescsaba	0,7	0,41	0,9	2	1	0	0,72	0,63	0	2
Budapest	7,61	7,3	7,36	9	7	7,5	5,11	8,75	8	6
Cegled	0,76	0,71	0,95	1	0	0	1,94	1,25	0	2
Debrecen	0,99	0,55	1,15	3	1	0	0,72	1,25	0	2
Dunaujvaros	0,56	0,46	0,78	1	0	0	1,44	0,63	0	2
Eger	0,72	0,66	0,92	1	1	0	1,22	1,25	0	2
Esztergom	0,64	0,56	0,85	1	0	0	1,89	0,63	0	2
Gyöngyös	0,63	0,55	0,84	1	0	0	1,22	1,25	0	2
Györ	0,87	0,62	1,05	2	1	0	1,67	0,63	0	2
Hajduboszormeny	0,54	0,44	0,76	1	0	0	0,72	1,25	0	2
Hatvan	0,63	0,55	0,84	1	0	0	1,22	1,25	0	2
Hodmezovasarhely	0,43	0,3	0,67	1	0	0	0,72	0,63	0	2
Jaszbereny	0,63	0,55	0,84	1	0	0	1,22	1,25	0	2
Kaposvar	0,81	0,55	1	2	1	0	0,72	1,25	0	2
Karcag	0,63	0,55	0,84	1	0	0	1,22	1,25	0	2
Kazincbarcika	0,63	0,55	0,84	1	0	0	1,22	1,25	0	2
Kecskemet	0,79	0,52	0,98	2	1	0	1,22	0,63	0	2
Kiskunfelegyhaza	0,52	0,41	0,75	1	0	0	1,22	0,63	0	2
Mako	0,43	0,3	0,67	1	0	0	0,72	0,63	0	2
Miskolc	1,6	1,29	1,66	3	1	0	1,22	2,08	2	2
Mohacs	0,5	0,39	0,73	1	0	0	0,5	1,25	0	2
Mosonmagyarovar	0,6	0,51	0,82	1	0	0	1,67	0,63	0	2
Nagykanizsa	0,52	0,41	0,75	1	0	0	1,22	0,63	0	2
Nyiregyhaza	1,09	0,88	1,23	2	1	0,5	0,72	1,25	1	2
Oroshaza	0,43	0,3	0,67	1	0	0	0,72	0,63	0	2
Ozd	0,63	0,55	0,84	1	0	0	1,22	1,25	0	2
Paks	0,52	0,41	0,75	1	0	0	0,61	1,25	0	2
Papa	0,52	0,41	0,75	1	0	0	1,22	0,63	0	2
Pecs	1,59	1,5	1,65	2	1	0	0,5	1,25	4,5	2
Salgotarjan	0,72	0,66	0,92	1	1	0	1,22	1,25	0	2
Sopron	1,11	1,13	1,25	1	0	0	1,67	0,63	2,8	2
Szeged	1,15	0,97	1,28	2	1	0	0,72	3,13	0	2
Szekesféhervar	0,83	0,57	1,01	2	1	0	1,44	0,63	0	2
Szekszard	0,61	0,52	0,82	1	1	0	0,61	1,25	0	2
Szolnok	0,72	0,66	0,92	1	1	0	1,22	1,25	0	2
Szombathely	0,61	0,52	0,82	1	1	0	1,22	0,63	0	2

Hungary (HU)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Tatabanya	0,73	0,67	0,93	1	1	0	1,89	0,63	0	2
Veszprem	0,61	0,52	0,82	1	1	0	1,22	0,63	0	2
Zalaegerszeg	0,61	0,52	0,82	1	1	0	1,22	0,63	0	2

Ireland (IE)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Cork	3,12	3,15	3,57	3	1	2	2	4,58	5,1	6
Dublin	7,13	6,94	7,26	8	7,5	8,5	5,31	6,25	7,4	8
Dundalk	0,43	0,31	0,98	1	1	0	0,25	0,63	0	4
Galway	1,6	1,51	1,97	2	1	0,5	0,5	2,29	3	4
Limerick	2,64	2,56	3,15	3	1	1	1,75	3,75	4,5	6
Tralee	0,55	0,44	0,77	1	1	0	0,25	1,25	0	2
Waterford	0,59	0,5	0,81	1	0	0,5	0,5	1,25	0	2

| **Italy (IT)** | | | | | | | | | |
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fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Adrano	0,61	0,52	0,82	1	0	0	1,08	1,25	0	2
Agrigento	1,38	1,25	1,48	2	1	0	0,86	1,25	3	2
Alba	0,71	0,65	0,91	1	0	0	1,67	1,25	0	2
Alcamo	0,54	0,44	0,76	1	0	0	0,72	1,25	0	2
Alessandria	1,34	1,19	2,06	2	1	0,5	3,11	1,25	0	6
Altamura	0,56	0,46	0,47	1	0	0	1,44	0,63	0	0
Ancona	1,53	1,43	2,22	2	2	0,5	3,17	1,25	0,5	6
Andria	0,56	0,46	0,47	1	0	0	1,44	0,63	0	0
Aosta	1,19	1,23	1,31	1	2	0	1,89	1,25	1,4	2
Arezzo	1,35	1,43	1,76	1	1	0	1,89	1,25	2,8	4
Arzignano	0,88	0,86	1,06	1	0	0	2,61	1,25	0	2
Ascoli Piceno	0,85	0,82	1,34	1	1	0	1,94	1,25	0	4
Asti	1,25	1,08	1,67	2	1	0	3,11	1,25	0	4
Avellino	0,96	0,73	1,43	2	1	0	2,17	0,63	0	4
Aversa	1	0,78	1,46	2	0	0	2,89	0,63	0	4
Avezzano	0,58	0,49	0,8	1	0	0	0,94	1,25	0	2
Avola - Noto	0,59	0,49	0,5	1	0	0	0,97	1,25	0	0
Bagheria	0,61	0,52	0,82	1	0	0	1,08	1,25	0	2
Barcellona Pozzo di Gotto	0,61	0,52	0,82	1	0	0	1,08	1,25	0	2
Bari	2,6	2,07	3,13	5	2	0	2,19	3,13	3	6
Barletta	0,74	0,46	1,24	2	0	0	1,44	0,63	0	4
Bassano del Grappa	1,07	0,86	1,52	2	0	0	2,61	1,25	0	4
Belluno	0,8	0,76	1,3	1	1	0	1,67	1,25	0	4
Benevento	0,96	0,73	1,12	2	1	0	2,17	0,63	0	2
Bergamo	2,04	1,38	2,96	5	1	0,5	3,33	1,88	0	8
Biella	1,16	0,97	1,59	2	1	0	2,61	1,25	0	4
Bisceglie	0,74	0,46	1,24	2	0	0	1,44	0,63	0	4
Bologna	4,3	4,14	4,56	5	2	2,5	4,61	5,42	5,1	6
Bolzano	1,29	1,14	2,02	2	2	0	1,89	0,63	1,6	6
Borgomanero	0,97	0,97	1,13	1	0	0	3,11	1,25	0	2
Bra	0,86	0,83	0,73	1	0	0	1,67	2,08	0	0
Brescia	1,82	1,33	2,77	4	1	0,5	3,11	1,88	0	8
Brindisi	0,9	0,66	1,38	2	1	0	1,83	0,63	0	4
Cagliari	2,05	1,61	2,35	4	2	0	2,47	2,29	1,5	4
Caltagirone	0,61	0,52	0,82	1	0	0	1,08	1,25	0	2
Caltanisetta	0,57	0,47	0,79	1	1	0	0,36	1,25	0	2
Campobasso	0,65	0,57	0,86	1	2	0	0,94	0,63	0	2
Canicatti	0,57	0,47	0,48	1	0	0	0,86	1,25	0	0

Italy (IT)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Carpi	0,97	0,97	1,13	1	0	0	3,11	1,25	0	2
Casale Monferrato	0,97	0,97	1,13	1	0	0	3,11	1,25	0	2
Casarano	0,52	0,41	0,75	1	0	0	1,22	0,63	0	2
Caserta	1,79	1,29	2,43	4	1	0	2,89	0,63	1,8	6
Cassino	0,99	0,76	1,45	2	0	0	2,17	1,25	0	4
Catania	2,6	1,84	2,82	6	1	0	2,58	2,92	2,3	4
Catanzaro	0,86	0,61	1,04	2	2	0	0,5	1,25	0	2
Cecina	0,84	0,81	0,71	1	0	0	2,39	1,25	0	0
Cento	0,84	0,81	0,71	1	0	0	2,39	1,25	0	0
Cerignola	0,52	0,41	0,75	1	0	0	1,22	0,63	0	2
Cesena	0,89	0,86	1,37	1	0,5	0	2,39	1,25	0	4
Chiavari	0,84	0,81	1,02	1	0	0	2,39	1,25	0	2
Cittadella-Castelfranco Veneto	1,03	0,81	1,48	2	0	0	2,39	1,25	0	4
Civitanova Marche	0,63	0,55	0,53	1	0	0	1,22	1,25	0	0
Civitavecchia	1,02	1,02	1,17	1	0	0	3,36	1,25	0	2
Colleferro	0,97	0,97	0,82	1	0	0	3,11	1,25	0	0
Corato	0,56	0,46	0,47	1	0	0	1,44	0,63	0	0
Corigliano Calabrese	0,54	0,44	0,46	1	0	0	0,72	1,25	0	0
Cosenza	0,96	0,73	1,43	2	1	0	0,72	2,08	0	4
Crema	1	1	1,15	1	0	0	2,61	1,88	0	2
Cremona	1,09	1,11	1,54	1	1	0	2,61	1,88	0	4
Crotone	0,55	0,44	0,77	1	1	0	0,25	1,25	0	2
Cuneo	1,03	0,82	1,8	2	1	0	1,92	1,25	0	6
Empoli	0,93	0,92	1,41	1	0	0,5	2,39	1,25	0	4
Fabriano	0,8	0,76	0,99	1	0	0	2,17	1,25	0	2
Faenza	0,84	0,81	1,02	1	0	0	2,39	1,25	0	2
Fano	0,82	0,78	1	1	0	0	1,44	2,08	0	2
Fasano	0,54	0,44	0,46	1	0	0	1,33	0,63	0	0
Fermo	0,76	0,71	0,95	1	0	0	1,94	1,25	0	2
Ferrara	1,81	1,77	2,15	2	1	0	2,39	2,08	3	4
Fidenza	0,97	0,97	1,13	1	0	0	3,11	1,25	0	2
Firenze	4,49	4,16	4,72	6	2	1	3,89	5,42	7,4	6
Foggia	0,79	0,52	1,28	2	1	0	1,22	0,63	0	4
Foligno	0,67	0,6	0,88	1	0	0	1,44	1,25	0	2
Forli	1,12	0,92	1,56	2	0,5	0	2,64	1,25	0	4
Formia-Gaeta	0,76	0,71	0,95	1	0	0	1,94	1,25	0	2
Fossano	0,71	0,65	0,91	1	0	0	1,67	1,25	0	2
Frosinone	1,08	0,87	1,53	2	1	0	2,17	1,25	0	4

Italy (IT)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Galatina	0,52	0,41	0,44	1	0	0	1,22	0,63	0	0
Gela	0,52	0,41	0,75	1	0	0	0,61	1,25	0	2
Genova	4,16	3,75	4,44	6	2	3	4,39	4,58	3,9	6
Ginosa	0,54	0,44	1,07	1	0	0	1,33	0,63	0	4
Gioia del Colle	0,56	0,46	0,78	1	0	0	1,44	0,63	0	2
Gorizia	0,89	0,87	1,06	1	1	0	2,17	1,25	0	2
Grosseto	0,72	0,66	0,92	1	1	0	1,22	1,25	0	2
Iglesias	0,43	0,3	0,98	1	0	0	0,72	0,63	0	4
Imola	0,97	0,97	1,44	1	0	0	3,11	1,25	0	4
Imperia	1,11	1,13	1,24	1	1	0	1,67	2,92	0	2
Isernia	0,56	0,46	0,78	1	1	0	0,94	0,63	0	2
Ivrea	0,93	0,92	1,41	1	0	0	2,89	1,25	0	4
Jesi	0,8	0,76	0,99	1	0	0	2,17	1,25	0	2
La Spezia	1,21	1,03	1,64	2	1	0	2,89	1,25	0	4
Lamezia Terme	0,5	0,39	0,73	1	0	0	0,5	1,25	0	2
Latina	1,22	0,82	1,95	3	1	0	1,94	1,25	0	6
Lecce	0,94	0,71	1,41	2	1	0	1,22	1,46	0	4
Lecco	1,54	1,22	2,23	3	1	0	3,11	1,88	0	6
Legnago	0,97	0,97	1,13	1	0	0	3,11	1,25	0	2
Lentini	0,59	0,49	0,8	1	0	0	0,97	1,25	0	2
Livorno	1,34	1,2	1,75	2	1	0	3,64	1,25	0	4
L'Aquila	1	1	1,16	1	2	0	0,94	2,08	0,5	2
Lodi	1,45	1,33	1,84	2	1	0,5	3,11	1,88	0	4
Lucca	1,79	1,74	2,13	2	1	0	2,39	1,25	3,7	4
Lugo	1,03	0,81	1,18	2	0	0	2,39	1,25	0	2
Lumezzane	1,09	1,11	1,54	1	0	0	3,11	1,88	0	4
Macerata	0,72	0,66	1,23	1	1	0	1,22	1,25	0	4
Manduria	0,54	0,44	0,46	1	0	0	1,33	0,63	0	0
Manfredonia	0,52	0,41	0,75	1	0	0	1,22	0,63	0	2
Mantova	1,27	1,11	2	2	1	0	2,61	1,88	0	6
Marsala	0,72	0,44	0,92	2	0	0	0,72	1,25	0	2
Massa-Carrara	1,03	0,81	1,18	2	1	0	1,89	1,25	0	2
Matera	0,52	0,41	0,75	1	1	0	0,72	0,63	0	2
Merano	0,64	0,56	0,85	1	0	0	1,89	0,63	0	2
Messina	1,06	0,63	1,51	3	1	0	1,08	1,25	0	4
Milano – Busto Arsizio – Como	7,65	7,13	8,01	10	3	9,5	6,81	6,88	7,4	10
Milazzo	0,7	0,63	0,9	1	0	0	1,58	1,25	0	2
Mirandola	0,97	0,97	0,82	1	0	0	3,11	1,25	0	0

Italy (IT)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Modena	1,82	1,56	2,47	3	1	0,5	3,11	2,92	0	6
Modica	0,47	0,36	0,71	1	0	0	0,36	1,25	0	2
Mondovi	0,71	0,65	0,6	1	0	0	1,67	1,25	0	0
Monfalcone	0,99	0,76	1,14	2	0	0	2,17	1,25	0	2
Monopoli	0,56	0,46	0,47	1	0	0	1,44	0,63	0	0
Montebelluna	0,84	0,81	1,33	1	0	0	2,39	1,25	0	4
Montecatini-Terme	0,84	0,81	1,33	1	0	0	2,39	1,25	0	4
Montevarchi	0,75	0,7	0,64	1	0	0	1,89	1,25	0	0
Napoli - Castellamare di Stabia-Torre Annunziata - Nola	4,94	4,04	5,1	9	3	2	5,14	3,13	6,4	6
Nocera Inferiore	0,87	0,62	1,35	2	0	0	2,17	0,63	0	4
Novara	1,25	1,08	1,98	2	1	0	3,11	1,25	0	6
Novi Ligure	0,97	0,97	1,13	1	0	0	3,11	1,25	0	2
Nuoro	0,39	0,25	0,64	1	1	0	0	0,63	0	2
Olbia	0,43	0,31	0,67	1	0	0	0,75	0,63	0	2
Oristano	0,39	0,25	0,64	1	1	0	0	0,63	0	2
Padova	3,14	2,73	3,58	5	1	1	2,39	4,58	3,8	6
Palermo	3,53	2,98	3,6	6	2	1	2,58	3,75	5,1	4
Parma	2,02	1,8	2,63	3	1,5	0,5	3,11	3,75	0	6
Pavia	1,82	1,78	2,46	2	1	0	3,11	4,38	0	6
Perugia	2,05	2,06	2,66	2	2	0	1,44	2,92	3,9	6
Pesaro	0,76	0,71	1,26	1	1	0	1,44	1,25	0	4
Pescara	1,58	1,26	1,95	3	1	0	2,42	1,25	1,5	4
Piacenza	1,25	1,08	1,67	2	1	0	3,11	1,25	0	4
Pinerolo	0,93	0,92	1,41	1	0	0	2,89	1,25	0	4
Piombino	0,89	0,86	1,06	1	0	0	2,64	1,25	0	2
Pisa	2,89	3,09	3,06	2	1	0	3,39	5,42	4,6	4
Pistoia	0,93	0,92	1,41	1	1	0	2,39	1,25	0	4
Poggibonsi	0,71	0,65	0,91	1	0	0	1,67	1,25	0	2
Pontedera	0,84	0,81	1,33	1	0	0	2,39	1,25	0	4
Pordenone	0,99	0,76	1,45	2	1	0	1,67	1,25	0	4
Portogruaro	0,84	0,81	1,02	1	0	0	2,39	1,25	0	2
Potenza	0,79	0,52	1,28	2	2	0	0,72	0,63	0	4
Prato	1,12	0,92	1,56	2	1	0	2,39	1,25	0	4
Putignano	0,56	0,46	0,47	1	0	0	1,44	0,63	0	0
Ragusa	0,57	0,47	0,79	1	1	0	0,36	1,25	0	2
Rapallo	1,23	1,28	1,04	1	0	0	2,39	1,25	2,1	0
Ravenna	2,13	2,16	2,42	2	1	0	3,39	1,25	4,6	4

Italy (IT)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Reggio di Calabria	1,33	1,18	1,44	2	1	0	3,08	1,25	0,5	2
Reggio nell'Emilia	1,43	1,08	2,13	3	1	0	3,11	1,25	0	6
Rieti	0,67	0,6	0,88	1	1	0	0,94	1,25	0	2
Rimini	1,53	1,43	1,91	2	1	0	2,39	1,25	2,3	4
Roma	8,52	8,41	8,44	9	10	8	6,11	8,75	10	8
Rosetto degli Abruzzi - Giulianova	0,67	0,6	0,88	1	0	0	1,44	1,25	0	2
Rovereto	0,75	0,7	0,94	1	0	0	1,89	1,25	0	2
Rovigo	0,89	0,87	1,06	1	1	0	2,17	1,25	0	2
Salerno	1,95	1,72	2,58	3	1	0	2,42	3,13	1,7	6
San Benedetto del Tronto	0,76	0,71	0,95	1	0	0	1,94	1,25	0	2
San Dona di Piave	0,84	0,81	1,33	1	0	0	2,39	1,25	0	4
San Remo-Ventimiglia	1,09	1,12	1,23	1	0	0	1,67	1,25	2,1	2
San Severo	0,52	0,41	0,75	1	0	0	1,22	0,63	0	2
Sarno	0,69	0,62	0,58	1	0	0	2,17	0,63	0	0
Sassari	0,91	0,66	1,38	2	1	0,5	0,25	0,63	1,1	4
Sassuolo	1,16	0,97	1,59	2	0	0	3,11	1,25	0	4
Savona	1,07	1,09	1,52	1	1	0	3,14	1,25	0	4
Schio	0,88	0,86	1,06	1	0	0	2,61	1,25	0	2
Senigallia	0,8	0,76	0,99	1	0	0	2,17	1,25	0	2
Sessa Aurunca	0,82	0,78	0,7	1	0	0	2,89	0,63	0	0
Siena	2,11	2,36	2,4	1	1	0,5	1,67	3,75	4,2	4
Siracusa	1,67	1,59	2,03	2	1	0	1,72	1,25	3,7	4
Sora	0,8	0,76	0,99	1	0	0	2,17	1,25	0	2
Sorrento	1,2	1,25	1,33	1	0	0	2,89	0,63	2,1	2
Sulmona	0,58	0,49	0,8	1	0	0	0,94	1,25	0	2
Taranto	1,31	0,94	1,72	3	1	0	2,58	0,63	0,5	4
Teramo	0,76	0,71	1,26	1	1	0	1,44	1,25	0	4
Termini Imerese	0,61	0,52	0,82	1	0	0	1,08	1,25	0	2
Termoli	0,47	0,35	0,7	1	0	0	0,94	0,63	0	2
Terni	0,89	0,65	1,37	2	1	0	1,17	1,25	0	4
Thiene	0,88	0,86	1,36	1	0	0	2,61	1,25	0	4
Torino	5,57	5,03	5,94	8	2,5	6,5	4,14	6,25	4,5	8
Tortona	0,97	0,97	1,13	1	0	0	3,11	1,25	0	2
Trapani	0,86	0,6	1,03	2	1	0	0,97	1,25	0	2
Trento	2,27	2,33	2,84	2	2	0	1,89	4,58	3	6
Treviso	1,3	0,92	2,02	3	1	0	2,39	1,25	0	6
Trieste	2,18	2,22	2,15	2	2	1,5	3,42	2,08	2	2

Italy (IT)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Udine	1,58	1,26	2,26	3	1	0	1,44	3,75	0	6
Varese	1,4	1,27	1,8	2	1	0	3,33	1,88	0	4
Vasto	0,8	0,76	0,99	1	0	0	2,17	1,25	0	2
Velletri	0,97	0,97	1,44	1	0	0	3,11	1,25	0	4
Venezia	4,43	4,31	4,68	5	2	0,5	5,14	3,75	9	6
Verbania	0,88	0,86	1,06	1	1	0	2,11	1,25	0	2
Vercelli	1,07	1,08	1,52	1	1	0	3,11	1,25	0	4
Verona	3,51	3,18	3,9	5	1	1	4,11	2,92	5,8	6
Viareggio	0,84	0,81	1,33	1	0	0	2,39	1,25	0	4
Vibo Valentia	0,59	0,5	0,81	1	1	0	0,5	1,25	0	2
Vicenza	2,07	1,86	2,98	3	1	0	2,61	1,25	4	8
Viterbo	0,94	0,71	1,11	2	1	0	1,44	1,25	0	2
Vittoria	0,47	0,36	0,71	1	0	0	0,36	1,25	0	2
Vittorio Veneto-Conegliano	1,03	0,81	1,48	2	0	0	2,39	1,25	0	4
Voghera	1,09	1,11	1,23	1	0	0	3,11	1,88	0	2

Lithuania (LT)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Alytus	0,5	0,39	0,73	1	1	0	0,61	0,63	0	2
Kaunas	1,89	1,2	1,91	5	1	2	0,61	2,29	0	2
Klaipeda	1,3	0,92	1,4	3	1	1,5	1,5	0,63	0	2
Panevezys	0,45	0,33	0,69	1	1	0	0,36	0,63	0	2
Sialiai	0,63	0,33	0,84	2	1	0	0,36	0,63	0	2
Vilnius	4,26	3,87	3,91	6	7	6	1,5	3,13	3,3	2

Luxembourg (LU)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Luxembourg	5,05	5,29	5,2	4	8,5	8	4,56	1,88	5,1	6

Latvia (LV)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Daugavpils	0,61	0,31	0,83	2	1	0	0,25	0,63	0	2
Jelgava	0,43	0,31	0,67	1	1	0	0,25	0,63	0	2
Liepaja	0,43	0,31	0,67	1	1	0	0,25	0,63	0	2
Rezekne	0,43	0,31	0,67	1	1	0	0,25	0,63	0	2
Riga	4,88	4,41	4,44	7	7	6	2,97	2,29	5,1	2
Ventspils	0,75	0,7	0,94	1	1	1	1	0,63	0	2

Malta (MT)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Valletta	3,42	3,29	3,2	4	6	4	1,25	1,25	5,3	2

