ESPON

TPM
Territorial Performance Monitoring
Annexes

Core Quantitative Benchmarking Dataset
Definitions and Explanations

Targeted Analysis 2013/02/13

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

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

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

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

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

This basic report exists only in an electronic version.

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1 Introduction

During the project a set of core benchmarking indicators for EU-wide benchmarking related to the four challenges - globalisation, demographic changes, climate change and new energy paradigm - was developed These indicators shall provide an overall impression on the region's position within the four mentioned challenges. This annex presents the indicators in detail.

Exhaustive Europe-wide data at regional scale is limited at best. The below listed indicators are a selection among the existing data and are believed to be relevant representatives for each theme and thus allow for an exemplified benchmarking of each region's performance. Data was not always available for the EFTA countries. A detailed description of the efforts made to gather such data was submitted to the ESPON Coordination Unit.

Regions can use the dataset as such, for example by using the provided ESPON HyperAtlas input files or the ESPON TPM benchmarking tool, but they should probably also assess the dataset and adapt it to the specific needs of the region. The project team expresses its hope that the ESPON programme will find a way to make this dataset into a permanently maintained and up-to-date dataset available to regions. It should, therefore, be taken into account in the current discussions in the ESPON Monitoring Committee on monitoring indicators. In the annexed "Atlas of Monitoring Indicators" we present a map of each indicator.

Each indicator is listed below in order to give a short technical overview and is then explained further on in more detail from a policy perspective. Compared to the draft final report, and based on feedback and expert opinion, we decided to leave out the following indicators because of the instability of the data or the lack of interest expressed by stakeholders:

- Average salary per economic sector
- Employment share per economic sector

We also present a relevant ESPON typology for each of the challenges, allowing regions to identify other regions of the same type and we list current European quantified policy objectives which regions can benchmark themselves against.

This annex then goes on to give some short warnings concerning issues one might encounter with the data and with mapping such indicators and closes with a brief introduction on the use of the ESPON HyperAtlas.

2 List of benchmarking indicators

2.1 Globalisation

Indicator		Formula	Source	Explanation
1	Population born outside the EU aged 15-64	Population aged 15-64 born outside the EU / total population aged 15-64	5th Cohesion Report, NUTS 2, 2008, Eurostat	Share of working age population born outside the EU
2	Share of working age residents who moved from a different EU region within the last year		5th Cohesion Report, NUTS 2, 2007-2008	Share of working age residents who moved from a different EU region within the last year, 2007-2008
3	Number of branches of multinationals active in advanced services		GaWC, P.J. Taylor & D.R.F. Walker (2008), NUTS2, 2001	Branches location of 46 multinationals companies active in advanced services, 2001
4	Sales of the European largest companies		Forbes, NUTS 2, 2006	Sales of the European firms included in the top 2000 largest companies (in billion $)
5	Number of employees of the European largest companies		Forbes, NUTS 2, 2006	Number of employees of the European firms included in the top 2000 largest companies
6	Internet access	Households with broadband connection / total number of households	5th Cohesion Report, NUTS 2, 2009, Eurostat	Share of households with internet access
7	Expenditure on R&D	Expenditure on R&D / total GDP	5th Cohesion Report, NUTS 2, 2007, Eurostat	Share of regional GDP spent on R&D
8	Relative number of patents	Total number of patents filed / active population aged 15-64	Eurostat, NUTS 2, 2005 Compared to: 1997	Number of patents filed in relation to the total active population
9	Tourism non-residents	Nights spent by non-residents / total nights spent	Eurostat, NUTS 2, 2009 Compared to: 2001	Share of nights spent by non-residents in all tourist

Indicator		Formula	Source	Explanation
				accommodations
10	Daily population accessible by car	Population accessible by car	EDORA Project ESPON, NUTS 3, 2004	Population accessible within a day trip by car
11	Migration into NUTS 3 regions	Net migration into NUTS 3 regions	5th Cohesion Report, NUTS 3, 2001-2007	Balance of immigration and emigration; per million inhabitants
12	Accessibility to passenger flights	Number of passenger flights per day	5th Cohesion Report, NUTS 3, 2008	Average weighted number of passenger flights per day
13	Tertiary education	Population aged 15-64 with tertiary education / total population aged 15-64	EDORA Project, ESPON, NUTS 2, 2007, Eurostat	Share of population aged 15-64 with tertiary education
14	Early school leavers	Early school leavers aged 18-24 / total population aged 18-24	5th Cohesion Report, NUTS 2, 2007, Eurostat	Share of population aged 18-24 leaving school without having finished their education
15	Unemployment rate	Unemployed persons / active population	Eurostat, NUTS 3, 2009 Compared to: 2007	Unemployment rate of population older than 15 years
16	Change in unemployment rate	Unemployment rate 2009 - unemployment rate 2001	Eurostat, NUTS 3, 2000 - 2009	Change of unemployment rate in that period