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The Netherlands (NL)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Alkmaar	1,75	1,7	1,79	2	0	0	3,33	2,71	1,6	2
Almelo	1,2	1,02	1,01	2	0	0	3,33	1,25	0	0
Almere	1,31	1,16	1,42	2	0	0	3,33	1,88	0	2
Amersfoort	1,76	1,48	1,79	3	0	0,5	4,28	1,88	0	2
Amsterdam	8,13	8,15	7,8	8	3,5	9,5	8,06	9,38	8	6
Appeldoorn	1,39	1,25	2,1	2	0	0	3,56	2,08	0	6
Arnhem	2,05	1,84	2,35	3	1	1	3,78	1,88	1,1	4
Assen	0,93	0,92	1,1	1	1	0	2,39	1,25	0	2
Bergen op Zoom	1,06	1,07	1,2	1	0	0	3,56	1,25	0	2
Breda	1,51	1,18	2,2	3	0	0,5	3,56	1,25	0	6
Delft	2,87	3,07	2,43	2	0	0	4,06	6,04	3,7	0
Den Bosch	1,69	1,4	2,05	3	1	1	3,56	1,25	0	4
Den Haag	4,96	4,73	4,81	6	9	5,5	4,06	2,71	4,5	4
Den Helder	1,09	1,11	1,23	1	0	0	3,11	1,88	0	2
Deventer	1,2	1,02	1,32	2	0	0	3,33	1,25	0	2
Dordrecht	1,94	1,48	2,87	4	0	0,5	4,28	1,88	0	8
Ede	1,81	1,55	2,46	3	0	0,5	3,56	2,92	0	6
Eindhoven	2,77	2,5	3,27	4	0	1,5	3,81	5,42	0,5	6
Emmen	1,07	0,86	1,52	2	0	0	2,61	1,25	0	4
Enschede - Hengelo	2,32	1,94	2,88	4	0	0	3,33	5,42	0	6
Geleen	1,1	1,12	1,54	1	0	0	3,78	1,25	0	4
Gouda	1,44	1,32	1,53	2	0	0	4,06	1,88	0	2
Groningen	2,3	2,14	2,87	3	1	0	3,11	6,04	0	6
Haarlem	2,04	2,05	2,03	2	1	0,5	3,33	1,88	3	2
Heerlen	1,7	1,41	2,06	3	0	0,5	3,78	2,08	0	4
Helmond	1,24	1,07	1,05	2	0	0	3,56	1,25	0	0
Hilversum	1,44	1,32	1,84	2	0	0	4,06	1,88	0	4
Hoogeveen	0,92	0,91	0,78	1	0	0	2,83	1,25	0	0
Leeuwaarden	1,32	1,17	1,73	2	1	0	2,89	1,88	0	4
Leiden	2,65	2,36	2,86	4	0	0,5	4,06	6,04	0	4
Lelystad	1,22	1,27	1,34	1	1	0	3,33	1,88	0	2
Maastricht	1,82	1,78	2,16	2	1	0	3,78	3,75	0	4
Middelburg-Vlissingen	1,38	1,24	1,17	2	1	0	3,83	1,25	0	0
Nijmegen	2,18	2	2,46	3	0	0	3,78	5,21	0	4
Oss	1,66	1,81	1,41	1	0	0	3,56	4,58	0	0
Roosendaal	1,06	1,07	1,2	1	0	0	3,56	1,25	0	2
Rotterdam	5,73	5,22	6,08	8	0	6,5	6,81	4,38	5,8	8
Smallingerland	0,92	0,91	0,78	1	0	0	2,83	1,25	0	0

The Netherlands (NL)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Tilburg	1,97	1,74	2,59	3	0	0,5	3,56	3,75	0	6
Utrecht	5,11	5,14	5,25	5	1	5	4,28	8,54	4,8	6
Velsen	1,45	1,32	1,84	2	0	0	4,08	1,88	0	4
Venlo	1,24	1,07	1,66	2	0	0	3,56	1,25	0	4
Zwolle	1,29	1,13	1,7	2	1	0	3,33	1,25	0	4

Norway (NO)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Alesund	0,52	0,42	0,75	1	0	0	0	1,88	0	2
Arendal	0,66	0,58	0,87	1	1	0	0,25	1,88	0	2
Bergen	3,61	3,74	3,97	3	1	1,5	2,25	6,88	5,7	6
Drammen	0,8	0,53	0,98	2	1	0	0	1,88	0	2
Frederikstad	0,75	0,47	0,94	2	0	0	0,25	1,88	0	2
Gjovik	0,52	0,42	0,75	1	0	0	0	1,88	0	2
Hamar	0,61	0,53	0,83	1	1	0	0	1,88	0	2
Haugesund	0,66	0,58	1,17	1	0	0	0,75	1,88	0	4
Kristiansand	1,05	1,06	1,51	1	1	0	0,75	3,54	0	4
Larvik	0,57	0,47	0,79	1	0	0	0,25	1,88	0	2
Molde	0,61	0,53	0,83	1	1	0	0	1,88	0	2
Moss	0,66	0,58	0,87	1	1	0	0,25	1,88	0	2
Oslo	6,73	6,68	6,62	7	7	8,5	3,72	7,92	6,4	6
Skien	0,57	0,47	0,79	1	0	0	0,25	1,88	0	2
Stavanger	1,52	1,2	1,9	3	1	2	1	1,88	0	4
Tonsberg	0,71	0,64	0,9	1	1	0	0,5	1,88	0	2
Tromsö	1,4	1,49	1,49	1	1	0	1	5,21	0	2
Trondheim	1,78	1,73	2,12	2	1	0	1,25	6,04	0	4

Poland (PL)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Belchatow	0,6	0,51	0,51	1	0	0	1,67	0,63	0	0
Biala Podlaska	0,61	0,52	0,82	1	0	0	1,11	1,25	0	2
Bialystok	1,13	0,5	1,27	4	1	0	0,61	0,63	0,5	2
Bielawa - Dzierzoniow	0,69	0,62	0,58	1	0	0	2,17	0,63	0	0
Bielsko-Biala	1,15	0,51	1,89	4	0	0	1,67	0,63	0	6
Boleslawiec	0,69	0,62	0,58	1	0	0	2,17	0,63	0	0
Brzeg	0,52	0,41	0,44	1	0	0	1,22	0,63	0	0
Bydgoszcz	1,4	0,83	1,8	4	0,5	0	1,22	1,25	1	4
Chelm	0,52	0,41	0,75	1	0	0	0,61	1,25	0	2
Chojnice	0,5	0,39	0,42	1	0	0	1,11	0,63	0	0
Ciechanow	0,63	0,55	0,53	1	0	0	1,22	1,25	0	0
Cieszyn	0,8	0,76	0,68	1	0	0	2,17	1,25	0	0
Czestochowa	1,42	0,85	1,82	4	0	0	1,67	1,25	0,9	4
Debica	0,69	0,62	0,58	1	0	0	2,17	0,63	0	0
Elblag	0,59	0,28	0,81	2	0	0	0,61	0,63	0	2
Elk	0,63	0,55	0,53	1	0	0	1,22	1,25	0	0
Gdansk	3,95	3,49	4,26	6	1	1,5	3,33	4,58	5,8	6
Glogow	0,41	0,28	0,34	1	0	0	0,61	0,63	0	0
Gniezno	0,41	0,28	0,34	1	0	0	0,61	0,63	0	0
Gorzow Wielkopolski	0,63	0,33	1,15	2	0,5	0	1,22	0	0	4
Grudziadz	0,63	0,55	0,84	1	0	0	1,22	1,25	0	2
Inowroclaw	0,5	0,39	0,42	1	0	0	1,11	0,63	0	0
Jaroslaw	0,52	0,41	0,44	1	0	0	1,22	0,63	0	0
Jaslo	0,52	0,41	0,44	1	0	0	1,22	0,63	0	0
Jelenia Gora	1,06	0,85	1,2	2	0	0	1,44	1,88	0,5	2
Kalisz	0,7	0,41	0,9	2	0	0	1,22	0,63	0	2
Katowice	2,98	1,64	3,44	9	1	2	3,14	0,63	1,1	6
Kiedzierzyn-Kozle	0,52	0,41	0,44	1	0	0	1,22	0,63	0	0
Kielce	1,24	0,84	1,35	3	1	0	2,17	0,63	0,5	2
Kolobrzeg	0,71	0,65	0,6	1	0	0	1,67	1,25	0	0
Konin	0,81	0,55	1	2	0	0	1,22	1,25	0	2
Koszalin	0,68	0,39	0,88	2	0	0	1,11	0,63	0	2
Krakow	4,33	3,74	4,59	7	1	2	3,14	4,17	7	6
Krosno	0,5	0,39	0,73	1	0	0	1,11	0,63	0	2
Kutno	0,56	0,46	0,47	1	0	0	1,44	0,63	0	0
Legnica	0,74	0,46	0,93	2	0	0	1,44	0,63	0	2
Leszno	0,5	0,39	0,73	1	0	0	1,11	0,63	0	2
Lodz	2,56	1,58	3,09	7	1	0,5	2,17	2,92	1	6

| Lomza | 0,43 | 0,3 | 0,67 | 1 | 0 | 0 | 0,72 | 0,63 | 0 | 2 |
| Lubin | 0,41 | 0,28 | 0,34 | 1 | 0 | 0 | 0,61 | 0,63 | 0 | 0 |

Poland (PL)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Lublin	1,78	1,29	2,12	4	1	0	1,22	2,08	2	4
Mielec	0,69	0,62	0,58	1	0	0	2,17	0,63	0	0
Nowa Sol	0,73	0,67	0,62	1	0	0	2,39	0,63	0	0
Nowy Sacz	0,85	0,6	1,03	2	0	0	1,44	1,25	0	2
Nowy Targ	0,44	0,32	0,38	1	0	0	1,44	0	0	0
Nysa	0,52	0,41	0,44	1	0	0	1,22	0,63	0	0
Olsztyn	1,04	0,83	1,5	2	1	0	0,61	0,63	2	4
Opole	0,9	0,43	1,38	3	1	0	1,44	0	0	4
Ostroleka	0,4	0,27	0,65	1	0	0	1,22	0	0	2
Ostrow Wielkopolski	0,61	0,3	0,52	2	0	0	0,72	0,63	0	0
Ostrowiec Swietokrzyski	0,62	0,53	0,52	1	0	0	2,39	0	0	0
Pila	0,68	0,39	0,58	2	0	0	1,11	0,63	0	0
Piotrkow Trybunalski	0,67	0,6	0,88	1	0	0	1,44	1,25	0	2
Plock	0,68	0,38	0,88	2	0	0,5	1,22	0	0	2
Poznan	2,93	2,25	3,4	6	1	1,5	2,19	2,92	3	6
Przemysl	0,5	0,39	0,73	1	0	0	1,11	0,63	0	2
Pulawy	0,4	0,27	0,34	1	0	0	1,22	0	0	0
Raciborz	0,67	0,6	0,57	1	0	0	1,44	1,25	0	0
Radom	0,88	0,41	1,05	3	0	0	1,22	0,63	0	2
Radomsko	0,6	0,51	0,51	1	0	0	1,67	0,63	0	0
Rybnik	1,15	0,51	1,89	4	0	0	1,67	0,63	0	6
Rzeszow	0,95	0,49	1,11	3	1	0	1,22	0	0,5	2
Sandomierz	0,62	0,53	0,52	1	0	0	2,39	0	0	0
Sanok	0,63	0,55	0,84	1	0	0	1,22	1,25	0	2
Siedlce	0,4	0,27	0,65	1	0	0	1,22	0	0	2
Sieradz	0,56	0,46	0,47	1	0	0	1,44	0,63	0	0
Skarzysko-Kamienna	0,62	0,53	0,52	1	0	0	2,39	0	0	0
Skierniewice	0,67	0,6	0,88	1	0	0	1,44	1,25	0	2
Slupsk	0,68	0,39	0,88	2	0	0	1,11	0,63	0	2
Stalowa Wola	0,87	0,62	0,74	2	0	0	2,17	0,63	0	0
Starachowice	0,62	0,53	0,52	1	0	0	2,39	0	0	0
Stargard Szczecinski	0,74	0,68	0,63	1	0	0	1,83	1,25	0	0
Starogard Gdanski	0,36	0,22	0,31	1	0	0	0,36	0,63	0	0
Suwalki	0,41	0,28	0,65	1	0	0	0,61	0,63	0	2
Swidnica	0,69	0,62	0,58	1	0	0	2,17	0,63	0	0
Szczecin	2,05	1,4	2,35	5	1	0	1,72	2,08	2	4

Poland (PL)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Tarnobrzeg	0,69	0,62	0,58	1	0	0	2,17	0,63	0	0
Tarnow	0,99	0,55	1,15	3	0	0	1,22	1,25	0	2
Tczew	0,36	0,22	0,31	1	0	0	0,36	0,63	0	0
Tomaszow Mazowiecki	0,6	0,51	0,51	1	0	0	1,67	0,63	0	0
Torun	1,13	0,94	1,57	2	0,5	0	1,22	1,25	1,5	4
Walbrzych	0,97	0,74	1,13	2	0	0	1,44	1,88	0	2
Warszawa	6,92	6,46	7,09	9	8,5	7	4,14	6,67	7	8
Wloclawek	0,81	0,55	1	2	0	0	1,22	1,25	0	2
Wroclaw	3,21	2,6	3,64	6	1	1	2,39	4,79	3	6
Zamosc	0,52	0,41	0,75	1	0	0	0,61	1,25	0	2
Zary	0,73	0,67	0,62	1	0	0	2,39	0,63	0	0
Zdunska Wola	0,56	0,46	0,47	1	0	0	1,44	0,63	0	0
Zielona Gora	0,67	0,38	0,88	2	0,5	0	1,44	0	0	2

Portugal (PT)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Aveiro	0,91	0,88	1,38	1	1	0	1,19	2,29	0	4
Barcelos	0,49	0,38	1,03	1	0	0	1,08	0,63	0	4
Braga	1,31	1,16	1,72	2	1	0	1,08	3,13	0,5	4
Coimbra	2,17	2,21	2,15	2	1	0,5	0,69	3,96	4,3	2
Faro	1,1	0,9	1,24	2	1	0	1,25	0	2,3	2
Funchal	1,36	1,22	1,46	2	2	0	1,5	0	3	2
Guimaraes	0,67	0,38	1,19	2	0	0	1,08	0,63	0	4
Leiria - Marinha Grande	0,36	0,22	0,61	1	1	0	0,47	0	0	2
Lisboa	7,36	7	7,15	9	8	8	4,81	6,67	8	6
Ponta Delgada	0,45	0,33	0,69	1	2	0	0,5	0	0	2
Porto	4,57	3,8	4,79	8	1	4	3,56	3,96	5,1	6
Rebordosa - Pacos de Ferreira - Freamunde	0,67	0,38	1,19	2	0	0	1,08	0,63	0	4
Santa Maria de Feira	0,69	0,4	1,2	2	0	0	1,19	0,63	0	4
Santo Tirso	0,49	0,38	1,03	1	0	0	1,08	0,63	0	4
Vila Nova de Famalicao	0,25	0,08	0,82	1	0	0	0,36	0	0	4
Viseu	0,36	0,22	0,61	1	1	0	0,47	0	0	2
Paredes-Penafiel	0,69	0,4	1,2	2	0	0	1,81	0	0	4
Ovar	0,66	0,59	1,18	1	0	0	1,19	1,46	0	4

Romania (RO)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Alba Iulia	0,38	0,25	0,63	1	1	0	0,61	0	0	2
Alexandria	0,4	0,27	0,65	1	1	0	0,72	0	0	2
Arad	0,69	0,4	0,89	2	1	0	0,61	0	0,7	2
Bacau	0,61	0,3	1,13	2	1	0	0,86	0	0	4
Baia Mare	0,57	0,25	0,79	2	1	0	0,61	0	0	2
Birlad	0,29	0,14	0,56	1	0	0	0,61	0	0	2
Bistrita	0,38	0,25	0,63	1	1	0	0,61	0	0	2
Botosani	0,57	0,25	0,79	2	1	0	0,61	0	0	2
Braila	0,66	0,36	0,86	2	1	0	1,11	0	0	2
Brasov	2	1,56	2	4	1	0,5	0,72	0	5,3	2
Bucuresti	5,53	4,76	5,6	9	8	6,5	3,67	0,83	6,4	6
Buzau	0,59	0,27	0,8	2	1	0	0,72	0	0	2
Calarasi	0,4	0,27	0,65	1	1	0	0,72	0	0	2
Cluj-Napoca	1,77	1,28	2,12	4	1	0	0,86	0	4,4	4
Constanta	2,14	1,72	2,42	4	1	1	1,86	0	4,4	4
Craiova	0,93	0,25	1,09	4	1	0	0,61	0	0	2
Deva	0,38	0,25	0,63	1	1	0	0,61	0	0	2
Drobeta - Turnu Severin	0,38	0,25	0,63	1	1	0	0,61	0	0	2
Focsani	0,4	0,27	0,65	1	1	0	0,72	0	0	2
Galati	1,15	0,52	1,28	4	1	0,5	1,33	0	0	2
Giurgiu	0,4	0,27	0,65	1	1	0	0,72	0	0	2
Hunedoara	0,29	0,14	0,56	1	0	0	0,61	0	0	2
Iasi	1,7	1,18	2,05	4	1	0	1,33	0	3,5	4
Medias	0,29	0,14	0,56	1	0	0	0,61	0	0	2
Onesti	0,29	0,14	0,56	1	0	0	0,61	0	0	2
Oradea	1,05	0,84	1,2	2	1	0	0,97	0	2,3	2
Petroseni	0,29	0,14	0,56	1	0	0	0,61	0	0	2
Piatra Neamt	0,38	0,25	0,63	1	1	0	0,61	0	0	2
Pitesti	0,59	0,27	0,8	2	1	0	0,72	0	0	2
Ploiesti	0,81	0,54	0,99	2	1	0,5	1,44	0	0	2
Resita	0,36	0,22	0,62	1	1	0	0,5	0	0	2
Rimnicu Vilcea	0,4	0,27	0,65	1	1	0	0,72	0	0	2
Roman	0,29	0,14	0,56	1	0	0	0,61	0	0	2
Satu Mare	0,57	0,25	0,79	2	1	0	0,61	0	0	2
Sfintu Gheorghe	0,4	0,27	0,65	1	1	0	0,72	0	0	2
Sibiu	1,11	0,91	1,25	2	1	0	0,61	0	3	2
Slatina	0,4	0,27	0,65	1	1	0	0,72	0	0	2
Slobozia	0,4	0,27	0,65	1	1	0	0,72	0	0	2

Romania (RO)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Suceava	0,77	0,71	0,96	1	1	0	0,61	0	2,1	2
Timisoara	1,57	1,03	1,95	4	1	0,5	1,25	0	2,4	4
Tirgoviste	0,53	0,43	0,76	1	1	0	1,44	0	0	2
Tirgu Jiu	0,38	0,25	0,63	1	1	0	0,61	0	0	2
Tirgu Mures	0,57	0,25	0,79	2	1	0	0,61	0	0	2
Tulcea	0,32	0,17	0,58	1	1	0	0,25	0	0	2
Turda	0,29	0,14	0,56	1	0	0	0,61	0	0	2
Vaslui	0,38	0,25	0,63	1	1	0	0,61	0	0	2
Vulcan	0,29	0,14	0,25	1	0	0	0,61	0	0	0
Zalau	0,38	0,25	0,63	1	1	0	0,61	0	0	2

Sweden (SE)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Boraas	1,06	0,85	1,51	2	0	0	0,5	3,33	0	4
Eskilstuna	0,59	0,5	1,11	1	0	0	0,36	1,88	0	4
Falun	0,95	0,71	1,42	2	1	0	0	2,71	0	4
Gävle	0,84	0,58	1,33	2	1	0	0,25	1,88	0	4
Göteborg	4,86	4,61	5,35	6	1	5	3,25	7,5	4,5	8
Halmstad	0,84	0,8	1,32	1	1	0	0,61	2,5	0	4
Jönköping	1,07	0,86	1,83	2	1	0	0,5	1,88	1	6
Kalmar	1,18	1,22	1,61	1	1	0	0,25	3,33	1,4	4
Karlskrona	0,66	0,58	1,17	1	1	0	0,25	1,88	0	4
Karlstad	0,99	0,77	1,46	2	1	0	0,25	2,71	0	4
Kristianstad	0,95	0,71	1,42	2	0	0	1,33	1,88	0	4
Lidköping	0,73	0,67	0,92	1	0	0	0,5	2,5	0	2
Linköping	1,6	1,51	1,97	2	1	0	0,25	6,04	0	4
Luleaa	1,04	0,82	1,49	2	1	0	0,5	2,71	0	4
Malmö	4,02	3,8	4,63	5	1	3	2,83	6,88	3,9	8
Nyköping	0,73	0,66	0,92	1	1	0	0,61	1,88	0	2
Nörrköping	0,84	0,58	1,33	2	0	0,5	0,25	1,88	0	4
Orebrö	1,21	1,03	1,64	2	1	0	0,61	3,54	0	4
Ornsköldsvik	0,52	0,42	0,75	1	0	0	0	1,88	0	2
Ostersund	0,61	0,53	0,83	1	1	0	0	1,88	0	2
Skelleftaa	0,52	0,42	0,75	1	0	0	0	1,88	0	2
Skövde	0,91	0,67	1,38	2	0	0	0,5	2,5	0	4
Stockholm	7,14	6,72	7,27	9	7,5	9	3,83	6,67	7	8
Sundsvall	0,52	0,42	1,06	1	0	0	0	1,88	0	4
Trollhättan	0,73	0,67	1,23	1	0	0	0,5	2,5	0	4
Uddevalla	0,73	0,67	0,92	1	0	0	0,5	2,5	0	2
Umeaa	1,78	1,73	2,12	2	1	0	0,25	6,04	1	4
Vaesteraas	0,86	0,61	1,34	2	1	0	0,36	1,88	0	4
Växjö	0,98	0,98	1,45	1	1	0	0,5	2,71	0,7	4

| **Slovenia (SI)** | | | | | | | | | |
fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Celje	0,97	0,74	1,13	2	1	1	1,22	0,63	0	2
Koper	0,97	0,96	1,13	1	1	1	2,19	0,63	0	2
Kranj	0,83	0,79	0,7	1	1	1	1,44	0,63	0	0
Ljubljana	4,73	4,89	4,62	4	6	6	2,44	6,46	4,1	4
Maribor	1,63	1,55	1,69	2	1	1,5	1,44	3,54	0	2
Nova Gorica	0,74	0,68	0,93	1	1	0,5	1,44	0,63	0	2
Novo Mesto	0,68	0,61	0,88	1	1	0,5	1,11	0,63	0	2

Slovakia (SK)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Banska Bystrica	0,86	0,83	1,04	1	1	0	1,22	0,63	1,4	2
Bratislava	4,47	4,36	4,4	5	7	6	3,14	3,96	3	4
Humenne	0,69	0,63	0,59	1	0	0	2,19	0,63	0	0
Komarno	0,64	0,56	0,54	1	0	0	1,89	0,63	0	0
Kosice	1,5	1,16	1,88	3	1	0,5	1,94	2,29	0	4
Levice	0,64	0,56	1,16	1	0	0	1,89	0,63	0	4
Liptovsky Mikulas	0,6	0,51	0,82	1	0	0	1,67	0,63	0	2
Lucenec	0,52	0,41	0,75	1	0	0	1,22	0,63	0	2
Martin	1,59	1,72	1,96	1	0	0	1,67	3,96	2,1	4
Michalovce	0,65	0,57	0,86	1	0	0	1,94	0,63	0	2
Nitra	0,91	0,67	1,39	2	1	0	1,89	0,63	0	4
Nove Zamky	0,64	0,56	1,16	1	0	0	1,89	0,63	0	4
Piestany	0,99	0,98	0,83	1	0	0	2,39	0,63	1,4	0
Poprad	0,78	0,73	0,96	1	0	0	1,94	0,63	0,7	2
Povazska Bystrica	0,84	0,81	1,33	1	0	0	2,39	1,25	0	4
Presov	0,92	0,68	1,4	2	1	0	1,94	0,63	0	4
Prievidza	0,84	0,81	1,02	1	0	0	2,39	1,25	0	2
Ruzomberok	0,6	0,51	0,51	1	0	0	1,67	0,63	0	0
Spisska Nova Ves	0,65	0,57	0,55	1	0	0	1,94	0,63	0	0
Trencin	1,21	1,03	1,64	2	1	0	2,89	1,25	0	4
Trnava	1,29	1,14	1,4	2	1	0	2,39	0,63	1,6	2
Zilina	0,87	0,62	1,35	2	1	0	1,67	0,63	0	4
Zvolen	0,52	0,41	0,44	1	0	0	1,22	0,63	0	0

The United Kingdom (UK)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Aberdeen	2,87	2,84	NA	3	1	2	1,75	5,21	3,3	NA
Alloa - Stirling	1,5	1,61	NA	1	1	0	1,33	5,42	0	NA
Ashford	1,01	1,02	NA	1	0	0	3,33	1,25	0	NA
Ayr	0,73	0,66	NA	1	1	0	0,61	1,88	0	NA
Ballymena	0,55	0,44	NA	1	1	0	0,25	1,25	0	NA
Barrow-in-Furness	0,79	0,74	NA	1	0	0	1,44	1,88	0	NA
Bedford	1,74	1,68	NA	2	1	0	3,33	3,75	0	NA
Belfast	3,84	3,36	NA	6	4	2	3,72	5,42	2	NA
Birmingham metropolitan area	5,78	5,07	NA	9	2	5	6,06	6,25	4,5	NA
Blackburn/Burnley	1,45	1,11	NA	3	1	0	2,61	1,88	0	NA
Blackpool	1,41	1,06	NA	3	1	0	2,39	1,88	0	NA
Bournemouth/Poole	1,97	1,3	NA	5	1	0	2,64	2,71	0	NA
Braintree	1,13	1,16	NA	1	0	0	3,33	1,88	0	NA
Brighton/Worthing/Littlehampton	3,99	3,77	NA	5	1	1	2,89	6,88	5,7	NA
Bristol metropolitan area	5,28	4,9	NA	7	1,5	4	4,61	6,88	5,8	NA
Burton on Trent	0,92	0,91	NA	1	0	0	2,83	1,25	0	NA
Cambridge	3,85	4,04	NA	3	2	0,5	3,33	8,54	4,8	NA
Canterbury	2,34	2,64	NA	1	0	0	3,33	3,75	4,8	NA
Cardiff and South Wales valleys metropolitan area	3,83	3,35	NA	6	4	2	3,17	2,92	5	NA
Carlisle	0,88	0,85	NA	1	1	0	1,44	1,88	0	NA
Cheltenham	1,18	1	NA	2	0	0	2,61	1,88	0	NA
Clacton	1,13	1,16	NA	1	0	0	3,33	1,88	0	NA
Colchester	1,92	1,9	NA	2	0	0	3,33	5,21	0	NA
Crewe/Nantwich	0,88	0,86	NA	1	0	0	2,61	1,25	0	NA
Dover	1,15	1,18	NA	1	0	0	4,08	1,25	0	NA
Dumfries	0,88	0,85	NA	1	1	0	1,44	1,88	0	NA
Dundee	1,82	1,78	NA	2	1	0	0,61	6,88	0	NA
Dunfermline	0,83	0,57	NA	2	0	0	1,33	1,25	0	NA
Edinburgh	5,28	5,35	NA	5	5	3,5	4,58	6,88	6,6	NA
Exeter	1,87	1,62	NA	3	1	0	1,69	4,58	0,5	NA
Falkirk	1,13	0,94	NA	2	1	0	1,83	1,88	0	NA
Folkestone	1,01	1,02	NA	1	0	0	3,33	1,25	0	NA
Glasgow	5,3	4,7	NA	8	1	2,5	5,31	6,04	6,8	NA
Gloucester	1,27	1,11	NA	2	1	0	2,61	1,88	0	NA