Table 1: Detailed definition of benchmarking indicators for globalisation

2.2 Demography

	Indicator	Formula	Source	Explanation
1	Young age dependency ratio	Population aged 1-14 / working age population	Eurostat, NUTS 3, 2009 Compared to: 2005	Relation of young population to active population
2	Old age dependency ratio	Population aged 65 and older / working age population	Eurostat, NUTS 3, 2009 Compared to: 2005	Relation of old population to active population
3	Old age dependency ratio in 2050	Population aged 65 and older (2050) / working age population (2050)	DEMIFER Demographic Scenarios, NUTS2, 2005-2050	Old Age Dependency Ratio in 2050 – status quo scenario
4	Change in labour force 2005-2050	Total labor force in 2050 / total labor force in 2005	DEMIFER Demographic Scenarios, NUTS2, 2005-2050	Relative change (%) in the labor force between 2005 and 2050 – status quo scenario
5	Total population in 2050		DEMIFER Demographic Scenarios, NUTS2, 2005-2050	Total population in 2050 after status quo DEMIFER scenario
6	Life expectancy at birth	Life expectancy at birth	DEMIFER Project, ESPON, NUTS 2, 2004	Number of years that a newborn is expected to live, based on mortality rate
7	Median Age	Median of the population structure	Eurostat, NUTS 2, 2008	Age that divides the population into two numerically equal groups; that is, half the people are younger than this age and half are older
8	Population growth	Population 2009 / population 1999	Eurostat, NUTS 3, 1999/2009	Population growth between 1999 and 2009

Table 2: Detailed definition of benchmarking indicators for demography

2.3 Climate change

Indicator		Formula	Source	Explanation
1	Soil sealing	Sealed area / total area NUTS 3 region	5th Cohesion Report, NUTS 3, 2006, Eurostat	Percentage of area that has been sealed up to the total NUTS 3 area
2	NATURA 2000 areas	Area of NATURA 2000 / total area	5th Cohesion Report, NUTS 3, 2009, Eurostat	Share of NATURA 2000 areas of total NUTS 3 area
3	Concentration of particulate matter at surface level	Concentration of particulate matter at surface level	5th Cohesion Report, NUTS 3, 2009, Eurostat	Average population-weighted concentration of particulate matter at surface level
4	Ozone concentration exceedances	Days with ozone exeedance	5th Cohesion Report, NUTS 3, 2008, Eurostat	Population weighted share of days with ground-level ozone concentration above 120 µg/m³.
5	Potential energy consumption for heating	Heating degree days of one year / heating degree days of another year	Eurostat, NUTS 2, 1981-2009	Expression of the severity of the cold as a relation of room temperature to outside temperature on annual basis, indicator of change
6	Change in mean temperature January	Average (mean temperature January 2006-2008) - Average (mean temperature July 1994-1996)	ReRisk ESPON Project, NUTS 2, 1994-2008	Change of mean temperature in January between the years 1994-2008
7	Change in mean temperature July	Average (mean temperature July 2006-2008) - Average (mean temperature July 1994-1996)	ReRisk ESPON Project, NUTS 2, 1994-2008	Change of mean temperature in July between the years 1994-2008
8	Change in annual mean temperature	Difference between future value (average of 2071-2100) and present	ESPON Climate Data, NUTS3, 1961-2100	Change in annual mean temperature, 1961-2100

Indicator		Formula	Source	Explanation
		value (average of 1961-1990)		
9	Change in annual mean precipitation in summer months	[Mean summer precipitation (average of 2071-2100)/ Mean summer precipitation (average of 1961-1990)]-1	ESPON Climate Data, NUTS3, 1961-2100	Relative change (%) in mean summer (months 6,7,8) precipitation between the years 1961-2100
10	Change in annual mean precipitation in winter months	[Mean winter precipitation (average of 2071-2100)/ Mean winter precipitation (average of 1961-1990)]-1	ESPON Climate Data, NUTS3, 1961-2100	Relative change (%) in mean winter (months 12,1,2) precipitation between the years 1961-2100
11	Change in annual mean number of days with heavy rainfall	Difference between future value (average of 2071-2100) and present value (average of 1961-1990)	ESPON Climate Data, NUTS3, 1961-2100	Change in annual mean number of days with heavy rainfall (>20mm) between the years 1961-2100