The United Kingdom (UK)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Great Yarmouth	0,84	0,81	NA	1	0	0	2,39	1,25	0	NA
Greenock	0,84	0,8	NA	1	1	0	1,22	1,88	0	NA
Grimsby	1,21	1,03	NA	2	0	0	3,39	1,25	0	NA
Hastings/Bexhill	1,23	1,06	NA	2	0	0	2,89	1,88	0	NA
Hereford	0,84	0,81	NA	1	1	0	1,89	1,25	0	NA
Hull	2,12	1,7	NA	4	1	0	3,39	3,75	0	NA
Inverness	0,96	0,95	NA	1	1	0	0,5	1,88	1,4	NA
Ipswich	1,39	1,25	NA	2	1	0	3,89	1,25	0	NA
Irvine	1,04	0,82	NA	2	1	0	1,33	1,88	0	NA
Kettering - Corby	1,2	1,02	NA	2	0	0	3,33	1,25	0	NA
Kirkcaldy	0,83	0,57	NA	2	0	0	1,33	1,25	0	NA
Lancaster	1,76	1,71	NA	2	0	0	3,11	4,58	0	NA
Leeds - Bradford metropolitan area	4,79	4,07	NA	8	1,5	4,5	4,83	6,25	2	NA
Leicester	3,29	2,91	NA	5	1	2	3,33	6,25	1	NA
Lincoln	1,25	1,08	NA	2	1	0	2,61	1,25	0,5	NA
Liverpool/Birkenhead metropolitan area	5,16	4,31	NA	9	1,5	2,5	5,61	5,42	5,1	NA
London	9,71	9,65	NA	10	9,5	10	9,28	9,38	10	NA
Londonderry	1,01	0,8	NA	2	1	0	0,5	2,08	0,5	NA
Lowestoft	0,84	0,81	NA	1	0	0	2,39	1,25	0	NA
Lurgan/Portadown	0,45	0,33	NA	1	0	0	0,25	1,25	0	NA
Manchester metropolitan area	5,7	4,96	NA	9	1,5	5	5,83	6,25	4,5	NA
Middlesborough	1,93	1,25	NA	5	1	0	3,67	1,46	0	NA
Milton Keynes	1,85	1,59	NA	3	1	0	3,33	3,33	0	NA
Newbury	0,83	0,79	NA	1	0	0	3,56	0	0	NA
Northampton	1,56	1,24	NA	3	1	0,5	3,33	1,25	0	NA
Norwich	2,53	2,42	NA	3	1	1,5	2,64	3,75	2,5	NA
Nottingham-Derby metropolitan area	4,22	3,6	NA	7	2	3,5	4,08	5,42	2,2	NA
Oxford	3,3	3,59	NA	2	1	0	3,33	7,71	4,6	NA
Perth	0,95	0,94	NA	1	1	0,5	1,33	1,88	0	NA
Peterborough	1,27	1,11	NA	2	1	0,5	2,11	1,88	0	NA
Plymouth	2,31	2,16	NA	3	1,5	1,5	2,08	2,08	3,3	NA
Portland/Weymouth	0,86	0,82	NA	1	0	0	1,83	1,88	0	NA
Portsmouth/Southampton metropolitan area	4,73	4,22	NA	7	1	2,5	5,61	6,88	3,5	NA
Preston	1,58	1,26	NA	3	1	0	3,11	2,08	0	NA

The United Kingdom (UK)

fua name	global score	functional score	functional score with industry	population	administration	decision	transport	knowledge	tourism	industry
Rugby	1,17	1,21	NA	1	0	0	3,56	1,88	0	NA
Rushden	1,2	1,02	NA	2	0	0	3,33	1,25	0	NA
Scarborough	0,84	0,81	NA	1	0	0	2,39	1,25	0	NA
Scunthorpe	1,42	1,29	NA	2	1	0	2,39	2,92	0	NA
Sheffield metropolitan area	3,81	3,1	NA	7	1,5	2	3,33	6,88	1	NA
Shrewsbury	1,09	1,11	NA	1	1	0	2,61	1,88	0	NA
St. Austell	0,5	0,39	NA	1	0	0	0,5	1,25	0	NA
Stafford	1,26	1,31	NA	1	1	0,5	2,83	2,08	0	NA
Stoke	2,37	2,01	NA	4	1	0	3,83	2,92	1,8	NA
Swansea	1,66	1,36	NA	3	1	0	2,69	2,92	0	NA
Swindon	1,69	1,4	NA	3	1	0	3,11	2,71	0	NA
Taunton	0,89	0,87	NA	1	1	0	2,17	1,25	0	NA
Telford	1,27	1,11	NA	2	1	0	2,61	1,88	0	NA
Thanet	1,2	1,02	NA	2	0	0	3,33	1,25	0	NA
Torbay	0,94	0,71	NA	2	1	0	1,44	1,25	0	NA
Tyneside metropolitan area	4,34	3,75	NA	7	2	3,5	4,14	6,25	2	NA
Whitehaven	0,65	0,58	NA	1	0	0	0,72	1,88	0	NA
Worcester	1,25	1,08	NA	2	1	0,5	2,61	1,25	0	NA
York	2,49	2,59	NA	2	1	0,5	2,39	4,58	3,7	NA

6.2   The Maps

Typology of Functional Urban Areas (FUAs)
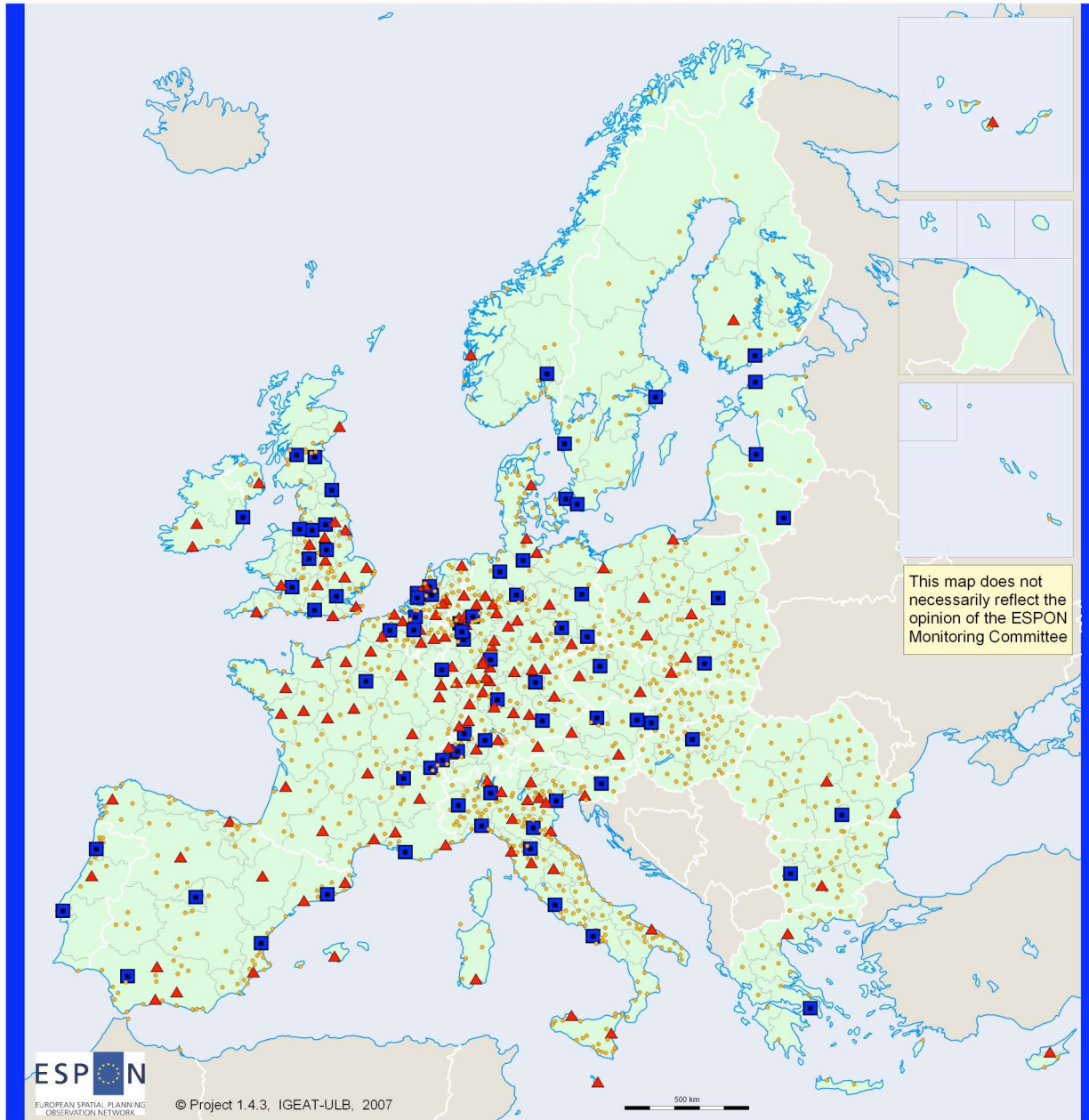
■ Metropolitan European Growth Areas (MEGAs)
▲ Transnational / national FUAs
• Regional / local FUAs

Figure 23   The FUAs according to the functional criteria (Global score)

Decision specificity of Functional Urban Areas (FUAs)
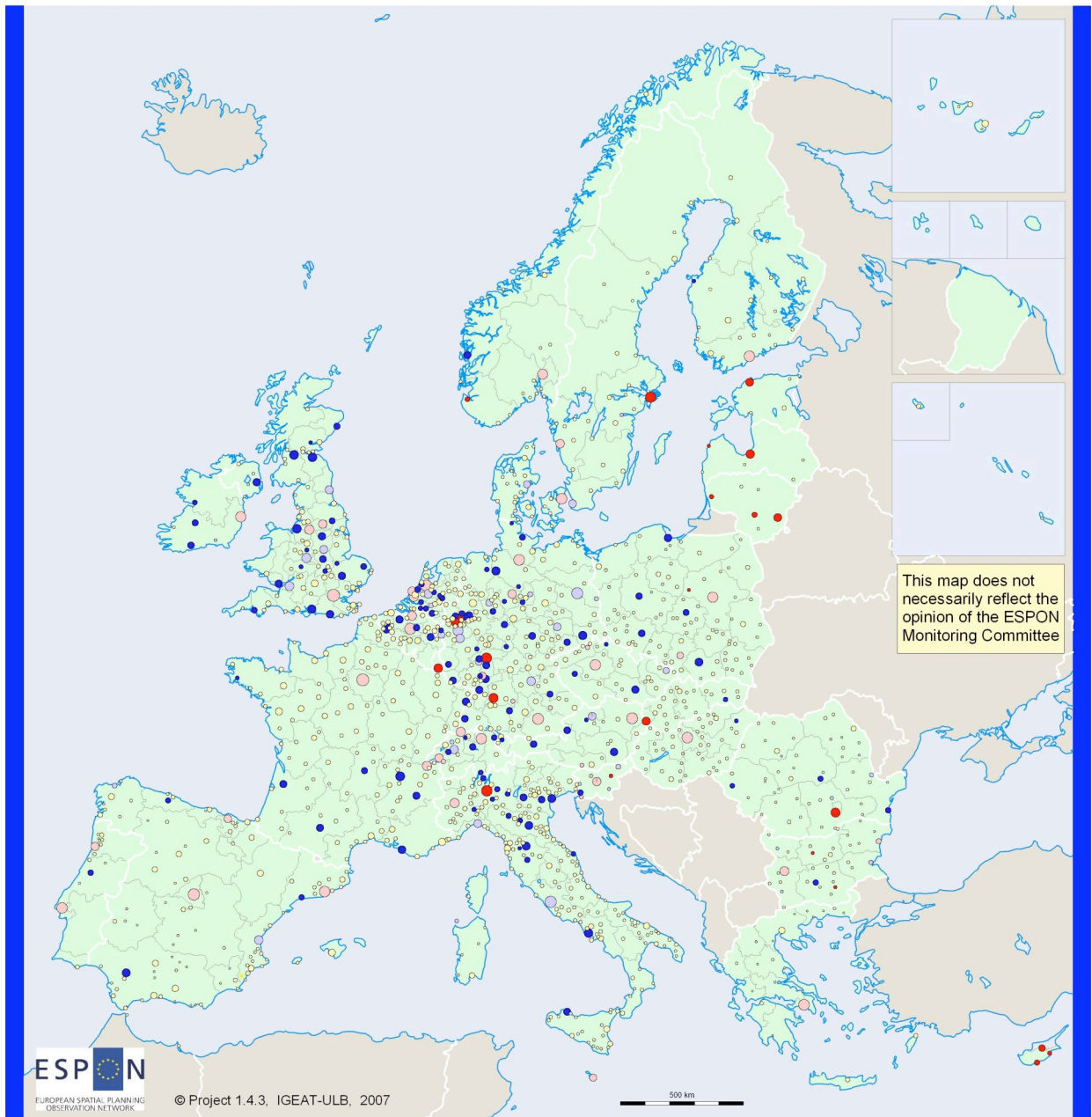
Degree of specificity (1 = non specific)
- 0
- 0 - 0.7
- 0.7 - 1
- 1 - 1.3
- 1.3 - 2.96

Global score of the functional measure

Figure 24   The decision specificity of the FUAs

Administrative specificity of Functional Urban Areas (FUAs)
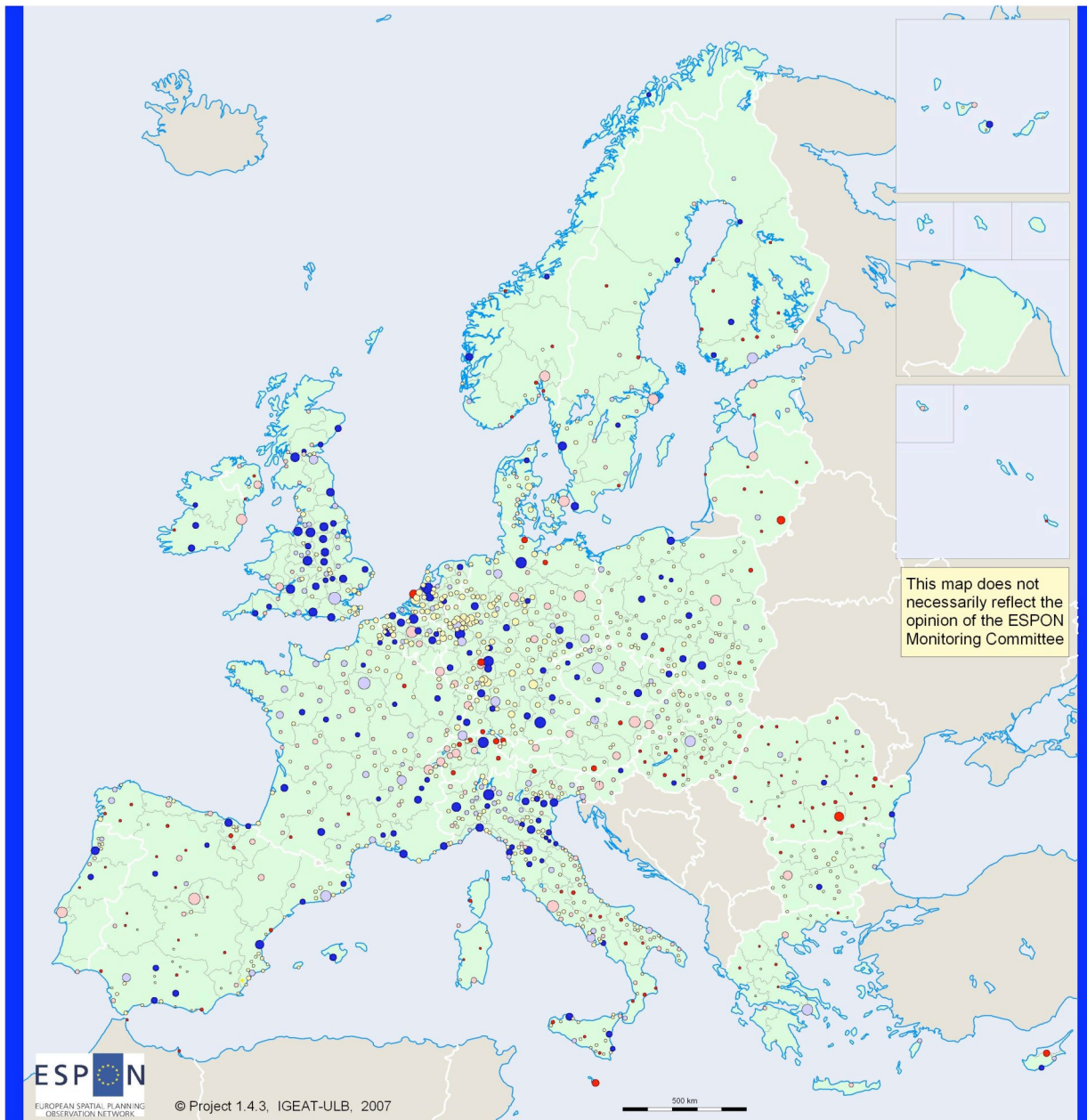
Degree of specificity (1 = non specific)

- 0
- 0 - 0.7
- 0.7 - 1
- 1 - 1.64
- 1.64 - 7.14

Global score of the functional measure

Figure 25   The administrative specificity of the FUAs

Knowledge specificity of Functional Urban Areas (FUAs)
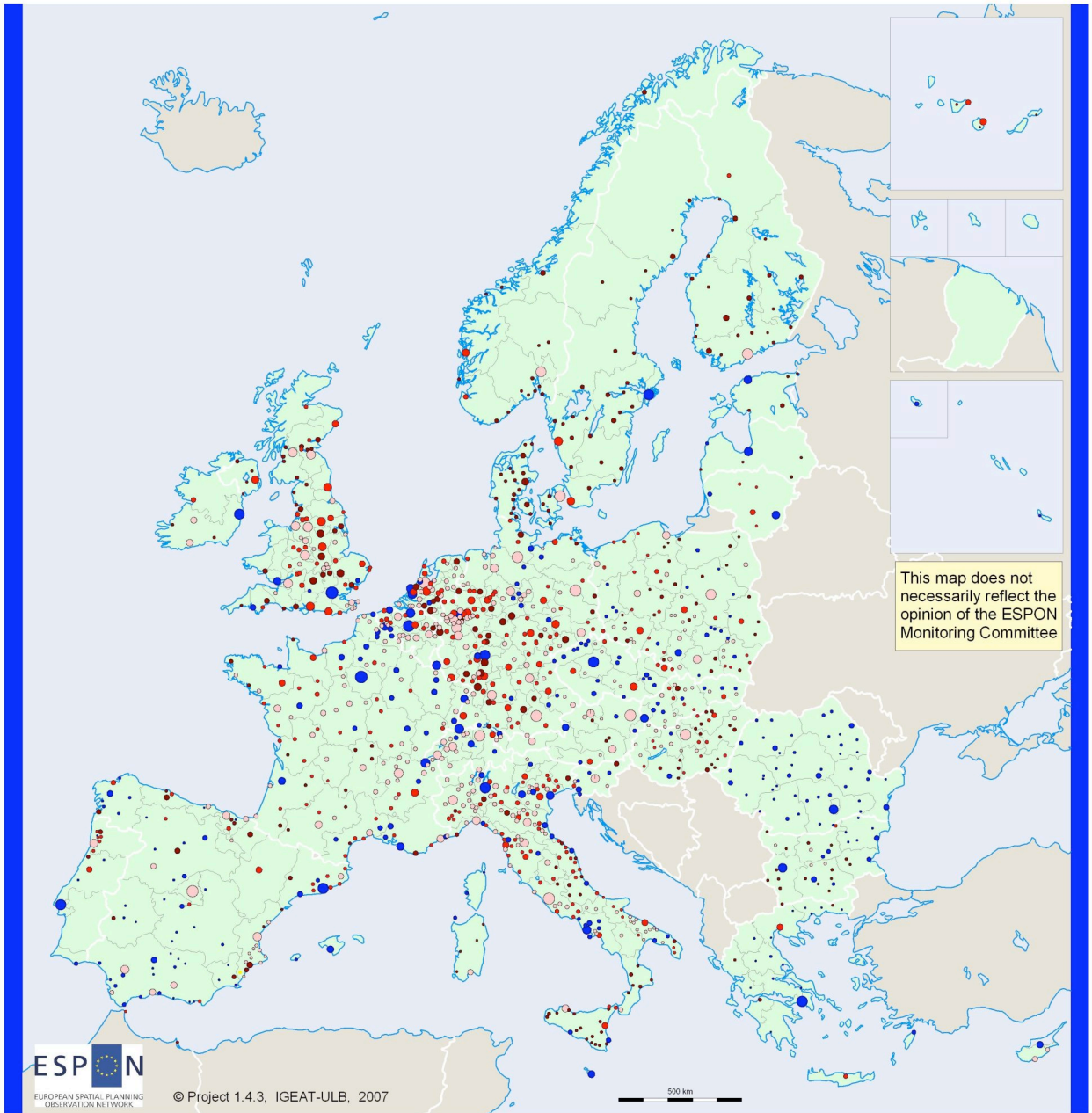
This map does not necessarily reflect the opinion of the ESPON Monitoring Committee

© EuroGeographics Association for the administrative boundaries

Origin of data: EU 27, CC's and CH, NO : Eurostat, National Statistical Offices.

Degree of specificity (1 = non specific)
- 0 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 4.5

Global score of the functional measure

Figure 26   The knowledge specificity of the FUAs

Transport specificity of Functional Urban Areas (FUAs)

This map does not necessarily reflect the opinion of the ESPON Monitoring Committee

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Origin of data: EU 27, CC's and CH, NO : Eurostat, National Statistical Offices.
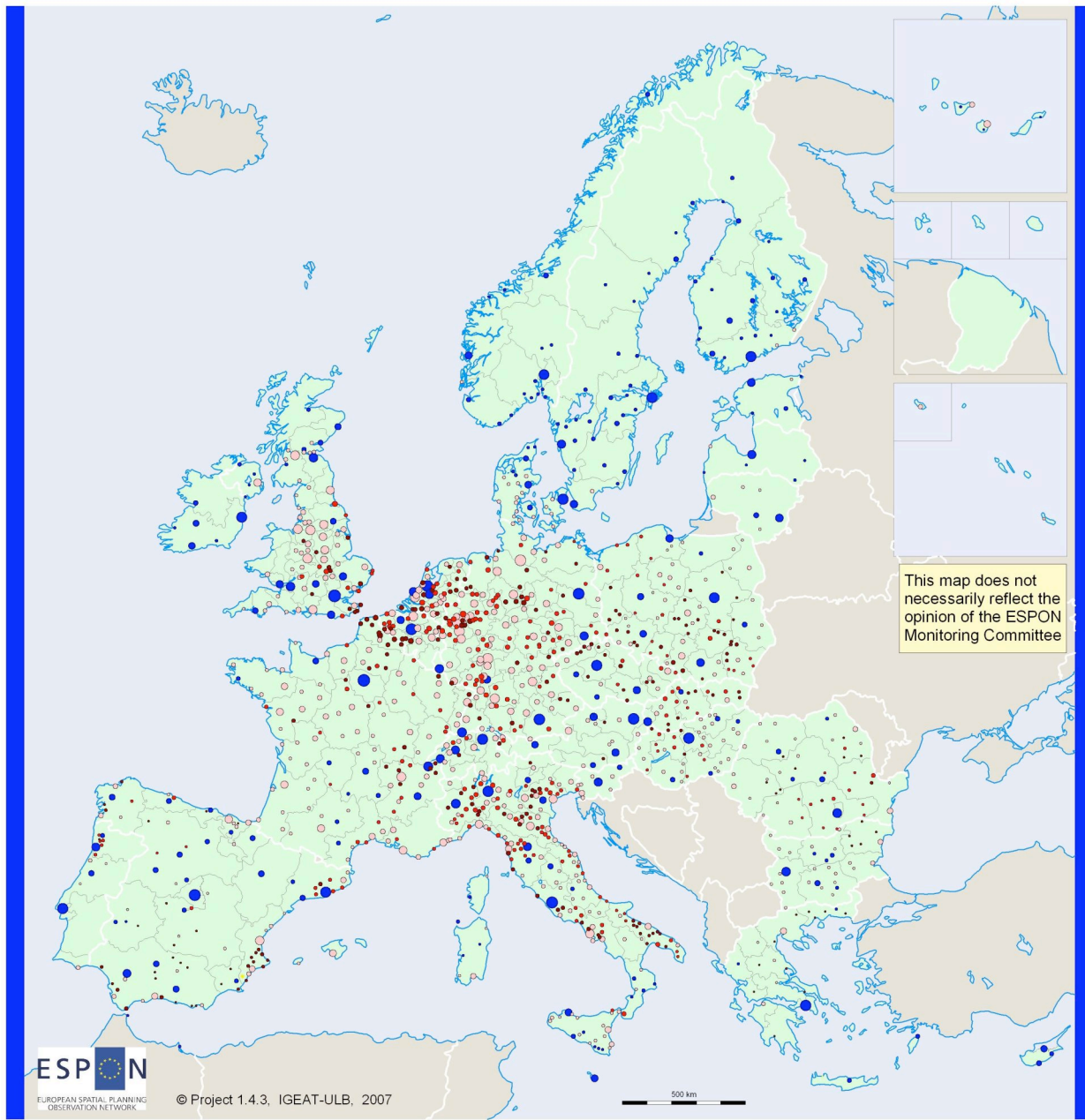
Degree of specificity (1 = non specific)
- 0 - 1
- 1 - 2.5
- 2.5 - 3
- 3 - 5.5

Global score of the functional measure

Figure 27   The transport specificity of the FUAs

Tourism specificity of Functional Urban Areas (FUAs)
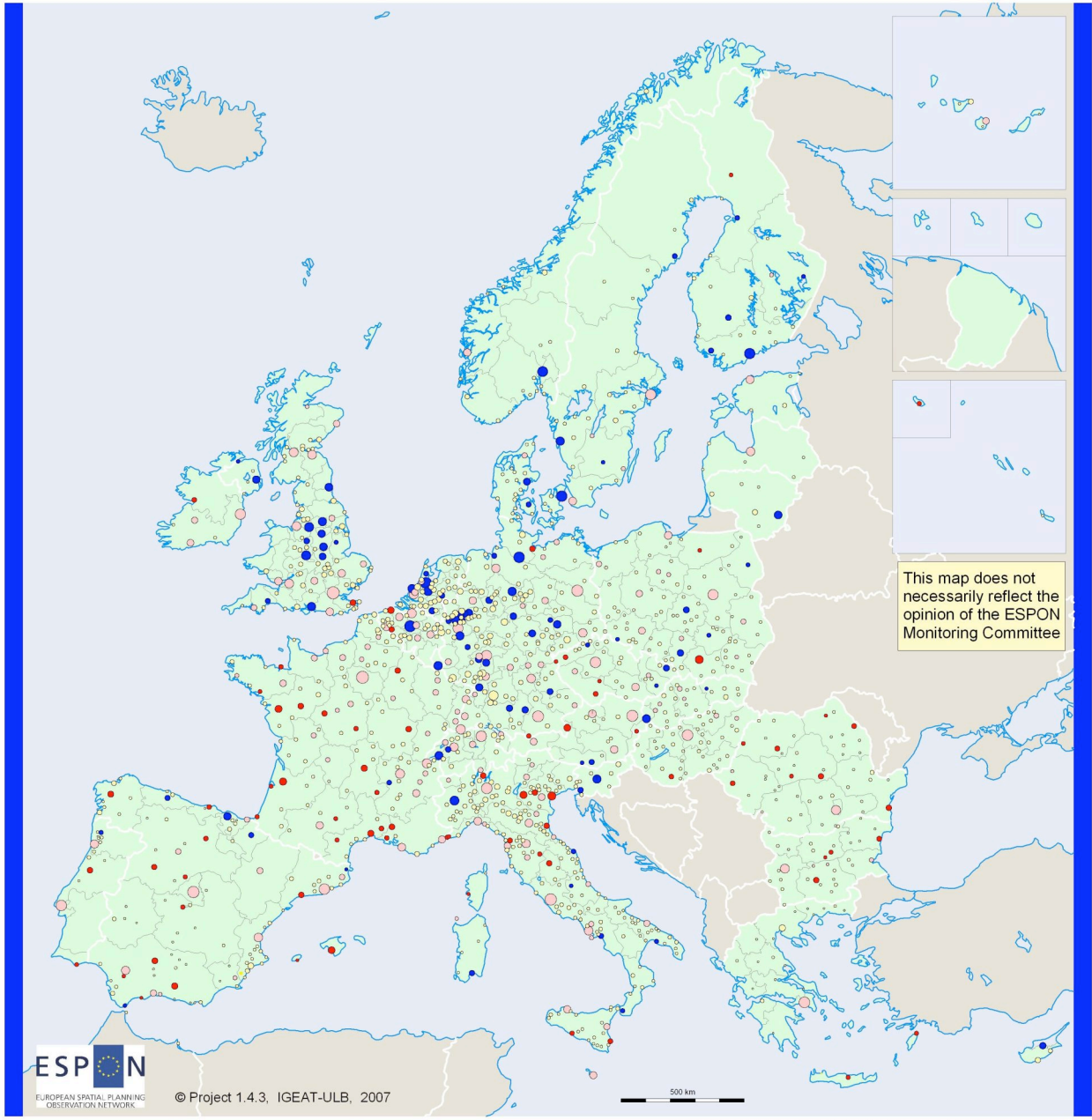
Degree of specificity (1 = non specific)
- 0
- 0 - 1
- 1 - 1.8
- 1.8 - 3.72

Global score of the functional measure

Figure 28   The tourism specificity of the FUAs

6.3   The measure of polycentricity with the functions

Polycentrism has until yet been estimated on a morphological basis, i.e. on the basis of the analysis of the distribution of the population of the FUAs. We can also try to estimate a more functional view of polycentrism, taking into account the functions of the cities.

For each country, the functional index is based on the average between the following indicators:

the coefficient of asymetry of the global scores of the whole set of FUAs, scaled from 0 and 100 between the most asymetric, Hungary, and the most symetric, Cyprus ;

the part of the score of the highest ranked FUA in the sum of the scores of the five highest ranked FUAs, scaled from 0 (the highest part, in Estonia) to 100 (the smallest part, in Germany); the number of FUAs scored 10 or more and the number of FUAs scored 5 or more in the field of administrative and private decision. The sum of these two values have been scaled from 0, when it concerns only one FUA, and the highest number, 100 (7 FUAs rating 10 or more and 14 5 or more in Germany);

the ratio between the score of the best ranking FUA and the average score of the whole set of FUAs, scaled from 0 (Greece, where this ratio is the highest) to 100 (Cyprus, where it is the lowest)

The average of these four scores shows that Hungary is the most functionally monocentric country (score = 3) and Germany the most polycentric (score = 88).

Some links exist between morphological and functional polycentrism, but the coefficient of regression between the two sets of scores is only r = 0,34.
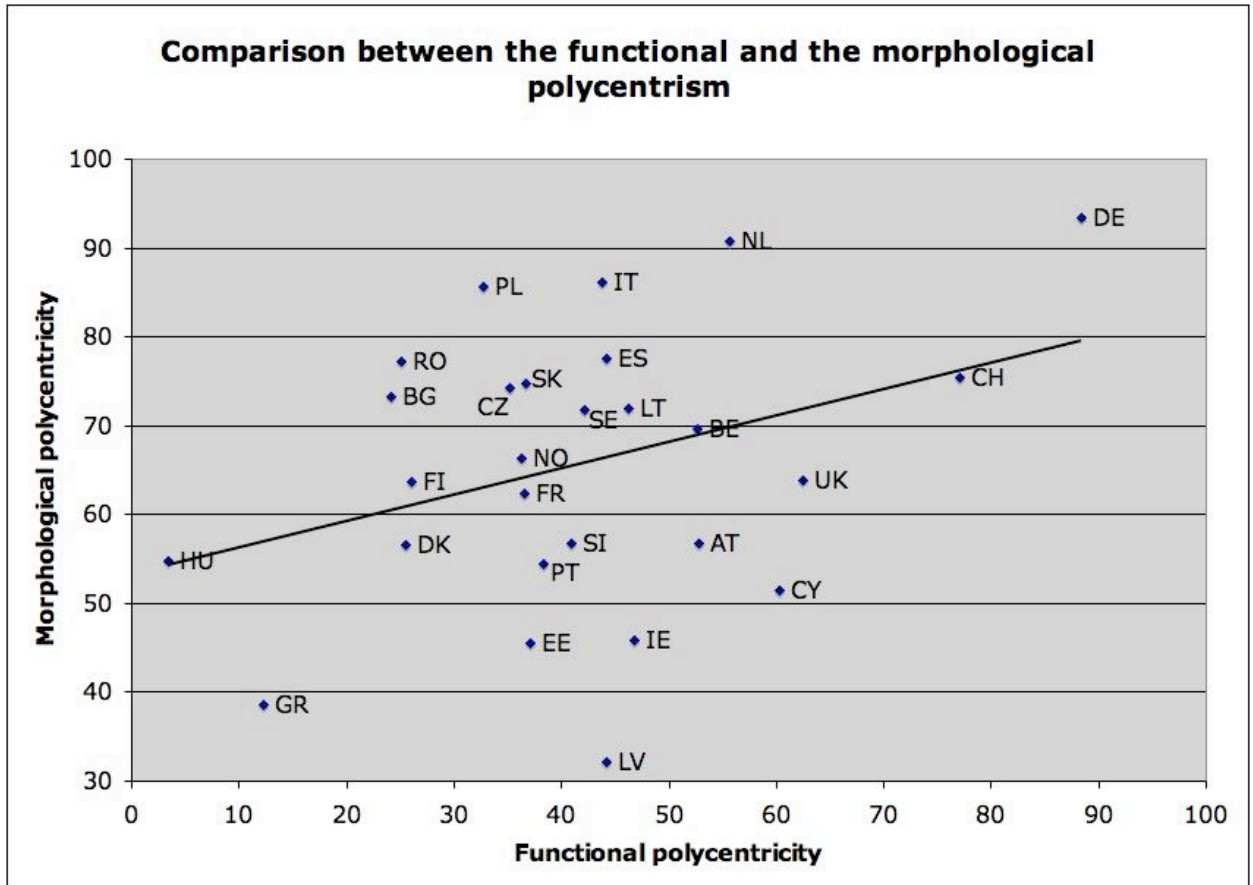
Figure 29   Bad correlation between morphological and functional polycentricity

We can thus identify different kinds of countries, for instance :

Strongly polycentric countries, as well from the morphological as from the functional point of view : firstly Germany, but also Switzerland and the Netherlands;
A group of central-Eastern European countries, quite polycentic from the morphological point of view, but strongly monocentric from the functional point of view, with most of the decisional functions concentrated in the capital : Poland, Romania, Bulgaria, the Czech republic, Slovakia; in Hungary, the functional monocentrism is yet more strong and the morphological monocentrism is also strong;
As Hungary, Greece is strongly monocentric from the two points of view, despite the size of Thessaloniki as the second Greek city;
Among the other countries, functional monocentrism appears quite strong in Denmark, Finland or Norway, as well as in France and Portugal. France and Britain appear at the same level concerning the morphological monocentrism, with the same strong weight of their capital-region. However, the other British MEGA benefit from more decisional functions that the French ones, so that the United Kingdom appears to be more polycentric than France. The morphological polycentrism is stronger in Spain and in Italy, but functionaly polycentrism is a bit weaker than in Britain, despite of the sharing of the functions between Madrid and Barcelona and between Rome and Milano.

Part 4. Discussion on the polycentricity issue

An index of polycentricity

We have built an index of polycentricity, based on a purely morphological methodology (as approached by the arguable proxies of population data of the FUAs), using the cardinal ranking of the following indicators:

1. weight of the main FUA in the total population of the country or macro-region
2. weight of the main FUA in the total population of the whole set of FUAs with more than 200 000 and more than 50 000 inhabitants
3. average of the differences of population between a FUA and the following one in a decreasing ranking from the most populated FUA to the one immediately beneath the threshold of 200,000 inhabitants and until the threshold of 50 000 inhabitants
4. standard deviation of the population of the set of FUAs with more than 200 000 and with more than 50 000 inhabitants.

The value of each of these seven indicators has been distributed on a scale bounded from 100 (the highest value for the indicator) and 0 (the lowest one). The arithmetic average of these seven indicators gives the cardinal global index. We stress that this exclusively morphological index of polycentricity imperfectly reflects the functional polycentricity, decisional functions appearing to be much more concentrated than the urban populations (C. Vandermotten & *al.*, 1999). An apparent morphological polycentricity may conceal a strong functional monocentricity at the level of the location of the command of the economy: this is one of the most significant results of the POLYNET study, which shows how even inside apparently very polycentric urban regions, like Delta Metropolis in the Netherlands and South-East England, the main functions linked to the advanced services sector remain concentrated in the traditional economic cores, like Amsterdam and London (Hall & Pain, 2006). In fact, the functional polycentricity does not exist inside the enlarged metropolitan areas but between their cores, at the European or worldwide level.

Does increased polycentricity bring about advantages?

The question is asked from a point of view of the role cities and regions play in the development of a performing and durable economy, not from the point of view of the provision of services throughout a territory. The question can be put from three points of view:

- does increased polycentricity lead to a better economic efficiency?
- does increased polycentricity lead to more spatial equity?
- does increased polycentricity lead to a more sustainable development?

As regards economic efficiency, a small advantage is detected in favour of the most monocentric countries and macro-regions. This assessment is not only due to the globalisation of the economy, which favours the most accessible and the best integrated cores in the world networks (Sassen, 1991; Veltz, 1996; Taylor, 2003), but also to the fact that a rise in subcontracting, just-in-time, shift work, and advanced services increases the interest of more central locations. But the factors of economic success are so numerous that the statistical correlation between more economic growth and more monocentricity is very weak. Therefore, this small statistical obviousness may by no means be interpreted, in the field of spatial planning and economic development policy, as a wish to promote monocentrism.

From the point of view of spatial equity, it appears of course that there is a small trend toward more homogeneity in the spatial distribution of GDP per inhab. in the most polycentric countries and macro-regions. However, the statistical link is weak in this case too, and quite dependent on statistical divisions which isolate the major core-cities and their peripheries arbitrarily. Moreover, the link disappears when GDPs per inhab. are no longer taken into consideration but the available income by inhab., while taking into account the GDP transfers either through public expenditure and transfer revenues, or through alternating moves and temporary workforce movements (secondary residences, family, business, leisure , week-end or longer duration tourism) (Behrens, 2003; Davezies, 2005).

As regards sustainable development, we have not conducted any study up to now. Meanwhile, it does not seem *a priori* evident that the environmental burden is worse in a more concentrated system than in a more scattered system: the densification and the big size of cities favour for instance public transport to the detriment of individual transport.

In any case, nothing allows us to significantly confirm that 'a more polycentric urban structure will contribute to a more balanced regional development, to reducing regional disparities, to increasing European competitiveness, to the fuller integration of European regions into global economy, and to sustainable development' (ESPON 1.1.1 report) (and*, a fortiori,* to establish causality relationships). It would besides be surprising if there was no contradiction between those different objectives.

Part 5. Comments on ESPON 1.1.1 final report

This project had the difficult task of critically reviewing the results of ESPON project 1.1.1 on polycentricity (NORDREGIO et *al.*, 2005). This is the first example of such "peer review" within the ESPON programme and obviously risks causing frustration. We would, therefore, from the outset like to insist on the fact that the aim of the critique is not to judge the scientific capacities of the teams working in that project, but rather to evaluate, on the basis of comments of the ESPON Monitoring Committee (MC), the ESPON Contact Point network (ECPs) and members of the research team, how the methodology used and the results presented answer the questions raised in the political debate about a difficult concept such as "polycentricity". We are aware of the difficult constraints the ESPON programme and the political agenda at the moment of the completion of project 1.1.1 (notably the elaboration of the Third Cohesion Report) limited their freedom of research.

However, as the concept of polycentricity is an important building block in European territorial policy documents, and as the results of this project are some of the most prominent presented by ESPON to the European world of spatial policy, it seems necessary to submit the scientific aspects of the work to a thorough and frank review and to raise the issues that seem doubtful. Not in the name of sterile academic debates, but in order to advance the applied research on a field which where policy makers need solid foundations in order to make informed decisions. In this sense, the 1.1.1 report, which is widely acknowledged as a step towards further understanding of the European urban system, raises many questions on conceptual and methodological aspects which have a significant influence on the research results and, thus, on the policy messages it conveys.

7. Overview of the comments on the final report ESPON 1.1.1 project by the Monitoring Committee and the ECP network

Owing to its wide scope, the pioneering character of research undertaken, as well as a particular position in the ESPON programme, the ESPON 1.1.1 project on: "The role, specific situation and potentials of urban areas as modes in a polycentric development", generated broad interest among both scholars, planners and policy makers across Europe. It also induced numerous comments by the ESPON Monitoring Committee and members of the ECP network. These comments, as recapitulated below, have been taken as a point of departure of, and whenever possible, integrated in the work on the ESPON 1.4.3 project.

7.1   Comments by Monitoring Committee Members

7.1.1   Considerations from Switzerland

The Swiss MC member points out that the Swiss urban system has been presented in the ESPON 1.1.1 project report on a factually correct basis, but often lacking details on its regional particularities. It is noted nevertheless, that ESPON's main merit is not the generation of new knowledge on individual European countries, but rather establishing a superordinate level of analysis, i.e. depicting the links among national urban systems and presenting their position in a broader spatial context.

Indeed, in ESPON 1.4.3 project an effort has been made to characterize these links first of all by identifying a new set of transboundary Functional Urban Areas. Also, work has

focused on improving cross-national comparability of FUAs by the implementation of a consistent, standardized definition of these basic spatial units.

Still, some specific problems as to the way, the Swiss urban system was depicted in the ESPON 1.1.1 report were identified in the MC comments. Among others, designation of the Swiss – French EuroAirport as belonging to the French city of Mulhause, while ignoring the neighbouring city of Basel, is strongly questioned. Such an allocation has been corrected in ESPON 1.4.3 report. In fact, the Basel – Mulhause area is identified as one of transnational Functional Urban Areas (metropolitan area) with the population total of 982 thousand (Section 6, Table 4 and 5).

7.1.2   Consideration from France

The French MC member prizes the ESPON 1.1.1 project for succeeding in overcoming the lack of a unified statistical system while presenting an integrated picture of Urban Europe. Aside from this, a number of critical points are also raised. These include: the use of static indicators that fail to account for the evolutionary dimension of urban areas; the use of GDP as a measure (not fully satisfactory one) of the wealth of regions; an arbitrary selection of some other indicators, for example the 45-minutes isochrone as the accessibility criterion.

As a result, it is claimed, the picture of the French urban system is not quite complete. Among other things, Le Havre and Rouen should be considered one FUA, while Nantes – Saint Nazaire and Strasbourg should (and could, if trends were taken into account) appear among the MEGAs.

Further discussion focused on polycentricity measures as adopted in ESPON 1.1.1. First of all, the policy recommendations concerning polycentrism are seen as rather vague, and addressed to thee different scales of government. These recommendations are not easily converted into concrete policies. Secondly, morphological polycentrism indicators can dominate the relational (read: functional) polycentrism – i.e. measures which are much more important. Thirdly, the vision of polycentricity based upon the Randstad example is restrictive, as only few urban systems have such a configuration (proximity, density, specialization, complementarity). Finally, the question that remains open is: what does performance of a polycentric urban system mean in terms of sustainable development?

In the present report, the question of polycentricity and its correlates are treated quite extensively. It is one of the crucial notions, introduced in the ESDP, and its relevance for spatial policy at various levels should be discussed, with different aspects and alternative interpretations analysed in debth.

7.1.3   Consideration from Finland

The Finish MC member notes that the part of the report devoted to networks and specialization of urban areas is based on case studies only and the information about strategies adopted is weak.

Another comment concerns the use of five functions, out of the original set of seven, to classify the FUAs. In the case of Finland this resulted in the allocation of a MEGA rank to Turku but not to Tampere, which is difficult to accept.

The policy recommendations, as formulated in the ESPON 1.1.1. Final Report, are relevant, but remain too general. Admittedly it is not an easy task to offer concrete policy recommendations and measures, especially at the European level. Differences between national and regional administrative systems make a transnational policy implementation difficult. The Report, as it is claimed by the Finish MC member, did not answer the following

questions: what kind of polycentricity is good for regional development? What is the optimal relation between centralization and decentralization?

Another problem pertains to cities, such as St. Petersburg, which are important nodes of transnational urban networks, but owing to their situation beyond the EU-27 +2 boundaries, were not included in the analysis. This problem, it is suggested in the present report, should certainly be tackled in a future ESPON study on the European Urban System.

7.1.4   Consideration from the Netherlands

Stimulation of cooperation between municipalities, i.e. promoting the formation of   urban networks is indicated as a policy recommendation, formulated in the ESPON 1.1.1 report, that fully corresponds to the Dutch planning practice.

Conversely, according to the Dutch MC member, there is ground for identifying polycentricity attributes with the Lisbon Gothenburg goals; neither can any causality be claimed to exist between policentricity level on the one hand, and the indicators of economic growth and sustainability on the other.

Also, it is pointed out that, while offering recommendations concerning national and regional levels, the Report gives insufficient attention to the way in which the EU itself can promote polycentric development – namely via structural funds and sectoral policies.

7.1.5   Consideration from Belgium

The Belgian MC member focus on the case of Brussels FUA, which is wrongly delimited, and appears as such in the Final Report, even though this error was indicated by the Belgian ECP already at the stage of Third Interim Report. Obviously, in the work of ESPON 1.4.3, the proper correction was introduced.

7.1.6   Consideration from the European Commission

An analogous question was raised by a representative of the European Commission. It concerned the city of Thessaloniki in Greece which, in spite of its relatively big size and important functions, was not depicted as a MEGA. This case was also investigated and corrected (see Tables 4 and 5) in the work of FUAs consolidation, in the framework of ESPON 1.4.3 project.

7.2   Comments by the ESPON Contact Points network

Out of numerous comments made by representatives of ten ECPs (of Belgium, the Czech Republic, France, Greece, Ireland, Malta, the Netherlands, Poland, Slovenia and Sweden) those presented below, refer mainly to the scope of ESPON 1.4.3 project. Among topics omitted are questions pertaining to the identification of PUSH and PIA areas, as well as to the urban networks analysis.

7.2.1   General questions (strategic reflections)

Individual evaluations of the report by national experts vary considerably. Thus, from the point of view a Belgian expert, the main problem concerning polycentricity as a spatial policy goal is: at what scale? For example, the strategy to strengthen the Vlaamse Ruit, which is an inter-urban polycentric node, is a monocentric strategy at the regional level.

Experts from the Netherlands identify two challenges, or lessons stemming from the report: Each FUA, in order to improve its position in the European urban system, should develop a specialization with a potential demand on the European market. Secondly, policies should strive to improve cohesion between regions and help to develop a balanced urban system. Unlike in the report, however, where cohesion is identified with "evenness" among regions at all spatial levels, in Dutch spatial policy cohesion is promoted at the level of metropolitan regions, while international competitiveness is seen as stemming from the diversity of the regions.

In the case of the Czech Republic, polycentricity goal is judged to be of high importance, since the process of transition to market economy has brought strong imbalance between Prague and the rest of the country. While FUAs are distributed fairly adequately throughout the Czech Republic, inter-urban, international and cross-border cooperation remains poor.

For Sweden the report is relevant at all levels of governance. The position of MEGAs and other bigger FUAs, with a functional specialization of urban nodes, is very important from the national perspective. Strong, successful urban regions situated across the national territory are the main contributors to economic growth, and the challenge for the regions is (similarly as in the Dutch case) to be able to use their unique conditions and resources.

In Polish ECP comments on ESPON 1.1.1 Final Report it is emphasized that the results of the project concerning urban system's polycentricity closely correspond with results of studies conducted in Poland. While the overall polycentricity index is high, its value is dominated by the weight of structural indicators (rank-size distribution, spatial distribution of urban places). Conversely, the values of functional polycienticity indicators (accessibility, connectivity), are low. This leads to strong policy recommendations concerning improvements in spatial accessibility at both transnational and interregional levels, as well as the promotion of inter-urban cooperation and networking. This similarity of the results is achieved in spite of the fact that the set of FUAs, as identified for Poland in the ESPON 1.1.1 report is far from optimal and poorly corresponds with FUA sets identified for a number of other countries. In fact, in the framework of ESPON 1.4.3 project it has been subject to basic revision.

The Slovenian expert notes that high morphological polycentricity, a feature of the urban system of that country in the light of 1.1.1 report, also reflects the national perspective and national policies that aim at the development of a balanced urban system. However, according to national studies, interrelations between the individual FUAs, and the integration of the urban system is stronger than it is suggested in the ESPON report.

French ECP expert resounds the comments by the MC representative concerning criteria adopted for the selection of MEGA's. It is namely pointed out that these criteria – the role attached to harbour functions in particular, favoured the seaport cities (the case of Le Havre), while they did not allow for inclusion into the set of MEGAs such major urban centres and agglomerations as Nantes and Strasbourg.

ECP comments from Ireland and Grecce are rather critical. According to them, the ESPON 1.1.1 results poorly correspond with the established knowledge concerning the spatial structure as well as functioning of the respective national urban systems. It is noted that consequences of the EU enlargement to the east (in 2004) are not clearly reflected in the project analytical results and its policy recommendations. Reference is made in particular to prospects of the emergence of linear urbanization corridors, beyond the Pentagon. These questions, admittedly, have been analysed extensively in another project, namely the ESPON 1.1.3. Also it this context, the Belgian experts point to a potentially dramatic impact of polycentric development on natural assets, especially through the development of transport corridors between high and medium rank MEGAs.

The latter point relates to problematic aspects of polycentric development, which are referred to in a number of ECP comments. These include especially the possible contradictions between spatial cohesion and competitiveness objectives, and between polycentric development strategies as implemented at different levels simultaneously. For illustration: a contradiction is found between economic efficiency goals of EU transportation

strategy that promotes the growth of major urban centres in the NMCs, and the negative impact this strategy has on cohesion levels at the national scale.

At the same time it is emphasized by several ECP experts (those from Greece, Poland, Sweden and Malta) that the approach to polycentricity taken in ESPON 1.1.1 project follows the interpretation found in the European Spatial Development Perspective, where polycentricity is used as a descriptive and a normative concept at the same time. In ESPON 1.1.1 report, the emphasis is put on measuring rather than on the evaluation of polycentricity. For ECP experts from Ireland and Belgium this lack of critical analysis of polycentric development is a definite drawback of the report. As they point out, the positive statistical correlation between the level of polycentricity on the on hand, and economic wealth and sustainable development (environmental protection) is extremely weak, while the correlation with spatial equity measures is even negative. In each case, nothing is known about causal relations. As the Irish experts insist, one of the outcomes of the research should be a more critical assessment of the European urban system, and especially of the potential of the polycentric development model as a planning tool throughout Europe.

7.2.2   Methodological matters

Most of the ECP representatives appreciate an impressive volume of work conducted in ESPON 1.1.1 project which provides a solid basis and an important reference for future studies on the European urban system. Experts from France, the Czech Republic, Sweden, Belgium and Poland emphasize, among other merits, the wide scope of the study, the huge amount of information handled, an attempt to operationalize the polycentricity concept.

Still, a number of critical remarks have also been formulated in the ECP comments. The French expert considers the empirical study of city networks as a crucial aspect of the theme which, however , has been covered in the project in a rather fragmentary and preliminary way. Several experts point to limitations of the analysis and the results that stem from the lack of comprehensive sets of relevant spatial data, in particular the data on flows, functions, interrelations.

The ECP representative from Malta observes that although the FUA represent relevant units for socioeconomic analysis, they rarely function as formal administrative, or self-governance entities; hence, few actual policies are implemented at this level. The Slovenian expert noted a lack of mutual comparability of FUAs and FUA sets between individual countries, as the FUAs were identified and delimited by national experts at the country level.

The French expert points at both advantages and disadvantages of the FUA typology. The list of criteria adopted should be complemented by indicators of the range of influence of the urban agglomerations, their cultural heritage etc. According to several ECP experts, including those from Poland and Sweden, the typological analysis suffers from its static character. On still another point, Greek, Slovenian and Polish representatives regret that the EU-27 +2 is considered in the analysis as an excessively closed territorial system, while, even within the EU, cross-border metropolitan areas are not identified.

Numerous critical comments, including those by experts from the Netherlands, Belgium, Ireland and Poland, refer to the choice of indicators that measure economic competitiveness, spatial equity, and environmental sustainability of urban systems at the national and regional levels.

As to comments concerning relations between scientific results of the project and the policy recommendations, as formulated in the final report, experts of individual ECPs differ from each other. ECP representatives of Malta, Belgium, France, Greece and Poland find such a relationship in the report, but are critical of individual recommendations. For example, investments in city networking may not bring foreseeable results. Another point: building up potential of large urban centres (including the MEGAs) upon their functional specialization may involve a risk of instability in the long term. Also, due to insufficient data concerning the functions performed by andividual FUAs and MEGAs, the recommendation concerning functional specialization lacks solid scientific basis. These questions are raised in the ECP

comments from the Netherlands, Poland, Ireland and France. In a similar vein, for the Swedish expert the policy recommendations provided in the report are overly general and only implicitly related to the scientific results of the project.

According to ECP representatives from Ireland and the Netherlands, the report fails to prove that more polycentricity at the European level could lead towards achieving the Lisbon – Gothenburg goals. Not enough attention is given to alternatives to polycentricity, i.e. advantages of monocentricity and of spatial concentration. Experts from Poland, Belgium and the Netherlands claim that the association between values of the polycentricity index and policy objectives may be positive in some cases, while negative in others. Another criticism shared by most of the experts is that a contradiction appears when policies aim at fostering polycentricity at different spatial levels at the same time. Promoting polycentricity at one level tends to decrease polycentricity at other spatial levels. The report fails to spell out definite priorities in this respect.

Concerning the indicators and criteria selected for analytical purposes, opinions of the ECP representatives vary. Generally, it is pointed out that the concepts of FUA and MEGA should be further refined. Some of the indicators used in the FUA typology seem not to be relevant for measuring the importance of urban centres and their growth potential. This applies more specifically to airport (some serving mainly tourist traffic) and harbour functions (comments by Belgian and Polish ECP experts). Doubts are raised by Italian, Irish and Dutch ECP representatives with regard to the structure of polycentricity indexes used.

Differences in national definitions and data quality, as well as their accessibility, constitute a major difficulty. This concerns in particular the flow data. The French expert writes explicitly about limitations of the project results attributed to heterogeneity of national data sources and the lack of a genuine pan-European system of territorially disaggregated statistics. In spite of these problems, however, the effort undertaken in data collecting and processing is impressive. Also, the rich cartographic representation of the results is one of the essential contributions of the project. Assembling data base for 1595 FUAs in EU-27 +2 represents a major achievement, even with the problems of cross-national comparability of data.

7.2.3   Questions for further research

It is concluded by most of the ECP experts that further research on the European urban system is required. However, progress in research will be conditioned upon the availability of new internationally comparable data. These data should first of all pertain to inter-urban flows and networking activities. They should also allow to carry on dynamic analysis. Among new topics identified are: long term trends in economic structure, population mobility, housing market evolution, increasing intra-urban disparities and segregation, implications of demographic decline (depopulation) and international migration, the role of environmental assets, quality of urban life and cultural heritage as factors of urban development and urban competitivencess

8. Criticisms of Espon 1.1.1

8.1   An unclear scientific position

The ESPON 1.1.1 project is part of an applied research programme and as such obviously framed by the expectation of the policy makers. The ESDP defines polycentricity in a normative way as being inherently good. In general, ESPON research teams were not asked to critically discuss concepts of this type, but rather to start from the ESDP as the existing policy consensus and to operationalise its ideas. However, one can ask whether for difficult and complex questions such as polycentricity, this is really the best approach, even in an applied research programme, as it limits the researchers to a very small field of action, potentially resulting in highly contestable results.

In the case of the final report of project 1.1.1 it is sometimes difficult to differentiate the descriptive and analytical study from a more normative narrative often based on the ESDP and general objectives as defined by ESPON. In this context, many hypotheses remain unquestioned. For instance, on page 3 of the report, it is said that "(…), polycentricity is about promoting the balanced and multiscalar types of urban networks that are most beneficial from a social and economic point of view, both for the core areas and for the peripheries."

In this sentence the descriptive value of the concept of polycentricity is shifted – one would say biased – into a rationale of action: polycentricity is depicted here as a potential leverage (to be used by planners and policy-makers) to develop an efficient spatial planning policy ("most beneficial from a social and economic point of view"). Even though this could be a result of the analysis, it might be more appropriate in a research context not to take for granted such assumptions which have an incidence on the conceptual framework of the study and on its methodology, where the normative discourses are abusively implemented into unquestioned research hypotheses.

As an example, the morphological polycentricity analysis in chapter 3 frequently abandons the purely descriptive analysis to enter the darker waters of judgmental discourses about what the results should be. The rank-size rule (used in this case to describe the concentration of the population in the upper levels of urban systems a relatively constant relation between size and rank of cities in a given urban context), suddenly becomes a goal to be achieved in order to attain a morphological polycentricity that is implicitly depicted as positive for the EU, following in so an assumption developed for instance in the ESDP.

Here is how a situation of primacy is described in negative terms in Hungary:
> "Budapest, its capital city, for historical reasons is *far too* large for this small country, in fact two-and-half times *too* large" p. 66

Many other examples can be found in the report:
> "Athens and Thessaloniki are *far too large* for the remaining urban system in Greece"

"The 249 areas are *well* distributed across Europe" p. 16
> "A uniform distribution of cities across a territory is more appropriate for a polycentric urban system", p. 5

What are the criteria to decide if a country performs poorly or a city is too large or a distribution more appropriate? Moreover, the bias in favour of polycentricity is so important that it is nowhere said a capital might be 'too' small in countries in which the primatiality of the largest city is inferior to what the rank-size "law" provides for.

This is all the more puzzling as the report provides a critical examination of the ESDP's objectives at the beginning of chapter 2. It is as if the initial cautions expressed in this first part of the study have been forgotten when undertaking the actual research work (at least in chapters 3 to 5). When the report states (on page 13) that "the question is therefore where new functional entities, created trough increased integration and co-operation, may change the European urban hierarchy: where can new nodes emerge, strong enough to counterbalance the Pentagon?" (p. 13), Belgian and Polish contact points criticised this approach, arguing that the main question should have rather been a critical examination of polycentricity as a descriptive tool and as a planning principle in Europe. The commentators (see V. Biot, 2005) insist on:

>"The problem of the 'relevance' of polycentrism, not scientifically proven by any 'correlation' method (…)" (p. 16)
>
>or
>
>"For Poland, this report has taken for granted the approach of polycentricity selected in the ESDP and uses it as a normative and descriptive concept. So the emphasis is on measuring (polycentrism), not on the evaluation of polycentricity." (p. 19).

Overall, the scientific approach seems thus to be biased by a pro-polycentricity position where the ESDP/ESPON framework is influencing the analysis and results by applying unquestioned principles, objectives, hypothesis and methods. Those normative presuppositions also produce some biases in the measurement tools elaborated to study the urban system – leading to the fact that some key methods and results of the ESPON 1.1.1 report, as we show, are contestable. The issues raised are obviously related to the question as to what extent solid scientific research can be done in an applied research context where researchers are pushed to apply vague political goals as if they were scientifically valid concepts.

8.2   Conceptual issues on polycentricity and functional specialisation

Within the concept of polycentricity, various issues are studied, at different scales, in the final report of project 1.1.1. Scales are sometimes mixed up and so are the concepts, without underlining the links between them.

8.2.1   Scale issue

A scale-dependant analysis of polycentricity:

The problem of the *scale* at which polycentricity is studied needs to be clarified. In the ESPON 1.1.1 report, polycentricity is promoted as a continuum, while the structuring role of cities is perceptible at two clearly different scales – defining distinct issues: on one hand, the framing purposes of territories as providers of people services, or the mere execution of production activities from a Christallerian angle; on the other hand, the issue of insertion points in the globalized economy. Polycentricity is even, in some parts of the study, conceived at the *inner* city scale, what constitutes another completely different issue:

>"Polycentricity is also opposed to urban sprawl, in which the structure of secondary centres is diluted in a spatially unstructured continuum" (p.3).

A scale-dependent analysis of functional specialisation:

After measuring some elements of polycentricity in Europe, the 1.1.1 report shifts for some times to another dimension of urban systems with the study of the functional specialisation of cities. This analytical reorientation relies on the assumption that differences in specialisation between two cities are the driving forces for their integration into a polycentric system.

However, there is an inconsistency in the use of this argument. The report assumes that polycentricity would result from functional specialisation at meso/micro level but that it is no longer relevant at the macro level (page 3). It is as if distance was reducing the potential complementarities between specialised cities. The scientific literature argues on the contrary that the most important European network of cities links distant global cities that share either functional complementarities or the same specialisation. From the metropolitan archipelago to the global city theories, recent researches argue that Paris, London, Amsterdam, Frankfurt and other major European cities shape a key polycentric economic system. To this little attention is paid in the 1.1.1 report that focuses on local accessibility and spatial proximity.

Actually, various situations have to be distinguished concerning functional specialisation:

- the case of performing small- and medium-sized cities, whose strength lies in their advanced specializations. These cities (or more precisely their firms or institutions) are often inserted into cooperation networks, but with a European if not worldwide dimension, thus not at all proximity networks. Small or medium university cities belong to this category.

- the case of neighbouring small- and medium-sized cities, in which firms actually operate in clusters (for instance, in the Belgian Courtrai area or in the north of Italy in the Brescia area or, in a high tech vein, the Silicon Valley). In the present case, it is not the specialization of cities, but well their insertion into a very specific chain and into proximity networks favouring cross-individual relationships that makes their prosperity;

- the case of polycentric urban frames, often found in old areas of heavy industrialisation or in mining areas, where neighbour cities suffer from the legacy of obsolete structures or their repercussions and from a development gap in their tertiary market sector, especially enterprise services. These cities often have weak links with each other. It is hard to see on which bases they could build up links while they compete for aids or investments. Those cities would draw more benefits from developing specialized niches in connection with nearby metropolises and would consequently make up for their lack of high level services, for instance in France, the cities of the Nord-Pas-de-Calais coal basin and Lille, or Charleroi and Brussels in Belgium.

- the case of metropolises: proposals favouring polycentricity presuppose that the remetropolisation and globalisation of the economy should lead cities to specialize. In fact, the most performing large metropolises appear to have their dominant structure both diversified and more and more similar (Cabus & Saey, 1997). A similarity can be established between inter-city relationships and the trends in international trade, which decreasingly concerns complementary goods exchanges (Krugman, 1991). This is not only true of the economic structures of those metropolises, but even of the image they wish to give of themselves and of their achievements. Besides, the benchmarking studies conducted by international offices encourage a homogenization of cities' urban policies.

8.2.2   Concepts mixing issue

As mentioned from the start polycentricity has two different dimensions, a morphological one and a functional one. The study covers a very large part to the first dimension, which constitutes the core of the quantitative analysis, and pays less attention to the relational issues. Even though much more difficult to study because of missing data, one needs to stress that the "space of flows" to use Castells terminology, actually quoted in the report in Chapter 6, is of crucial interest.

Besides, functional polycentricity can be envisaged in two ways:
•   In its first sense, this word is used to describe cities and regions which differ from each other as to their specialization in such or such functions, i.e. metropolises in global economy, medium-sized cities in people services, coast or mountain cities in tourism, small cities of rural regions in the industrial development of local productions, etc. In this first definition, functional polycentricity is thus closely linked to the notion of functional specialization, suggesting possible cooperations between complementary cities.

•   A second definition of functional polycentricity can start from a more dynamic approach of urban and regional systems. Functional polycentricity is then no longer limited to the study of the cities' economic specializations in such or such function, but corresponds to the *functioning* of the urban system. The emphasis is shifted here from complementarity to exchanges between cities and regions or, statistically speaking, from location quotients to intra- and inter-regional matrixes. Polycentricity is measured in terms of intensity of the relations (exchange of labour, capital, products, services, ideas, etc.) between the spaces considered.

In ESPON 1.1.1, specialization and relations are often assimilated as the same thing even though their relation is never demonstrated nor even analyzed. This appears clearly on page 3:
"At the regional or local scale, polycentricity occurs when two or more cities have functions that complement each other and even more so, if the cities co-operate with each other in order to be able to act jointly as a larger city. At this level, policies for polycentricity stimulate the functional division of labour, as well as the flows and the level of co-operation between neighbouring cities".

The study of functional specialisation seems to take for granted the causal link between functional complementarities and potential polycentricity. Yet, there are numerous examples of interactions that result not from distinct functional specialisation but from common specialisation in one or more functions. This is the case in the metropolitan systems in many developed western countries where the strongest interactions in a given urban system take place between the major agglomerations which in fact share the same economic specialisation. Relations do not come from differences but from identical specialisations in this case. At a larger scale, the London – New York – Tokyo triarchy described by Sassen results from the same concentration of financial services in these three global cities.

Moreover, the 1.1.1 report does not manage to propose a framework explaining how functional specialisation is a tool to describe relational polycentricity. It only does so implicitly with the seven functions depicted in each country in chapter 4. It is unclear, however, how a high ranking score in one function or another increases the potential for polycentric integration of a city. Many studies on city-region networks have stressed the limits of such hierarchical classifications (ranking method). At least it should be complemented with an analysis of "real" economic flows (see P. Taylor, 2003 and its argument on global city networks for instance). In other words, to allocate a value to cities

does not inform about actual exchanges between them. This is the paradox of the analysis proposed by project 1.1.1: it focuses on functional specialisation of cities but fails to indicate functional - that is to say relational – polycentricity.

As one can see, there is also a confusion between "spontaneous" relational polycentricity and institutional cooperation as if the processes were almost equivalent. The indistinct use of both functional integration processes (that result from real flows) and of co-operation (which is not defined in this case as functional or political) is clear in the following sentence:
> "A third important precondition for polycentricity is that of functional integration and co-operation." (p. 17).

As these two dimensions refer to different level of analysis (socio-economic and urban processes on one hand, political and administrative configurations on the other), one solution to limit an undifferentiated use of these complementary but yet distinct dimensions of relational polycentricity would have been to separate them much more strictly in the different parts of the report. Such a clearer distinction would have prevented some problems one faces in the understanding of PUSHs areas, where the potential role of political institutions is used to define inter-urban relations.

8.3   Measures

8.3.1   Measure of polycentricity

The study of the European urban system is done in a very empirical way, using standard statistical tools. Polycentricity for instance is qualified via different measures among which the size and location indexes. Demographic size is the primary indicator of polycentricity. However, it refers to a relatively limited understanding of urban "systems". As urban geographers have shown the rank-size analysis is only efficient to qualify the hierarchy of a set of cities but not a *system* of effective relations. Indeed, the use of the rank-size rule is at best only a very indirect indicator of how an urban system might work. It is based on the underlying hypothesis that the geographical distribution of cities follows a hierarchical pattern. In this case, the European urban system is therefore not seen as a network but as a hierarchical arrangement of cities.

This Christaller-like approach is even more obvious when complementing the size index by the location index. The report says:
> "The second prerequisite of a polycentric urban system is that its centres are equally spaced from each other – this prerequisite is derived from the optimal size of the service or market area of centrally provided goods and services. Therefore, a uniform distribution of cities across a territory is more appropriate for a polycentric urban system (…)". (p. 60).

This normative proposal, where a homogeneous distribution of cities is considered "optimal", follows a Christallerian rule. This expresses a partly out-dated understanding of contemporary urban systems, especially in regard with the notion of relational polycentricity which demands a network approach rather than the study of an evenly distributed and hierarchical urban structure. In this regard, the 1.1.1 report analysis has been criticised by Contact Points as too static, studying the location of cities (*urban structure*) but missing the interactions between cities (*urban system*). In other words the priority is given to morphological polycentricity (via the analysis of spatial proximity) over relational polycentricity measured in terms of connectivity. Despite the complementary use of a connectivity index at the outset of the analysis (as a third indicator of polycentricity), the study quickly shifts to a narrowed definition of polycentricity:

"The preconditions for polycentricity are best where cities are located in proximity to each other." (p. 13).

This hypothesis should have been debated more thoroughly as it becomes the key to the rest of the analysis on potential new polycentric developments in Europe. It is indeed what justifies for the authors the use of 45 minutes isochrones to define the PUSHs and PIAs areas. This criterion unfortunately focuses on *local* accessibility rather than on long distance connectivity, most likely leaving aside the important interactions between distant city-regions that constitute the European urban system.

8.3.2   Measure of functional specialisation

There is a lack of theoretical clarification on the underlying urban model used to study the functional specialisation in Europe. It seems that the seven functions have been cherry-picked and correspond more to an opportunistic research strategy depending on data availability than on a solid analysis of what cities are, a problem obviously linked to the requirements of the ESPON programme to cover 29 countries. A basic model of urban functions would have been useful if only to explicit the rationale behind this functional typology.

On theoretical level, one might regret a lack of detailed analysis of some functions used in the classification as for instance with the "knowledge" function which is not clearly defined. Regarding the fuzziness of the terminology "knowledge", it would have been more explicit to discuss the content or to use a clearer term such as the *creative* function defined in Florida's works (2002) or the *innovation* function (understood in a more restricted way than the creative function as activities dealing with the commoditisation of new knowledge). This semantic debate is not a purely academic argument. It has interesting outcomes in the selection of relevant indicators. The number of students is interesting but is quite limited: number of scientific quotations (informing what could be labelled the "new knowledge production" function), amount of R&D investments (informing the "innovation" function) and the share of creative workers (i.e. the "creative" function) could have further helped understand a complex and probably crucial aspect of modern economies. From our point of view, the idea would be to go past a too high-tech industries related definition of the knowledge function and to broaden the analysis to this ability of cities to engage technological, conceptual, aesthetic and semiotic innovation.

At a more general level, the different "functions" used in the study would have benefited from an initial clarification of the goals and nature of the classification exercise. There is for instance an unclear relation between the nature of the specialisation (quality) and the implicit ranking (quantity) that is proposed for each city. From what one might understand, even though this is unfortunately not made clear in the report, the first dimension informs the quality of a city (administrative, residential, etc.) while the other measures its "attractiveness", i.e. how successful a city is in polarising a function. This results into giving two distinct objectives to this functional specialisation study which may not go together easily. One is strictly descriptive (what is the dominant function(s) of a city?); the other is more evaluative (how good is a city performing in this function?). These are two different exercises that need to be carefully articulated.

This can be illustrated with a detailed analysis of "the decision-making power in the public sector" function. What is described here is not so much a function strictly speaking than a valuation of how a city is successful in a function which could be labelled here the *administrative* function. This administrative function is not specific to European and national capital cities – the ones that have got strong decision-making power in the public sector – but to many other cities. The degree of specialisation (low/medium/strong decision-making

power) should probably be considered in a second step of the analysis. This classification can even be further refined by including a spatial reference depending on the scale that is considered. In the French case for instance, administrative cities could be differentiated for instance in four categories: préfectures (NUTS-3 level capital cities) would be *local* administrative cities, préfectures de région (NUTS-2 capital cities) would be *regional* administrative cities, where as Paris would be the *national* administrative city and Strasbourg would be a *European* administrative city. This example shows that to make the analysis more meaningful the nature of the specialisation (the function strictly speaking), its scale and its intensity should be differentiated more accurately. One could extend this to most functions. For instance a city specialised in the "production" function (this can be refined for instance into manufacturing and service production) can be either a local, regional, national or European decision-marking city. In this context, the distribution of the headquarters of the top European firms might be an indicator among "productive cities" of a European concentration of decision-making powers[2]. Following the same reasoning, a city with national headquarters would be a productive city with national decision-making powers, and so forth with other regional and local firms.

In conclusion, the functional classification of European cities should distinguish more clearly the *nature* of the specialisation, its *intensity* and its different *scales*, leading to a three dimensional analysis of specialisation.

Axis 1: nature of the specialisation (qualitative)
Axis 2: scale of the specialisation (qualitative)
Axis 3: intensity of the specialisation (quantitative)
This could lead to a comprehensive table of analysis as follows: Axis 1 = columns, Axis 2 = lines, Axis 3 = quantitative values in the table

	Residential function	Industrial function	Innovation function	Administrative function
International/European				
National				
Regional				
Local				

8.4   Methodological issues

Our strongest criticisms go to the methodology used in the delimitation of the FUAs and in the measurement of polycentricity.

8.4.1   Data availability: the strongest limitation to the study

The 1.1.1 report most important limit comes from the lack of consistent data which can be harmful in terms of results and methodology as shows the following example. If the authors of the report express their intentions to give priority to a European-based study of the urban system ("the point of departure is that of the European scale" (p. 4)), thus following one of the major objectives given to the ESPON programme, the report is almost entirely based on a very national-centric approach. The study of polycentricity is for example firstly achieved at the national level as the title of chapter 3 indicates. Furthermore, the very definition of the basic geographical building blocks of the study refers to the national level. For instance the FUAs are based on "two thresholds depending on the total number of inhabitants of a *country"*. Seemingly the degree of polycentricity is studied within national

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[2] See draft final report of ESPON 3.4.2, page 78, figure 31

urban systems. Even though the authors argue that "the countries are the best-integrated territorial level in Europe" (p. 5), this argument is no justification for an analysis that is a European-oriented research project. The object is not to study the most-integrated territorial level (whatever it is) but to focus on the *European* urban system. This has severe consequences in the results. For instance, the calculation of Thiessen polygons within national borders excludes all potential transborder polycentricity.

The problem of nation-centricity of the study becomes even more critical when it is combined with irreproducible national data (such as subjective expert "insights"):
> "In countries lacking official definitions, the identification of FUAs was based on insights provided by our national experts. The use of national definitions means, however, that the choice of FUAs is not totally comparable across Europe." (p. 4)

This explains partly the problems with some building blocs of the analysis: the Functional Urban Areas.

8.4.2 Evaluation of MEGA identification and qualification

The aim of ESPON 1.1.1., "The role, specific situation and potentials of urban areas as nodes in a polycentric development" was to research the conditions for a more polycentric development of the European urban system, following, with some restrictions, the idea of polycentricity manifested by the European Spatial Development Perspective. The starting point for the discussion on the topic was the assertion that a polycentric urban development of the EU27+2 requires a counterweight to the Pentagon, which constitutes a too much concentrated space of European urban power. This had led to an investigation of the state of the urban system with respect to its functional specialization and the degree if its polycentricity. Eventually the study required a reasonable division of space, i.e. an identification of spatial units, the building blocks of polycentricity 'to be'. The urban structure of 29 European countries was mapped by distinguishing 1,595 Functional Urban Areas (FUAs). These were identified according to either travel-to-work areas, commuter catchments areas, urban poles, or insights provided by national experts. Although, the non-uniform criteria of FUA identification (Ex. population mass of the urban core) had actually hampered the possibility to confront them, the FUAs constituted a basis for further inquiry. The analysis of these spatial units according to their functional specialization had given an overall ranking of all FUAs. The study had distinguished three groups of FUAs. Those were: regional or local FUAs, transnational or national FUAs, and, FUAs of special importance, called the Metropolitan European Growth Areas (MEGAs)..

FUA typology and MEGA identification

The study identified 76 MEGAs, defined by the authors of the project as the strongest. The distinguishing of the so called 'FUAs of Exellence" required a check-up of all 1,595 European FUAs according to selected features and functions. Seven such indicators were chosen,

namely: population (i.e. the mass function), transport, tourism, industry, knowledge, decision-making and public administration.

The selected factors can be evaluated as interesting and important criteria and they mostly cover the needs of such an analysis, assuming of course, that the level of the analysis is quite general. The choice of features follows to a certain extent the goal of the project, namely the idea of identifying FUAs which could functionally counterbalance, or at least complement the cities of the Pentagon. It should be stressed however, that there are some basic restrictions to this assessment.

The criteria of FUA evaluation should encompass those fields of activity which, on the one hand, typically decide about the metropolitan power of a city and region, and on the other are characteristic for the cities of the Pentagon. The functional structure of the strongest European cities is based on the quantity and quality of metropolitan functions. i.e. their specialization and spatial range. This study had not separately analyzed the range of the given functions. In some categories, the way they were chosen had allowed them to a a priori evaluation of the city's importance in the spatial dimension. This concerned in the first place, the decision-making function. The location of the largest companies in Europe, whether their headquarters or not, may to a certain extent give an idea about the range of the corporate-control function. Similarly, when describing the administrative role of the FUA, the importance of the city was either identified as local, regional, national or transnational. With respect to the last function, it was the case, when the city held European or international institutions.

The situation was to a certain extent different with regard to other functions. For example, one of the two indicators evaluating the position of a FUA as a transportation node were the traffic levels at the main airports. The levels themselves did not characterize the range of the airport, at least if their structure, i.e. origin and destination of the passengers was not identified.

The measures used for describing the knowledge functions of a FUA provided good information on the degree of polycentricity of knowledge in the respective country and gave an idea about the national importance of the city with respect to this function, as well as general facts on the overall level of national higher education. It delivered no knowledge however, on whether the function of the FUA was mainly regional, or national, or even transnational. Of course the attainment of this information would have required detailed survey studies. And apparently at this level of analysis this was not necessarily obligatory.

Another issue is the selection of features itself. Some of the categories seem much less informative and objective than the others. The fact that such commonly understood metropolitan functions as culture or media had been omitted maybe due to problems with measures and data collection, could have had an influence on the results of the inquiry. Although, for example, it's a common fact that the main cultural centers are usually also those with universities. At the same time, the mass criterion and the tourist function might

on the one hand have eliminated smaller cities, or on the contrary, included them if they were strongly specialized tourist centers, without other important functions.

MEGAs' qualification

According to the above criteria, 76 FUAs qualified as best. These urban areas, the MEGAs had in the further course of the study undergone an analysis which aimed at their qualification, again, according to selected factors. As building stones of four basic themes: mass criterion, competitiveness, connectivity and knowledge basis, altogether eight variables were selected, namely population, GDP in millions of EURO, GDP in Purchasing Power Parity per capita, location of TOP 500 companies in Europe, passengers at airports, the multimodal accessibility indicator, education level and R&D share of employment. It seems difficult not to point to the fact that at least two measures where chosen a second time, namely population and passengers at airports, which might not necessarily be wrong, but does not add a special quality to the overall picture.

It had been mentioned in the project report, nevertheless it should be stressed here, that the factor of "competitiveness of the MEGAs" could only indirectly be estimated, without going deeply into the analysis of certain factors which stimulate the attractiveness of the city's and region's environment. Without such an analysis, it is difficult to actually describe the development potential of the MEGA, as the location of TOP 500 companies and GDP in PPS are results and not factors of urban competitiveness. Another point is that competitiveness should not be measured by economic indicators.

In some cases, when qualifying a city's potential, the national importance of the urban area seems to be as important as the international role. There is no conflict between this statement and that of the necessity of including the range of functions in the analysis. A city may actually be strong nationally (also in a polycentric system) and have a comparatively low position in the macro scale, but as European polycentricity is concerned, both roles are important in evaluating a MEGA. The country's territory is namely also a space of influence, sometimes not without significance when considering the role of possible counterweighs for the Pentagon.

It is difficult to argue with the results of the MEGA analysis. The qualification achieved in much respect corresponds with other rankings of European metropolises. In some cases however, the 'affiliation' of a city to a category seems to be coincidental (Ex. Palma de Mallorca as a highly specialized area in the same category as Warsaw and Prague, or even the placement of Bratislava in the same category as the two other Central-European capitals).

This also points to the question, whether the way to achieve a more balanced urban system in Europe leads through a specialization of functions in MEGAs outside the Pentagon, or whether functional specialization should concern rather FUAs of lesser importance, which would allow them to promote in the national urban systems. The viewpoint of the present

author follows the latter concept, according to which MEGAs of at least 3 first categories should omit specialization, which could in some cases cause economic collapse or isolation and be as multifunctional as possible, with some specialization, especially as far as non-economic functions are concerned.

8.4.3 Critics on the definition and delineation of the spatial units: FUAs, MEGAs, PIAs and PUSHs

Typical difficulties encountered when trying to delimitate a homogeneous set of functional spatial units in Europe are:
- differences among national definitions and criteria of identification of towns and urbanized areas
- heterogeneity of urban settlement patterns, related to variations in overall population density, urbanization level, historically development settlement forms
- non uniform availability of spatial data

The lack of common data for the Urban Agglomerations (UAs) and the FUAs partly explains the lack of a single Pan-European definition that is necessary to attain the objective of the study.

> p. 54: "Lacking comprehensive and definitive definitions, this research could only look at various national definitions of UAs".

Commuting data used in this case are available at NUTS-5 level only in 8 countries while national FUAs definitions are available in only 18 countries. Therefore, even though there is theoretically a definition of the FUAs, the final database at the end of the data collecting exercise looks much more like a patchwork of differentiated perimeters than a really standardised spatial study. Quite obviously the authors of the 1.1.1 report must not be blamed for this deficiency which points out our inability to create a pan-European statistical system.

However, this has lead to some decisions which appear somewhat arbitrary and which, therefore, limit the usefulness of the results:

> "For countries with more than 10 million inhabitants, a FUA is defined as having an urban core of at least 15,000 inhabitants and over 50,000 in total population. For smaller countries, a FUA should have an urban core of at least 15,000 inhabitants and more than 0.5% of the national population, as well as having functions of national or regional importance." (p. 24).

The difference in the definition that depends on total national population size is not explained. It is also not convincing. For example, one can see hardly a reason why the minimum population size for FUAs in Hungary, or the Czech Republic should be 50,000 while in Denmark, or Slovakia – 25,000.

The inclusion of cities under the 20,000 inhabitants threshold:

> "even smaller FUAs are considered if they have a functional role within the national urban system" (p. 64)

is another unjustified decision, and raises the question whether the goal is to elaborate a European view of the urban system, or to cater to national interests only.

More generally, in the light of the fact that the main goal of the 1.1.1 project was to identify areas of potential urban concentration that could constitute in the future a counterweight to the Pentagon, and hence to analyze urban patterns in Europe at a macro-level, the size limit of 50,000 for a FUA seemed to be an absolute minimum. Inclusion of de facto small towns

(as cores of free-standing FUAs) as potential concentration nodes at the European scale has led to a dilution of the analysis and to some paradoxical results, especially in its further steps, when the PUSH and PIA areas were identified. It should be recalled at this point that in the ESPON 1.4.2 project, on *Small and Medium-Sized Towns*, 50,000 inhabitants constitutes the upper size limit for small towns, while medium-sized towns are considered those falling in the 50,000 – 120,000 category.

Such a situation – a choice of FUAs not totally comparable across Europe – was unavoidable. Total comparability of spatial units would not be a realistic objective. The question remains, however, whether the comparability level actually achieved is satisfactory. This is an important question, as the FUAs comprise the basic units on which most of the further analysis (for example, measurement of polycentricity) was performed.

Some comments of the ex-post evaluations prepared by the monitoring Committee members and the ESPON Contact Points relate to the FUA definition, but these observations are fragmentary. A closer inspection of the FUAs on a country-by-country basis reveals further inconsistencies, as well as errors. The lower size limit for FUAs in several countries – Germany, France, Hungary, Italy, Romania and the United Kingdom – was set at 20,000 inhabitants, in contradiction to the general definition provided. At the same time, population of the smallest FUA identified in Belgium is 70,000 (with all the remaining ones above 100,000), 52,000 in Bulgaria, 51,000 in Spain, 39,000 in Latvia, 60,000 in the Netherlands, 47,000 in Slovenia, and 44,000 in Poland (with all the remaining FUAs, except one, exceeding 100,000 inhabitants). In the latter group of countries there exists, of course, towns below that size level which could qualify for inclusion as cores of potential FUAs. However, they were not considered as such. In Poland, to use one example, there are 137 towns in the size category of 20 – 50,000 inhabitants, the majority of which are free-standing settlements rather than parts of larger urban agglomerations.

As a consequence of this, differences in the number of FUAs among individual countries can not be rationally explained on the basis of structural characteristics of urban settlement (see Table 1). Indeed, the number of FUAs in the Czech Republic (25) is just one-third of the respective number for Hungary (77), in spite of similar population size and area of the two countries. It is even lower than the respective number for Slovakia – a smaller country, sharing a number of common characteristics with the Czech Republic. In the case of Poland, the number of FUAs identified (48) is comparable to that of Sweden, Portugal and Greece, countries with much smaller total population (and surface area for the latter two).

Country	Number of FUAs	Population size of third smaller FUA (in thousand)
Austria	24	22
Belgium	21	141
Bulgaria	31	59
Switzerland	48	22
Czech Republic	25	71
Germany	186	27
Denmark	35	26
Estonia	10	24
Spain	105	52
Finland	35	26
France	211	22
Greece	45	22
Hungary	77	26
Ireland	7	47
Italy	253	23

Lithuania	8	72
Latvia	8	49
Netherlands	39	61
Norway	36	24
Poland	48	105
Portugal	44	22
Romania	59	24
Sweden	47	23
Slovenia	6	77
Slovakia	27	28
United Kingdom	146	21
ESPON Space	1588	

Table 4   Selected data on Functional Urban Areas (FUAs)

The source of these inconsistencies is no doubt a lack of sufficient comparability of the FUA definitions actually used for individual countries. Differences in the selection criteria were simply too large. As a result, the set of 1584 FUAs identified in the project fails to represent a close enough approximation of the European urban network.

Some comments can also be made about the delimitation of the other spatial units used in the Espon 1.1.1 study:

• There are several references to the MEGA selection in the comments on the final report made by the MC and the ECPs. Most of the remarks pertain to individual cities (FUAs) that are missing from the MEGA list but, for some reasons, deserve to be included. The Swiss MC, for instance, points out the case of Basel which was not allocated to the MEGA group owing to the fact that, according to the comment, in the ESPON 1.1.1 the Swiss-French EuroAirport was allocated to the French city of Mulhouse, ignoring its relation to the city of Basel. This indicates one of the problems with the MEGA (and hence the FUA) delineation, i.e. it disregards transboundary areas.

Some comments also bring out the question of whether important metropolitan centres situated beyond the EU borders should not be considered among the MEGAs. St. Petersburg, for example, "one of the biggest MEGAs in Europe and a very important node of the Baltic Sea Network". This is in fact part of a bigger issue; another relevant example being that of Istanbul.

A number of doubts, as to the appropriateness of the selection criteria adopted, arise from a closer inspection of the full list of the 76 MEGAs, as well as their allocation among the four categories. An important point has been made by the Belgian CP who questions the major role attached to airport and harbour functions. Indeed, the elevation of Palma de Mallorca, Cork, Turku, Southampton or Le Havre to the MEGA status raises doubts, when centres such as Strasbourg, Hannover, Thessaloniki, The Hague, or Liverpool are left behind. The allocation of Palma de Mallorca into a category with cities such as Rotterdam, Budapest and Lisbon is a clear signal that revisions are required in the typological procedures applied.

• A number of comments converge on the fact that the function of PIA units is not clear. Questions pertain to their embeddedness within national territorial planning systems. The ESPON report seems to consider the PIAs as spaces for reflection, but also for action, in order to re-balance the European urban system. It seems, however, that this objective has not been fulfilled, owing mainly to methodological issues.

First of all, the PUSH and PIA systems reflect all the inconsistencies, primarily the differences among individual countries, in the way the FUA units were identified and delimited.

Secondly, it was not realistic to assume that all FUA centres, including the smallest ones, can extend their zones of influence over the area situated within the 45 minutes travel time isochrone. If clusters of PUSH and PIA areas were to form magnets for further concentration of economic and demographic potential, they would have to be based upon the network of large cities which offer real attracting power in terms of labour market and the range of specialized services.

Thirdly, as presented in the report, the pattern of PUSH areas reflects mainly variations in the overall density of urban settlement. Countries with high population densities are almost completely covered by the PUSH and PIA units. This says little about the structure of the urban systems.

Fourthly, the identification and typology of the PIA areas (276 in total) has produced a number of paradoxical outcomes. As a consequence of the adoption of specific rules, some de-facto middle-sized cities, for example Bielefeld and Verona, emerged as main cores of huge urbanized areas, with the total population of 7.6 million and 6.6 million, respectively. By doing so they could also "advance" within the European urban system, to 12th and 15th rank, among all major potential urbanized areas (PIAs) identified.

Using the case of Poland, one can easily demonstrate that in the elaborate construction of the system of PIA areas, little of the knowledge on the urban structures of a given country was used, thus significantly reducing the scientific nor practical utility of the results.

8.4.4   Travel to work: a restrictive approach to polycentricity

Commuting-based analysis is an inadequate indicator to describe relational polycentricity as it focuses only on some types of relations (workers' journeys from home to work) and favours a strong bias towards morphological polycentricity based on spatial proximity. Which the authors of the report acknowledge:

"One must however keep in mind that spatial proximity is only one aspect of the interaction between cities. Another potentially more important one, is the network aspect. Due to the lack of data, the present project has not endeavoured to present a comprehensive analysis of network interaction between cities." (p. 53)

If commuting does seem the least inefficient dataset to define FUAs perimeter, it is very contestable when applied in terms of relational polycentricity as it is does in the PUSHs and PIAs analyses.

"Our hypothesis is that cities with overlapping travel-to-work-areas have the best potential for developing synergies." (p. 13)

This hypothesis has the merit to be explicitly stated so that the reader knows on which assumption the results are based. However, one is bound to ask why would overlapping travel-to-work areas favour synergies?

"For each of the FUAs, we have calculated the area that can be reached within 45 minutes by car from the FUA centre. These areas are then approximated to municipal boundaries, as municipalities are potential building blocks in polycentric development strategies." (p. 13)

Here again we find in this explanation of the methodology a confusion between socio-economic processes and political and administrative forces (municipalities as actors of

polycentric development strategies). But it goes further as it is based on the belief that proximity leads to polycentricity. Commuting distance is however a very limited tool as the report explains itself:

> "Considering the potential commuter catchment's area as a proxy for each city's influence area is another major hypothesis underpinning the present analysis. Many other types of influence areas exist. For example, the concept of Global integration zones implies that some urban areas have transcontinental influence areas." (p. 121)

8.4.5   Criticism of some detailed indicators

Some more detailed problems can be encountered throughout the report, such as:

Size index. The regression plot is calculated on all cities but the major. No explanations are given on the reason why not to include the biggest city.
Location index. The Thiessen polygons methodology does not reflect effective influence of cities.
Connectivity index. Due to lack of data, it is potential connectivity that is measured and not "real" flows (p. 61).
Polycentricity index. Based on selected indicators from the three indexes (size, location and connectivity), this index is a weighted aggregation that refers to no theoretical framework. Therefore, the weight of each indicator seems to be the result of an arbitrary decision which is all the more problematic as the authors admit the final results to be sensitive to changes in the aggregation method. The health warning on the value of the polycentricity index is therefore alarming considering the small correlations observed later in the report between polycentricity and economic, social and environmental data.

GDP/inhabitants. Recent literature shows that the use of GDP/inhabitant is a poor indicator of social inequity and probably even of economic development dynamics in most developed city-regions (Davezies, 2005). Other indicators should be used as the one proposed by Behrens (2003).

8.4.6   Criticism of the indicator of polycentricity

The proposed indicator of polycentricity uses the size, location and connectivity indexes described above. It is based on three normative assessments:
•   a linear rank-size distribution indicates a better urban pattern because not dominated by a single big city
•   an uniform pattern of the cities disseminated through the national territory is better than a pattern of urban clusters polarised on certain parts of the national territory
•   in a polycentric pattern, accessibility should be identical for small and big FUAs.

The use of Thiessen's rather than Reilly's polygons to measure the more or less strong equidistribution of the territorial servicing by cities means that the equality of the size of these polygons is an objective per se, notwithstanding the pattern of the population on the territory (or that the even distribution of the population on the national territory is an objective per se).

A complex index adds indicators supposed to account for these three dimensions. It characterises each country by a synthetic value, notwithstanding the size of the country. Beyond the normative character assigned to the rank-size law, a logical incoherence

appears, as this index takes into account the distribution of the population of the FUAs as well as their GDP, when analysis should precisely aim at measuring if more or less polycentricity implies more or less equity in the regional distribution of the GDP.

8.4.7   Results

Due to these different limitations (conceptual and methodological), of which the lack of consistent data is the most harmful, some results are suspicious.

Part 6. Conclusion and Propositions for future research

9. General reflection

The present reflection takes no account of Christallerian polycentricity, that is, the analysis of basic provision of services to population and of the availability of good quality infrastructures which public authorities have to ensure on the whole territory. This question is indeed rather within the scope of the ESPON project on small and medium cities. We focus here on the question of global polycentrism as political objective aiming at Europe's economic development in a context of economic globalization, increased competitiveness, pursuit of the Lisbon objectives and quest for better cohesion. We leave environmental questions open for they would deserve a complete study in themselves: is enlarged polycentricity likely to favour more sustainable development?

The brief economic analysis we have achieved does not demonstrate any obvious advantage of polycentricity in terms of economic efficiency, measured globally in relative GDP growth compared to the European average: on the contrary, even if a very weak statistical relationship appears (quite insignificant indeed), this rather shows that more monocentric States or macroregions show a little better economic behaviours, which can be understood in the framework of a globalization and tertiarisation of the economy benefiting big cities, which are the strongest integration nodes in the world economy. The free play of the dominant globalised economic powers tends to reinforce this situation in favour of the "hubs" of the world economy. This can naturally impact negatively on cohesion inside national territories (let us take the case of new member countries in which the opening to market economy and the sudden tertiarisation and internationalisation have largely favoured the growth of capital regions to the detriment of industrial areas. The latter used to be, on the contrary, favoured by planned economy, which had also ensured an administratively balanced distribution of industrial activities on the whole of the national territory, even if command functions were centralized from the capital).

The political discourse in favour of polycentrism should be able to rely on a sufficiently refined statistical analysis, specifying which scales are concerned. This report tries to contribute to solve both questions, although it remains an incomplete preliminary draft that should be completed and refined, with increased means, especially if one wishes to add to the analysis the dimension of contribution to sustainable development.

In case an accurate analysis of polycentricity and polycentricity fitment on different scales fails to be achieved, the polycentrism option will remain an empty political slogan, an "auberge espagnole" where any partner will bring himself what he wants. Some will bring a line of argument to get regional aid, cohesion funds or public aid. Others inversely, will argue in favour of a *laisser-faire* policy and competition between urban areas, and a weakening of the regulating power of the States. If one wants the reflection on a polycentric Europe to really be in line with the aims of development, world competition, cohesion, and the Lisbon criteria and the concept to be operational, we believe, at the end this Report, that three fundamental questions should be discussed:
- specification and definition of urban areas, as a basis of any reflection on polycentrism;
- analysis of the polycentricity scales and its modalities, with impacts at different scales;
- examination of the deficiencies of the statistical measure tools and of the tracks to follow.

From this angle, we will examine three basic issues.

Definition of the city

This is no trivial question. The first problem is to make a choice between city as a FUA or as a MUA. It has appeared to us that the two dimensions should simultaneously be considered. Of course, the FUA, which corresponds to the employment pools, is an essential concept in functional terms and imposes itself more and more in a context of suburbanisation and growing mobility of active populations. However, the MUA, as a dense and coherent morphological whole, remains an essential concept: with identical populations, it clearly appears that FUAs which have better opportunities are those having a strong MUA in their centre, especially if the latter has some good quality historical and cultural heritage. This is an important element in the new forms of cross-city competitiveness. In addition, if we limit our work to the FUAs' level, it might lead us to political conclusions in opposition to, or taking no account of, the territorial planning policies aimed at by different states or regions: prevention of scattered housing - which increases mobility, energy and space consumption, and damages landscape values – and consequent reconcentration of housing and activities in urban cores.

We have therefore chosen to consider FUAs and MUAs separately.

Now comes the question of delineation.

In principle, the definition of FUAs is simple, as they are based on the functioning of labour pools. Meanwhile, defining the centres is not always trivial, for instance in the case of very densely populated areas where an intense industrial activity has developed from a history of transformation of craft activities into dense small- and medium firms networks: we then have labour pools without true centre-cities: such cases can be found in the large metropolitan area of Porto or in the north-east of Italy. Some similar situations are found in the intermediary areas between the biggest cities of some old industrialisation basins in Great Britain, (for ex. between Leeds-Bradford and Sheffield). But, if the definition is simple (even if the threshold of 10% of the actives heading for the MUA can be discussed), its exact application today is only possible with a considerable work of data collection in some countries (Belgium, France, Germany, Austria…). In other countries, even if we have strongly homogenised our data compared to those provided by the ESPON 1.1.1 report (often based upon administrative divisions only, most of the time much smaller than the FUAs), several problems remain. These can result from the fact that the available data (at least within the time and with the means we had) divide the whole national territory into labour pools, which are thus statistical entities in labour market analyses and are only proxys of the true FUAs. This is the case in Great Britain and Italy for instance, and to a certain extent, in The Netherlands, where the COROP (NUTS-3 level) have been drawn while taking into account the reality of the labour market spatial functioning. In other cases too, there were no statistics available, and we had to call on national experts to try to determine the labour pools. This problem was nevertheless less consequent in countries where extensive communal divisions have been determined according to commuting movements (like in Sweden, but in that case the MUA was overestimated), or in countries where suburbanisation is only starting (Romania, Bulgaria).

For MUAs, applying the basic statistical definition, in terms of contiguity of communes with high population densities, imposes in many cases a tiresome complementary analysis with the help of satellite images, in order to check morphological urban continuities. This is no formal exercise: indeed, behind such an analysis, the question of large scale polycentric morphological wholes is raised, generally much less coherent, less structuring and bearing less sustainable development values than more compact cores. In addition comes the question, in the case of polycentric urban entities, of densely populated areas or FUAs close

to FUAs' fitments: we had to define secondary MUAs, which can have their own big labour pool but can be at the same time included in a major FUA. Once again, these are no simple questions of formal description: they can have major impacts in territorial planning and regional development matters. The very long exercise of FUAs' and MUAs' delineation will still have to be refined for some countries, but the following extracts of (unfinished) working maps show what a map of FUAs and MUAs at NUTS-5 level, extended to the whole of Europe, could look like. The extracts partly concern Belgium, western central France, France and Germany (with the cross-border Basel area).
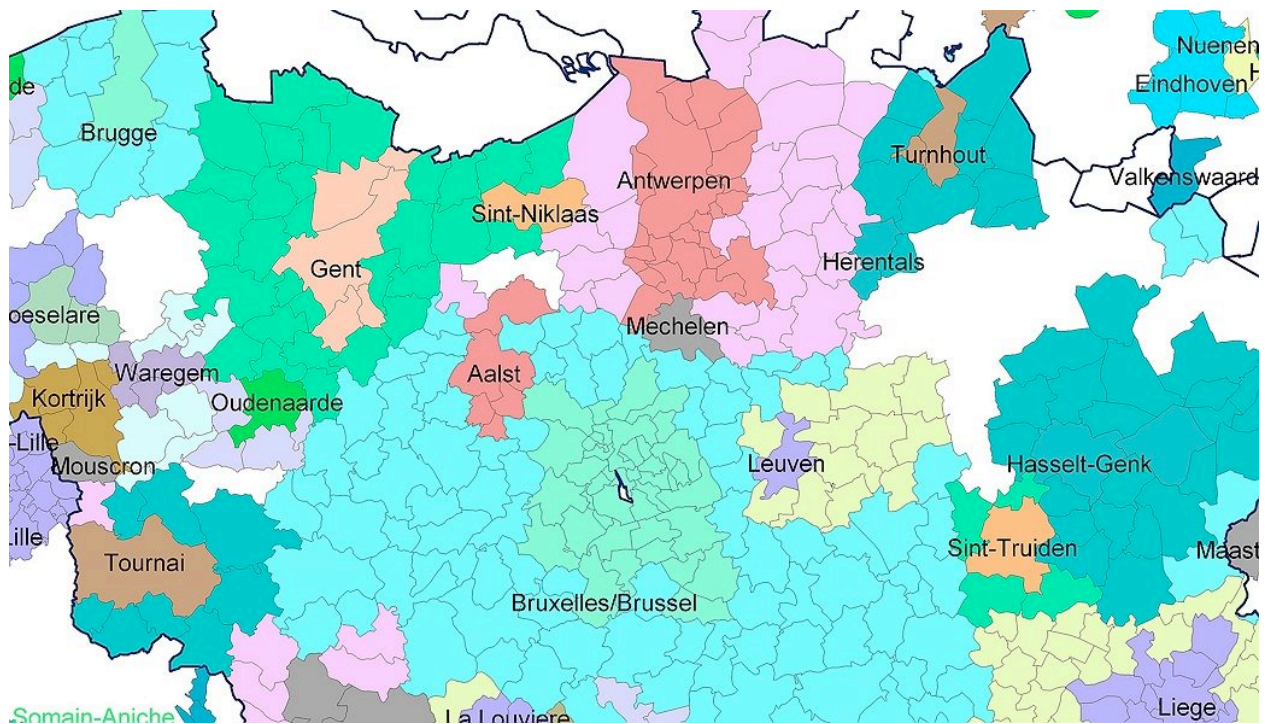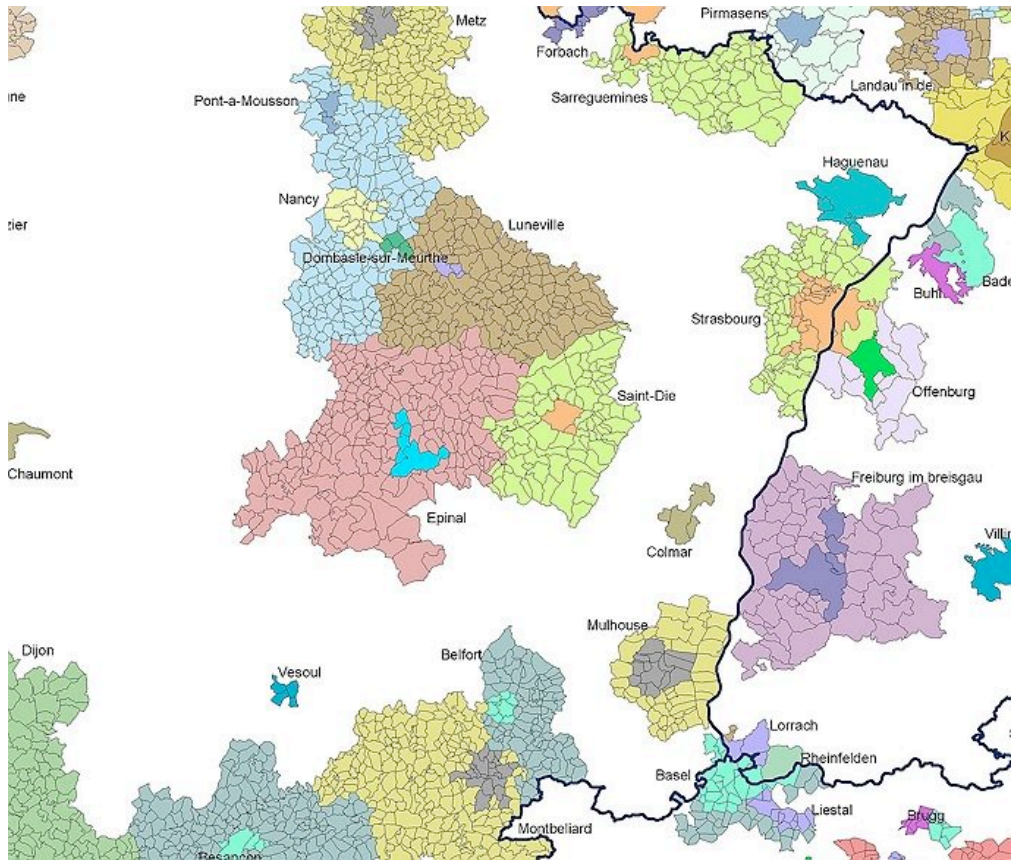

Figure 30   Belgium

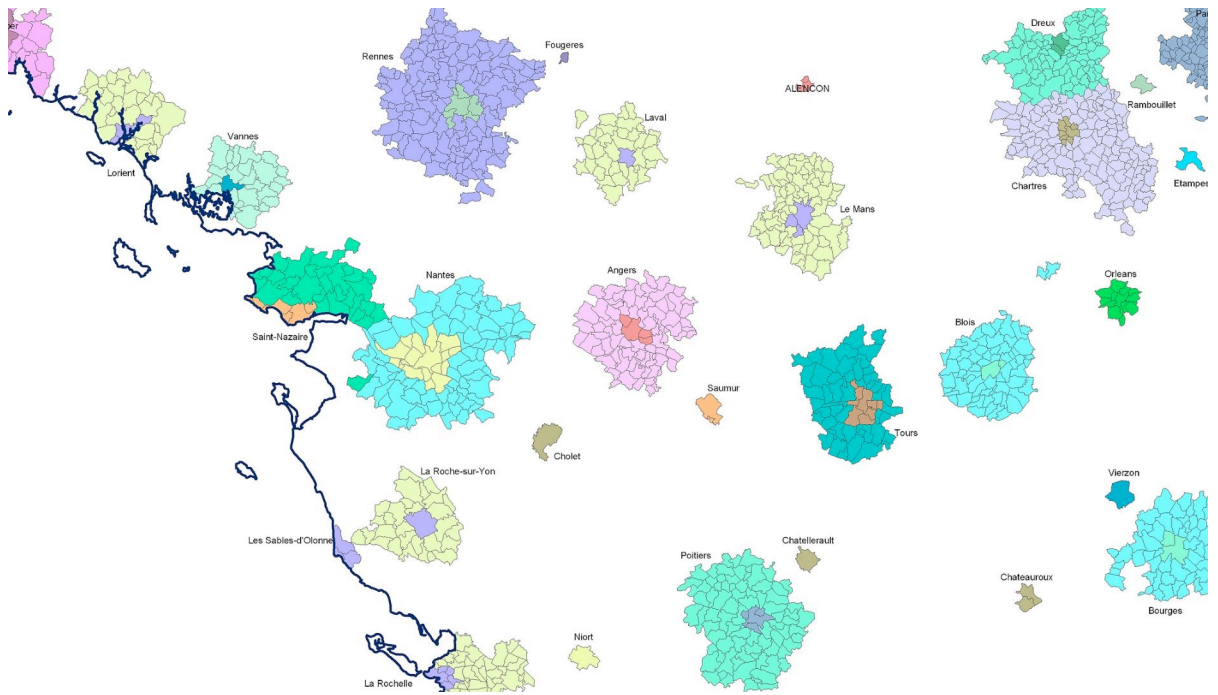**Figure 31   France and Germany**

Figure 32   Western central France

9.1   Polycentricity scales and political stakes

9.1.1   At European level

At this level, one can consider that the stake of polycentrism is the stake of cohesion within the EU. The promotion of polycentrism at this scale is however opposed to the strongest trends of the deregulated world-economy, which tend to increase the concentration of decision in a small number of big world places. For the countries situated outside the central European space (Polygon), in particular the new member states, the situation is paradoxical: the claim for more polycentrism is a quite legitimate aim in favour of cohesion, but at the same time those countries tend to adopt rather liberal attitudes which not only bear more polycentricity (at least functional, at the highest hierarchical levels) on a European scale, but also tend to reduce polycentricity (to the benefit of the capital) inside national territories.

9.1.2   At States' level

The level and models of polycentricity are, first of all, products of different histories of territorial shaping, during the very long cycles of history. Territorial planning and regional development policies will have few impacts in the short run on those situations, which does not mean that *laisser-faire* is satisfying, the less so as this can lead to a worsening of negative trends.

Meanwhile, statistical analysis shows no automatic advantage in favour of the most polycentric states or macroregions. Once again, the different situations and dynamics seem to be bound to the specific historical forms of monocentrality or polycentrality in the different states.

At the highest levels of the urban hierarchy, quite different forms of polycentricity can be measured, depending on whether clusters of metropolises are considered individually or are aggregated into polycentric metropolitan entities (for ex. Rhine-Ruhr, Rhine-Main, Birmingham polycentric metropolitan area, Upper Silesian polycentric metropolitan area, etc.), the more so if the analysis is extended to a transborder scale (for ex. the Öresund metropolitan area, with Kobenhavn and Malmö). Besides, Geneva, Basel and Luxembourg are large cities from a national point of view, but become metropolises (and even, for the latter two, the centre of polycentric metropolitan areas, if we take the transborder dimension into account). Globally, it seems that polycentricity based upon bicephalous type systems or with some very strong cores organized around large historical cities (for ex. Italy, Spain), is – all other things being equal – more efficient in terms of scattered economic command and major functions on the national territory, than polycentricity organized around the gathering of clusters of big cities, especially if the latter are characterized by a long industrial past. So, despite the strength of the German economy, the Rhine-Ruhr area appears to bear less integration into the world-economy, and much less cultural values (which is also an element of integration into the world-economy) than the metropolitan areas of London and Paris, which have approximately the same population size.

The impacts of polycentricity and its measurement will also have to take into account the concrete forms of organization of the urban hierarchy, which can be masked by the sole examination of synthetic indexes. For instance, France and Britain both show a strong domination of the capital-region on the urban frame. But in the first case, the urban frame

is completed by metropolises and large cities with an important historical and cultural weight (Lyon, Marseille, Bordeaux, etc.), but with a weak weight in functional command, even at the national scale. On the opposite, in Britain the concentration of international functions in London (and to a certain extent, in peripheral cities of the large London metropolitan area) is accompanied by the delegation of significant command functions at national level to other cities. But their cultural weight is rather weak, and the morphological structuration of their metropolitan areas mixes a very strong structuration at very large scale with confused organizations at metropolitan level.

The impacts of monocentricity will also vary depending whether monocentricity in favour of the capital is coupled with an urban frame from which some well equipped cities of second level emerge (for ex. Finland, with among other cities Tampere and Turku), or inversely whether an apparent polycentricity outside the capital masks in fact a very flat profile multiplying small cities whose sizes are more or less similar and of weak or very weak hierarchical level, without true capacity of economic impetus (for ex. Hungary, Romania, Bulgaria, or smaller countries such as Estonia or Latvia).

9.1.3   At metropolitan areas' level

When polycentricity concerns, in some metropolitan areas, big neighbouring cities of old industrial tradition sufficiently integrated in the world-economy, faced with lacks in knowledge economy and social problems bound to their economic re-conversion, those cities risk competing without much efficiency, none of them reaching the qualitative thresholds that might result in positive and multiplicative effects.

From the angle of territorial planning and more sustainable development, one should also examine more in depth the respective advantages and disadvantages, in particular as far as mobility and space consumption are concerned, of more or less developed polycentricity inside the large metropolitan areas, be they either structured around a single historical centre (Paris, London) or structured by several dense historical centres (Brussels, Antwerp, Ghent, Leuven, etc. in the central Belgian metropolitan area).

One should also study more in depth the impacts of metropolitan polycentricity in social justice matters: the development of polycentricity and suburbanisation can be accompanied by increased social disparities inside the metropolitan entities in the absence of strong cross-subsidization between the different parts of the metropolitan entity and in the absence of an integrated metropolitan government on a sufficiently huge zone. This might result in socially unacceptable consequences, which could eventually damage the development of the metropolitan area as a whole, seen as unique by external observers susceptible to its image.

9.1.4   Territorial polycentricity vs. networks polycentricity

Finally, networks polycentricity (not only their apparent morphological and functional polycentricity) deserves to be analysed more in depth.

At the level of cities, cooperation networks develop according to logics different from proximity logics. As we have seen, proximity can lead to costly and not much efficient competition, even if this is not always true. In this regard, small and medium sized neighbouring cities within industrial districts of small and medium firms should be distinguished from the situation of cities facing difficult industrial or mining reconversion processes, not to say intrametropolitan competitions whose effects can prove negative in terms of planning, sustainable and social development.

But, above all, surveys in Belgium (which should be conducted at European level too) have shown that, if firms do operate well in networks, these do not correspond to apparently obvious topological logics.

9.1.5 Measuring the features of polycentricity better

From what we have just seen, it is understandable that the question of monocentricity and polycentricity is very complex. It cannot lead to simplistic choices (promotion of polycentrism – or inversely monocentrism), without specifying the analyses, the scales and objectives pursued. It is for example not sure that economic growth and internationalisation, territorial cohesion (whose definition still remains to be deepened), social cohesion and sustainable development could be achieved through a similar promotion of "polycentrism". One should still analyze the possible operational measurements according to the objectives aimed.

At any rate, beyond the already mentioned issue of the definition of urban areas, as much at FUAs as at MUAs level (the latter being just as important), it appears that the indicators allowing to assess the impacts of policies are particularly deficient. The urban audit no doubt represents a significant progress, but still suffers from the vagueness of the delineation of the statistical frameworks, of the still very incomplete character of the data collected, and of the fact that the latter are oriented toward the assessment of social and environmental situations rather than economic situations. The regional statistics from EUROSTAT and other sources, still suffering from the lack of precision of their statistical frameworks, are the only left. This has truly less impact in the case of isolated informations (for ex. number of museums, patrimonial characteristics, importance of airports, etc.) than when it comes to measuring the importance and the economic structures of FUAs.

With a view to assess polycentricity (and possible polycentrism policies), it would be particularly important to go over the NUTS units framework, either through regrouping NUTS-3 units differently within a NUTS-2 division which would better reflect FUAs' reality (for ex. in Germany or in Belgium), or though dividing certain current NUTS-3 units, for instance on the basis of NUTS 4 units (for ex. in France or in Spain, where departments and provinces are too huge to determine correctly big metropolitan areas and, the more so, large cities). This question has already been addressed in another ESPON Report. It would of course be ideal to recompose new NUTS-3 units from NUTS-5 units, but one can easily imagine the political difficulties and the scope of such a work.

With all approximations implied in these conditions by such a work, we nevertheless try to close our study by a table (which in our opinion provides a very first, quite temporary, approach, and of which the methodology should be refined and specified) of what might be an analysis of the urban structures oriented toward an assessment of the realities of polycentricity. We were able to achieve this exercise, within the time limits of the project and in acceptable approximation conditions, only for the MEGAs (FUAs of more than 1 million inhabitants), through regrouping constituent cities in the case of polycentric metropolitan areas. Moreover, even at that level we were restricted by the frequent unavailability of important statistics at NUTS-3 level in some countries (for ex. absence of data permitting to estimate the product structure under the NUTS-2 level in Germany). We draw up hereafter a first list of suggested indicators, with their justification, although all of them could not be collected at this stage. Therefore, the structural table of European polycentricity is still very incomplete, even for the MEGAs.

The indicators are divided in four groups:

9.1.5.1   Size of the MEGA

- population of the MEGA's FUA (or of all FUAs of polycentric MEGAs);
- total GDP of the FUA, on the basis of GDP/inhab. values at NUTS-3 level and of the FUA's population or of the FUAs assigned to the NUTS levels making up the MEGA.

9.1.5.2   MEGA classification

We have founded this classification taking into account different dimensions:

- ***a dimension that reflects economic integration.***

The indexes considered are as follows:

- the weight of the MEGA in terms of advanced services office location and their worldwide connectivity (GAWc group's works under direction of P.J. Taylor at the University of Loughborough);
- location of headquarters of the main world firms, weighted by their turnover (those having their offices in Europe among the biggest 2000 world firms listed by Forbes), with distinction of financial, industrial, logistics and building, services and trade sectors;
- the weight of cities in national command. Indeed, the geographical command structure of the firms of national scope might differ from those of worldwide scope. Cities without any significance from a point of view of international integration could inversely prove rather important in terms of hierarchical organization of the national economy. We tried a first approach (imperfect, since it still concerns world firms) of this problematic on the basis of the location of national subheadquarters of big world firms.

- ***a dimension reflecting accessibility.***

The indexes considered are as follows:

- Air space opening. The works by F. Dobruszkes (ULB, IGEAT) allow to know the number of regular direct connections (outside charter flights) between one city and all the others, as much at intra-European as worldwide level (both have to be distinguished, because worldwide hubs have a different meaning for the most transnationalised firms);
- The gateway role of cities compared to the world's economy of transports, measured in first approximation by the importance of cities in containers transport;
- Another index could not yet be calculated: it should measure the number of cities (weighted by their importance and the number of daily connections) accessible by rail within a determined duration of time (for ex. a two hours journey, an acceptable duration for business trips).

- ***a dimension reflecting the patrimonial heritage and the quality of cultural supply.***

Those dimensions are known to take a considerable part in today's dematerialized economy and to represent major elements in the international attraction of cities and in the competition opposing them. The indexes considered are as follows:

- The importance of the MEGA's patrimonial heritage (number of stars and quotations in the European *Michelin* Guides; importance of museums). These measurements, resulting from J.M. Decroly's works (ULB, IGEAT), can still be marred by some biases, notably due to the choice of a French source exclusively for tourist attractions. They will have to be refined, but already provide a first satisfying approximation of the reality;

- One could also add the number of hotel nights.

Within the framework of this report, we provide here a temporary image of these classifications through characterizing each MEGA, on each of the dimensions and sub-dimensions, by an index varying from 100 (the best position) to 0.

9.1.6   The MEGA's structure in view of today's competitive economy and the development of a knowledge economy.

The considered indexes are as follows:

- assessment (from value added statistics calculated by IGEAT on the basis of regional statistical data from EUROSTAT and national sources) of the share of the manufacturing sector in the FUA's economy (excl. agriculture);
- assessment of the share of light industry (textile and clothing, food industry, wood and furniture, paper and publishing, diverse industries) in the industrial economy;
- assessment of the share of financial and business services in the FUA's economy;
- assessment of the share of public services (incl. health and education services) within the tertiary sector;
- assessment of the share of hotels and restaurants in the FUA's economy;
- assessment of the share of transport and communications in the FUA's economy;
- assessment of the share of research and development activities in the FUA's economy;
- one could add the number of quotations by authors working in the FUA in the international scientific literature.

9.1.7   Assessment of performances

This analysis has not been conducted yet, but according to us it should include the following dimensions:

- assessment of social performances (unemployment rate, share of inhabitants with university degrees; available income by inhabitant; ideally, scattering of incomes);
- assessment of environmental performances. This point refers to a more in depth examination of the urban audit's data.
- Assessment of economic performances (relative growth rate, either compared to the European mean or compared to the national average).

Proposition for future research

MEGAs and polycentric MEGAs (ranking according to the population)

		Population	Estimation of the GDP/inhab.	Estimation total GDP
UK	London metropolitan area	13709	29,2	400303
DE	Rhein-Ruhr	12190	25,9	315273
FR	Paris	11175	35,6	397830
NL	Randstad Holland/Delta metropolis	6787	28,9	196128
IT(-CH)	Milano metropolitan area	6011	33,0	198399
PL-CZ	Upper Silesian-Moravian metro. area	5294	10,5	55550
ES	Madrid	5263	24,8	130522
BE	Belgian central metropolitan area	5103	30,2	154042
ES	Barcelona metropolitan area	4251	22,4	95222
DE	Rhein-Main	4149	33,2	137807
DE	Berlin	4016	21,6	86746
GR	Athinai	3761	15,7	59048
IT	Napoli metropolitan area	3714	14,9	55269
UK	Birmingham metropolitan area	3683	21,4	78816
AT-SK	Wien-Bratislava	3368	27,3	92105
DE	München-Augsburg	3271	38,9	127092
IT	Roma	3190	28,3	90277
FR-BE	Lille transborder metropolitan area	3115	18,8	58683
BE-DE-NL	Euroregio MAHL	3016	20,4	61605
DE	Hamburg	2983	31,3	93368
DE	Rhein-Neckar	2931	27,3	80121
DK-SE	Öresund metropolitan area	2842	28,6	81410
PL	Warszawa	2785	18,6	51801
DE	Stuttgart metropolitan area	2665	30,8	81978
PT	Lisboa	2591	24,3	62961
UK	Manchester metropolitan area	2556	19,9	50864

MEGAs and polycentric MEGAs (ranking according to the GDP)

		Population	Estimation of the GDP/inhab.	Estimation total GDP
UK	London metropolitan area	13709	29,2	400303
FR	Paris	11175	35,6	397830
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DE	Rhein-Main	4149	33,2	137807
ES	Madrid	5263	24,8	130522
DE	München-Augsburg	3271	38,9	127092
ES	Barcelona metropolitan area	4251	22,4	95222
DE	Hamburg	2983	31,3	93368
AT-SK	Wien-Bratislava	3368	27,3	92105
IT	Roma	3190	28,3	90277
DE	Berlin	4016	21,6	86746
DE	Stuttgart metropolitan area	2665	30,8	81978
DK-SE	Öresund metropolitan area	2842	28,6	81410
DE	Rhein-Neckar	2931	27,3	80121
UK	Birmingham metropolitan area	3683	21,4	78816
PT	Lisboa	2591	24,3	62961
BE-DE-NL	Euroregio MAHL	3016	20,4	61605
GR	Athinai	3761	15,7	59048
FR-BE	Lille transborder metropolitan area	3115	18,8	58683
CH	Zürich	1615	35,7	57656
SE	Stockholm	1890	29,9	56511
PL-CZ	Upper Silesian-Moravian metro. area	5294	10,5	55550
IT	Napoli metropolitan area	3714	14,9	55269

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HU	Budapest	2523	17,3	43648
UK	Leeds-Bradford metropolitan area	2302	20,6	47421
UK	Liverpool metropolitan area	2241	19,9	44596
NL(-BE)	Noord-Brabant metropolitan area	2083	25,0	51993
RO	Bucuresti	2064	8,1	16718
SE	Stockholm	1890	29,9	56511
FR	Lyon metropolitan area	1787	27,7	49500
PT	Porto metropolitan area	1778	17,5	31115
IT	Torino metropolitan area	1716	29,0	49764
CZ	Praha	1669	18,9	31544
CH	Zürich	1615	35,7	57656
UK	Newcastle/Tyneside	1599	18,2	29102
DE	Nürnberg/Fürth metropolitan area	1583	28,8	45560
UK	Sheffield metropolitan area	1569	15,0	23535
UK	Portsmouth/Southampton metropolitan area	1547	24,6	38056
UK	Nottingham/Derby metropolitan area	1534	20,9	32061
FR	Marseille-Aix-en-Provence	1530	21,6	33048
ES	Valencia metropolitan area	1499	18,3	27432
IE	Dublin	1477	31,9	47116
IT	Venezia-Padova metropolitan area	1401	27,2	38139
UK	Glasgow	1395	22,5	31388
FI	Helsinki	1285	31,0	39835
ES	Sevilla metropolitan area	1262	14,2	17920
NL-DE	Gelderland metropolitan area	1257	22,6	28462
PL	Krakow	1236	14,8	18293
DE	Leipzig-Halle	1214	17,7	21496
LV	Riga	1195	11,5	13743
FR-IT	Nice Côte d'Azur	1189	22,1	26298
BG	Sofia	1174	10,2	11975
DE	Bielefeld/Detmold	1173	25,4	29843
PL	Lodz	1165	8,8	10252
DE	Saarbrücken-Forbach(DE-FR)	1102	21,7	23907
UK	Cardiff/Wales Valleys metropolitan area	1097	18,8	20624

NL(-BE)	Noord-Brabant metropolitan area	2083	25,0	51993
PL	Warszawa	2785	18,6	51801
UK	Manchester metropolitan area	2556	19,9	50864
IT	Torino metropolitan area	1716	29,0	49764
FR	Lyon metropolitan area	1787	27,7	49500
UK	Leeds-Bradford metropolitan area	2302	20,6	47421
IE	Dublin	1477	31,9	47116
DE	Nürnberg/Fürth metropolitan area	1583	28,8	45560
UK	Liverpool metropolitan area	2241	19,9	44596
HU	Budapest	2523	17,3	43648
FI	Helsinki	1285	31,0	39835
IT	Venezia-Padova metropolitan area	1401	27,2	38139
NO	Oslo	1037	36,7	38058
UK	Portsmouth/Southampton metropolitan area	1547	24,6	38056
FR	Marseille-Aix-en-Provence	1530	21,6	33048
UK	Nottingham/Derby metropolitan area	1534	20,9	32061
CZ	Praha	1669	18,9	31544
UK	Glasgow	1395	22,5	31388
IT	Firenze metropolitan area	1090	28,7	31308
PT	Porto metropolitan area	1778	17,5	31115
DE	Bremen	1077	28,6	30802
DE	Bielefeld/Detmold	1173	25,4	29843
DE	Hannover	997	29,2	29112
UK	Newcastle/Tyneside	1599	18,2	29102
NL-DE	Gelderland metropolitan area	1257	22,6	28462
CH-DE-FR	Basel-Mulhouse metropolitan area	982	28,7	28143
ES	Valencia metropolitan area	1499	18,3	27432
DE	Braunschweig-Wolfsburg	1004	26,7	26829
FR-IT	Nice Côte d'Azur	1189	22,1	26298
UK	Bristol metropolitan area	1041	23,6	24568
LU-BE-FR-DE	Luxembourg metropolitan area	983	24,7	24232
DE	Saarbrücken-Forbach(DE-FR)	1102	21,7	23907
UK	Sheffield metropolitan area	1569	15,0	23535

IT	Firenze metropolitan area	1090	28,7	31308	DE	Leipzig-Halle	1214	17,7	21496
DE	Bremen	1077	28,6	30802	UK	Cardiff/Wales Valleys metropolitan area	1097	18,8	20624
GR	Thessaloniki	1052	16,7	17568	CH-FR	Genève-Annemasse	692	29,3	20260
UK	Bristol metropolitan area	1041	23,6	24568	PL	Krakow	1236	14,8	18293
NO	Oslo	1037	36,7	38058	ES	Sevilla metropolitan area	1262	14,2	17920
DE	Braunschweig-Wolfsburg	1004	26,7	26829	GR	Thessaloniki	1052	16,7	17568
DE	Hannover	997	29,2	29112	RO	Bucuresti	2064	8,1	16718
PL	Gdansk	993	13,7	13604	LV	Riga	1195	11,5	13743
LU-BE-FR-DE	Luxembourg metropolitan area	983	24,7	24232	PL	Gdansk	993	13,7	13604
CH-DE-FR	Basel-Mulhouse metropolitan area	982	28,7	28143	BG	Sofia	1174	10,2	11975
CH-FR	Genève-Annemasse	692	29,3	20260	PL	Lodz	1165	8,8	10252

Table 5   Ranking of the European MEGAs and polycentric MEGAs according to their population and GDP

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	MEGAs and Polycentric MEGAs (London metropolitan area = 100)	Total GDP	Location of headquarters and presence of international services (average 1 and 2)	1. Ranking in international business services (average 1a and 1b)	1a. Ranking in international business services (according to GaWC)	1b. Ranking in international business services connectivity	2. Location of headquarters (All sectors)	2a. Location of headquarters (Finance)	2b. Location of headquarters (Manufacturing)	2c. Location of headquarters (Logistics and Building)	2d. Location of headquarters (Services and trade)	Air connectivity (average 3a and 3b)	3a. Air connectivity outside the European liberalised airspace (c)	3b. Air connectivity inside the European liberalised airspace (c)	Conteneurs gateway function (d)	Heritage value (in italics), touristic value only (average 5a and 5b)	5a. Touristic values	5b. Importance of the museums
AT-SK	Wien-Bratislava	23	29	56	48	63	3	6	2	0	2	31	29	33	14	70	80	61
BE	Belgian central metropolitan area	38	41	73	67	80	8	13	7	0	7	22	17	27	487	79	92	66
BE-DE-NL	Euroregio MAHL	15	1	2	2	3	0	0	0	0	0	0	0	0	7	24	17	31
BG	Sofia	3	8	17	13	20	0	0	0	0	0	7	15	0	0	21	21	0
CH	Zürich	14	32	46	43	49	19	75	4	9	0	26	26	26	0	16	20	12
CH-FR	Genève-Annemasse	5	13	26	21	31	0	0	0	0	0	16	10	21	0	27	36	18
CH-DE-FR	Basel-Mulhouse metropolitan area	7	8	10	7	13	6	3	14	0	0	6	0	11	14	43	39	46
CZ	Praha	8	20	39	34	43	0	0	0	0	1	17	10	25	0	83	83	0
DE	Rhein-Ruhr	79	55	77	66	88	32	1	20	118	55	30	18	42	85	51	44	58
DE	Rhein-Main	34	34	61	57	64	7	19	5	3	2	62	79	45	0	17	19	14
DE	Berlin	22	17	33	29	36	2	3	1	0	3	20	9	30	0	81	87	75
DE	München-Augsburg	32	31	36	33	39	27	63	32	0	0	36	30	41	546	37	36	39
DE	Hamburg	23	18	35	30	39	1	0	1	0	2	13	3	23	11	17	21	12
DE	Rhein-Neckar	20	5	4	4	5	6	0	9	22	5	0	0	0	0	13	9	17
DE	Stuttgart metropolitan area	20	19	22	17	27	16	3	35	0	5	14	5	24	0	7	2	12
DE	Nürnberg/Fürth metropolitan area	11	5	10	8	13	0	1	0	0	0	6	0	13	0	19	21	18
DE	Leipzig-Halle	5	6	13	11	15	0	0	0	0	0	3	0	5	0	12	4	20
DE	Bielefeld/Detmold	7	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0
DE	Bremen	8	0	0	0	0	0	0	0	0	0	3	0	7	284	9	13	6
DE	Braunschweig-Wolfsburg	7	4	0	0	0	9	0	22	0	0	0	0	0	0	1	0	2
DE	Hannover	7	6	9	6	11	3	4	3	0	5	7	0	14	0	4	2	7
DE	Saarbrücken-Forbach(DE-FR)	6	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2
DK-SE	Öresund metropolitan area	20	25	46	38	53	5	6	2	38	2	28	15	41	20	37	39	34
ES	Madrid	33	36	54	49	59	18	21	14	58	14	36	27	46	0	47	49	45
ES	Barcelona metropolitan area	24	19	37	32	43	1	1	0	2	2	23	5	40	147	38	55	20
ES	Valencia metropolitan area	7	7	14	9	18	0	0	0	0	0	6	0	12	177	11	15	7
ES	Sevilla metropolitan area	4	5	9	7	12	0	0	0	0	0	4	0	7	9	25	38	11
FI	Helsinki	10	17	25	21	29	10	2	20	9	3	15	6	25	42	16	21	10

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		99	79	67	64	70	91	100	82	204	80	76	83	69	0	116	110	122
FR	Paris																	
FR-BE	Lille transborder metropolitan area	15	5	11	8	14	0	0	0	0	0	2	0	3	7	32	40	25
FR	Lyon metropolitan area	12	10	19	14	24	0	0	0	0	0	13	7	20	0	32	37	28
FR	Marseille-Aix-en-Provence	8	7	14	10	17	0	0	0	0	0	11	10	12	74	30	39	20
FR-IT	Nice Côte d'Azur	7	0	0	0	0	0	0	0	0	0	12	4	20	0	39	53	25
GR	Athinai	15	16	30	23	36	3	4	2	0	3	20	14	26	0	43	43	43
GR	Thessaloniki	4	0	0	0	0	0	0	0	0	0	6	0	13	24	1	1	0
HU	Budapest	11	19	37	32	41	1	1	2	0	0	14	10	18	9	62	62	0
IE	Dublin	12	20	38	32	43	3	9	0	21	0	18	3	32	50	34	41	27
IT(-CH)	Milano metropolitan area	50	31	56	52	60	6	17	2	13	3	36	33	40	0	24	25	23
IT	Napoli metropolitan area	14	3	7	4	9	0	0	0	0	0	5	0	10	38	27	41	12
IT	Roma	23	21	31	27	36	10	5	15	12	8	36	27	46	0	72	86	57
IT	Torino metropolitan area	12	12	11	8	13	13	29	11	0	8	5	0	9	0	16	15	16
IT	Venezia-Padova metropolitan area	10	1	3	2	3	0	1	0	0	0	8	0	17	25	54	77	32
IT	Firenze metropolitan area	8	0	0	0	0	0	1	0	0	0	4	0	7	0	36	40	33
LU-BE-FR-DE	Luxembourg metropolitan area	6	16	29	25	33	3	1	8	0	0	15	0	29	0	17	24	10
LV	Riga	3	7	13	10	16	0	0	0	0	0	4	0	9	12	14	14	0
NL	Randstad Holland/Delta metropolis	49	77	97	84	109	57	77	76	43	23	51	53	49	636	108	126	90
NL(-BE)	Noord-Brabant metropolitan area	13	0	0	0	0	0	0	0	0	1	0	0	0	0	4	3	4
NL-DE	Gelderland metropolitan area	7	1	0	0	0	1	0	3	0	0	0	0	0	30	7	6	7
NO	Oslo	10	16	27	23	32	5	4	9	0	2	17	0	34	14	24	20	28
PL-CZ	Upper Silesian-Moravian metro. area	14	0	0	0	0	0	0	0	0	0	2	0	4	0	0	0	0
PL	Warszawa	13	19	38	34	42	0	1	0	0	0	12	6	18	0	69	69	0
PL	Lodz	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PL	Krakow	5	1	2	2	3	0	0	0	0	0	3	0	6	0	55	55	0
PL	Gdansk	3	0	0	0	0	0	0	0	0	0	0	0	0	27	28	28	0
PT	Lisboa	16	19	36	31	41	1	0	0	3	3	15	9	20	49	45	58	33
PT	Porto metropolitan area	8	1	0	0	0	1	3	1	0	0	4	0	8	27	7	14	0
RO	Bucuresti	4	10	21	17	25	0	0	0	0	0	9	19	0	0	34	34	0
SE	Stockholm	14	26	41	38	45	12	19	12	13	6	23	8	39	3	34	38	30
UK	London metropolitan area	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
UK	Birmingham metropolitan area	20	9	18	14	22	1	1	1	7	1	14	3	25	0	13	16	11
UK	Manchester metropolitan area	13	9	18	14	23	0	0	0	0	1	21	13	29	0	6	8	4
UK	Leeds-Bradford metropolitan area	12	7	14	9	18	1	2	0	0	2	7	0	14	0	8	2	14
UK	Liverpool metropolitan area	11	4	9	6	11	0	0	0	0	0	5	0	9	51	10	14	6
UK	Newcastle/Tyneside	7	5	9	6	12	1	2	0	6	0	6	0	11	0	7	7	6

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Sheffield metropolitan area	UK	6	3	6	4	8	0	0	0	0	0	0	0	0	4	1	7
Portsmouth/Southampton metropolitan area	UK	10	4	8	6	11	0	0	0	0	4	0	8	123	12	6	18
Nottingham/Derby metropolitan area	UK	8	6	10	8	13	1	0	3	0	5	0	10	0	11	7	15
Glasgow	UK	8	7	14	10	18	1	0	2	0	9	0	18	0	24	20	28
Cardiff/Wales Valleys metropolitan area	UK	5	3	6	4	8	0	0	0	0	3	0	6	4	16	17	16
Bristol metropolitan area	UK	6	8	15	13	18	1	2	2	0	6	0	12	9	7	13	2

(a) The worldwide business services connectivity of some polycentric metropolitan areas (mainly Randstatd Holland, could be slightly overestimated, as some links could be intra-MEGA links.
(b) The aerian connectivity of Bucharest and Sofia outside Europe are overestimated, and the intra-European underestimated, as Romania and Bulgaria are outside the European liberalised airspace.
(c) Average between an index based on the number of seats and on the number of regular links
(d) London's gateway function is strongly underestimated as ports like Felixstowe are located outside the limits of the MEGA

Table 6   Qualitative ranking of the main MEGAs and polycentric MEGAs (Business and Transport international connectivity and heritage)

9.1.8   Map of the first component analysis

The objective of this map is to illustrate the urban hierarchy of the major FUA in Europe.

This urban hierarchy has been evaluated at the light of two types of variables: the level of internationalization, on one hand, and the sectorial structure of the economy, on the other hand.
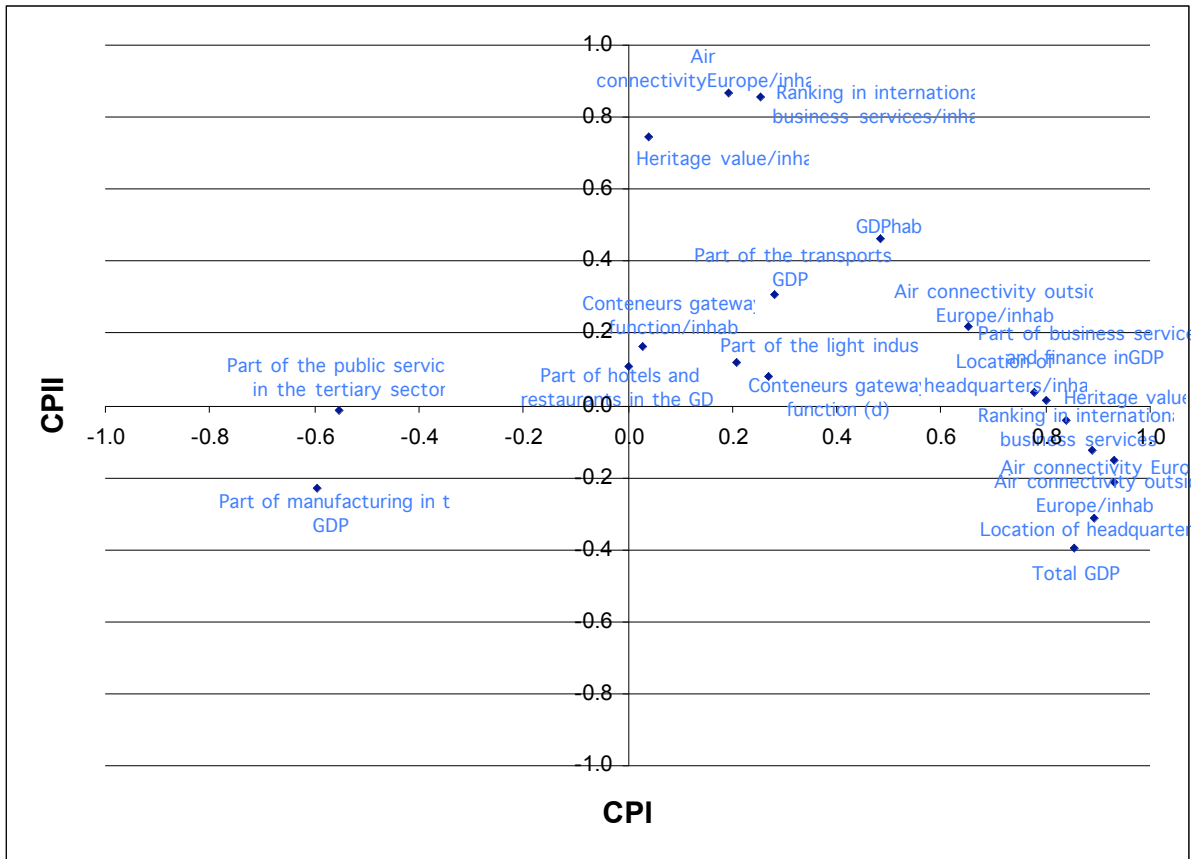

On the one hand, the level of internationalization includes the headquarters of international firms, the location of business services firms, the air connectivity, the Conteneurs gateway function and the touristical value. All these criteria have been integrated in the analysis in both absolute and relative (according to the population) terms: a high relative internationalization does not mean the same in some major world cities, such as London and Paris, or in more modest cities.

On the other hand, the economic structure includes the share of manufacturing, of light industry, of business and financial services, of public services, of hotels and restaurants as well as transportation in the GDP.

All these indicators (20) have been synthetized by a Principal component analysis. The first component of the analysis takes into account 38% of the intital variance, while the second, the third and the fourth only account for 14%, 12% and 10% of the information. Because of the high percentage taken into account by the first component and the big gap between the first and the second component, we only take into consideration this first component to establish the European urban hierarchy. Indeed, as shown on the graph, the first component is correlated with the indicators of high internationalization level: location of headquarters or businesse firms at both absolute and relative terms; air connectivity outside Europe ; and in terms of structure, the share of business and financial services in the GDP.

On the map, the size of the circle represents the total GDP, and the colour, the score on the first component of the Principal Component analysis. It illustrates the high concentration of major commanding and internationalized cities in the "blue banana". We can also observe the quadrialteral of the major internationalized poles of Europe, whose vertex are London, Paris, Amsterdam and Frankfurt. Zurich and Luxemburg are also very internationalized but, especially for the second, it should be relativized by the small size of the FUA. Outside
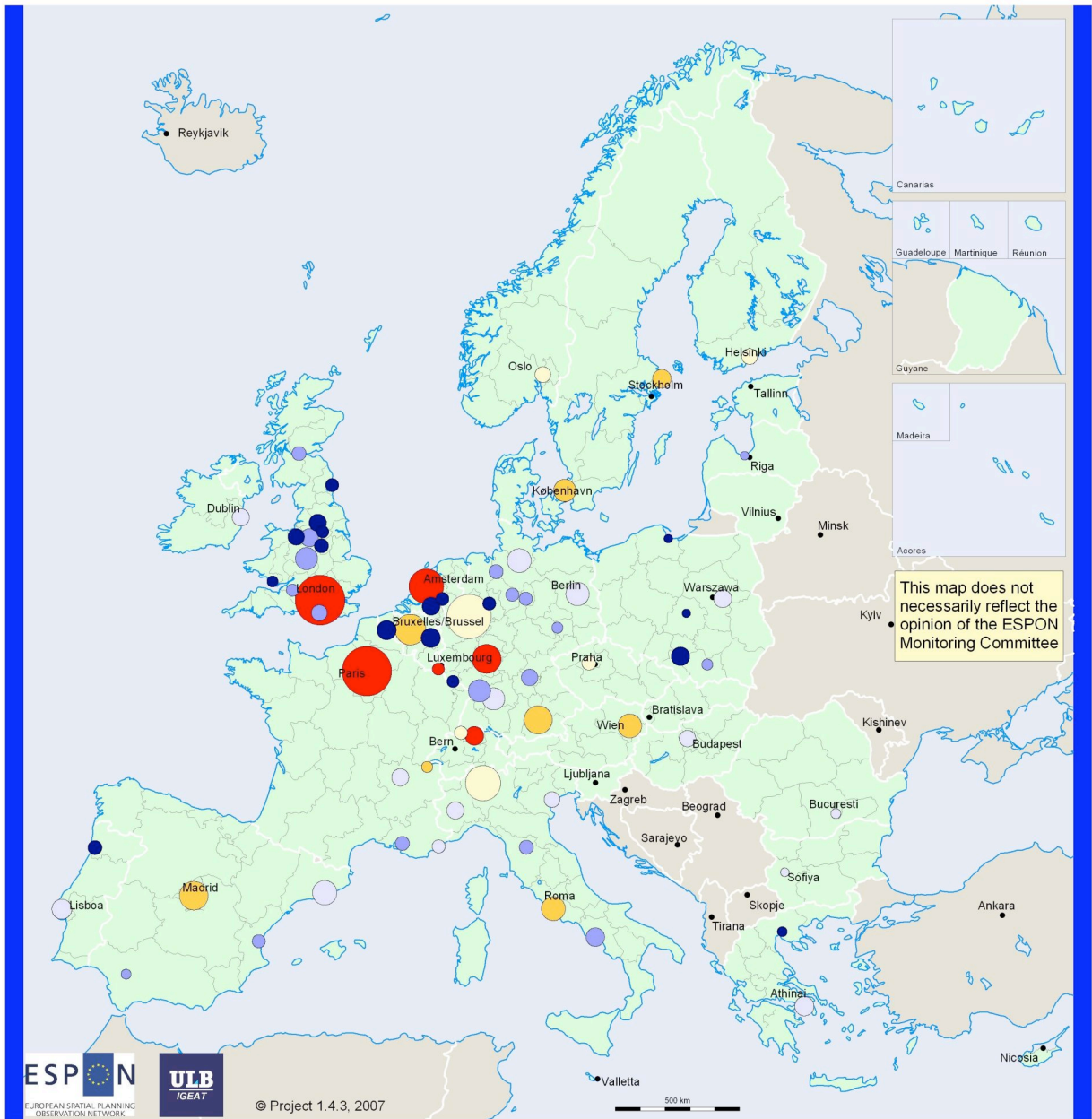
Central Europe, only the nordic capitals, Wien and Madrid reach a level of
internationalization above the average.

**Figure 33   Relation between the intial indicators and the first two components of the PCA
analysis on the major FUA.**

**Urban hierarchy in Europe according to their level
of internationalization and economic structures**

Scores on the first component analysis

- Low level of internationalization
- Medium level of internationalization
- High level of internationalization

Total GDP (Compared with London's GDP (=100))

Origin of data: EU 27, CC's and CH, NO : Eurostat,
National Statistical Offices.

**Figure 34   International connections and economic structure of the biggest European
FUAs**

		Part of manufacturing in the non-agricultural GDP	Part of the light industry in manufacturing	Part of business services and finance in the non-agricultural GDP	Part of the public services in the tertiary sector	Part of hotels and restaurants in the non-agricultural GDP	Part of the transports in the non-agricultural GDP
AT-SK	Wien-Bratislava	15	33	27	22	3	10
BE	Belgian central metropolitan area	15	32	32	24	1	10
BE-DE-NL	Euroregio MAHL (a)	22	17	15	21	1	5
BG	Sofia	20	54	23	21	2	17
CH	Zürich	13	32	47	16	2	7
CH-FR	Genève-Annemasse	9	24	44	20	3	6
CH-DE-FR	Basel-Mulhouse metropolitan area	27	22	29	23	2	7
CZ	Praha	16	35	29	16	3	13
DE	Rhein-Ruhr	21	20	32	23	1	7
DE	Rhein-Main	16	19	43	14	1	9
DE	Berlin	12	28	35	29	1	6
DE	München-Augsburg	20	21	39	19	2	5
DE	Hamburg	15	23	37	16	1	11
DE	Rhein-Neckar	27	18	33	21	1	5
DE	Stuttgart metropolitan area	34	17	30	20	1	5
DE	Nürnberg/Fürth metropolitan area	23	24	36	20	1	6
DE	Leipzig-Halle	14	28	30	29	1	7
DE	Bielefeld/Detmold	31	35	25	26	1	6
DE	Bremen	23	20	28	21	1	12
DE	Braunschweig-Wolfsburg	…	…	…	…	…	…
DE	Hannover	…	…	…	…	…	…
DE	Saarbrücken-Forbach(DE-FR)	25	13	32	26	1	5
DK-SE	Öresund metropolitan area	13	34	31	29	1	10
ES	Madrid	13	38	28	21	7	12
ES	Barcelona metropolitan area	26	35	23	19	7	10
ES	Valencia metropolitan area	18	42	21	21	7	11
ES	Sevilla metropolitan area	12	44	21	27	8	10
FI	Helsinki	16	29	27	20	2	14
FR	Paris	12	35	43	18	3	9
FR-BE	Lille transborder metropolitan area	24	42	25	32	2	6
FR	Lyon metropolitan area	20	27	35	23	2	6
FR	Marseille-Aix-en-Provence	15	34	31	31	3	8
FR-IT	Nice Côte d'Azur	10	35	33	25	6	6
GR	Athinai	12	47	21	29	7	11
GR	Thessaloniki	15	64	25	24	8	8
HU	Budapest	16	29	29	23	2	11
IE	Dublin	35	29	23	23	3	6
IT(-CH)	Milano metropolitan area	25	34	34	13	3	7
IT	Napoli metropolitan area	12	41	27	30	3	10
IT	Roma	8	38	32	24	3	13
IT	Torino metropolitan area	24	25	30	18	2	10
IT	Venezia-Padova metropolitan area	22	39	27	17	5	7

IT	Firenze metropolitan area	24	58	28	19	4	7
LU-BE-FR-DE	Luxembourg metropolitan area(b)	10	33	44	18	2	10
LV	Riga	15	73	20	22	1	17
NL	Randstad Holland/Delta metropolis	11	47	31	25	2	10
NL(-BE)	Noord-Brabant metropolitan area	24	43	25	27	2	5
NL-DE	Gelderland metropolitan area	17	51	25	33	2	5
NO	Oslo	10	44	32	24	2	12
PL-CZ	Upper Silesian-Moravian metro. area	29	17	15	22	1	8
PL	Warszawa	11	47	25	16	1	12
PL	Lodz	17	52	21	23	1	6
PL	Krakow	13	38	25	24	1	7
PL	Gdansk	16	25	24	20	1	11
PT	Lisboa	11	51	27	26	3	9
PT	Porto metropolitan area	25	62	15	37	2	5
RO	Bucuresti	21	59	27	13	3	13
SE	Stockholm	11	34	36	22	2	10
UK	London metropolitan area	10	47	40	16	3	10
UK	Birmingham metropolitan area	19	20	27	25	3	8
UK	Manchester metropolitan area	17	44	27	24	3	10
UK	Leeds-Bradford metropolitan area	27	36	18	30	4	6
UK	Liverpool metropolitan area	20	25	28	26	3	7
UK	Newcastle/Tyneside	20	31	24	32	3	7
UK	Sheffield metropolitan area	21	29	19	33	3	9
UK	Portsmouth/Southampton metropolitan area	14	23	31	22	4	8
UK	Nottingham/Derby metropolitan area	23	38	24	27	3	6
UK	Glasgow	17	42	20	32	4	10
UK	Cardiff/Wales Valleys metropolitan area	21	33	21	34	4	6
UK	Bristol metropolitan area	17	34	32	24	3	7

(a) Belgian and Dutch sides only
(b) Grand-Duchy and Belgian side only

Table 7   Main characteristics of the economic structure of the MEGAs and polycentric MEGAs

9.2   Recommendations for future researches

The work of Espon 1.1.1 like ours has been hampered by the lack of data. In particular there is a strong need for data or indices on industry and therefore Eurostat should provide a detailed information on production structure or at least a detailed repartition of the employment, possibly beyond the NUTS-3 level. It would also be interesting to have a demographic indicator, for instance data on migration that would distinguish between MUAs and FUAs. We're also in need for environment indices more appropriate than those of the Urban audit which has many missing data and doesn't use clearly delimited areas. It might perheaps be interesting somehow to establish a collaboration between Espon and the Urban Audit.

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