Table 3: Detailed definition of benchmarking indicators for climate change

2.4 Energy

Indicator		Formula	Source	Explanation
1	Solar energy resources	Average is calculated on the yearly sum of global irradiation on optimally-inclined surface (kWh/m2)	5th Cohesion Report, NUTS 3, 1981-1990	Solar energy resources per NUTS 3 regions, in kWh per year
2	Wind energy potential	Wind energy potential for NUTS 3 regions	5th Cohesion Report, NUTS 3, 2000-2005	Wind energy potential expressed in the number of onshore full load hours at 80m hub hight
3	Fuel costs of freight traffic as % of GDP	Fuel costs for freight traffic / total GDP	ReRisk Project ESPON, NUTS 2, 2005	Share of GDP that are fuel costs arising from freight traffic
4	Employment in energy intensive industries	Employment in energy intensive industries / total employment	ReRisk Project ESPON, NUTS 2, 2005	Share of the total employment that is linked to jobs in energy intensive industries

Table 4: Detailed definition of benchmarking indicators for energy

3 Detailed explanation of indicators

3.1 Globalisation (economic indicators)

1. *Population born outside the EU aged 15-64*: Indicator explaining the share of population in 2008 that was born outside the EU. As an indicator of globalization, it highlights the openness and attractiveness of regions to foreigners.
2. *Share of working age residents who moved from a different EU region within the last year*: This is an indicator of internal migration inside the EU. It reflects the attractiveness of an EU region for inhabitants of other EU region. A high share means benefiting from higher immigration, a larger labour force, a slower ageing of the population and a lower chance to see a decrease of the regional population.
3. *Number of branches of multinationals active in advanced services*: This is an indicator of the leading role of the cities at the world and European level. It concerns advanced market services firms (banks, insurance, services to firms, legal advice, advertising agency …), that is to say large international business services, which are the key to the metropolisation process.
4. *Sales of the European largest companies*: It reflects the presence of large companies in a region. It gives an indication of the level a region occupies in the global hierarchy of regions in Europe.
5. *Number of employees of the European largest companies*: Idem but it indicates the impact of large companies on employment in the region.
6. *Internet access*: As an important measure of accessibility and connectivity in the global network, this indicator has been chosen to examine the share of households that have a broadband connection. It provides an evaluation of both the access of individuals to the internet, and of the infrastructure available, and can thus be considered a measurement of technological advancement and also quality of life.
7. *Expenditure on R&D:* In terms of globalization, competitiveness in leading technologies and continuous progress in development is a key driver for the regions. This indicator shows the share of regional GDP in 2007 that has been invested in research and development.

8. *Relative number of patents:* Explaining the number of patents that have been filed in 2005 in each region in relation to its total active population, this indicator serves as a measurement of competitiveness on the global market. Patents as representation of technological research and development are an indicator for the capacity of the region's economy to translate research into economic production.

9. *Share of non-residents among the tourists:* This indicator is defined as the share of tourists that comes from outside the region. One drawback of this indicator is given by the variance of size of the regions since the bigger the region, the higher is the possibility for internal tourism. However, this indicator shall not only measure an effect of size but predominantly an effect of attractiveness and global/regional/local competitiveness in terms of tourism.

10. *Share of daily population accessible by car within one day*: Including this indicator as benchmarking reference for the challenge of globalization arises from the idea that better accessibility by car, thus larger and denser road networks, allows people to travel faster and further within a given timeframe. Therefore, it represents an economic indicator for accessibility, especially for business purposes due to the given time frame of one day. It also provides an indicator of the local market.

11. *Net migration into NUTS 3 regions*: There are two different components that affect population change: natural population change and the change due to migration. As a measure of economic and social attractiveness which today is the far more important force of population change, the indicator of net migration into NUTS 3 regions examines this second component of change. Net migration is defined as the difference of immigrants and emigrants, divided by the number of inhabitants of the region. In this case, the argument leads to a good performance if the net migration is high.

12. *Accessibility to passenger flights*: Just as the indicator of accessibility by car, this measure examines the performance of the regions in terms of air access: the average number of passenger flights per day represents the aspect of accessibility and its dispersion over the regions.

13. *Tertiary education*: A well-educated and highly skilled work force is considered a driver of competitiveness. One measurement that deals with the performance of regions according to these aspects is the share of population having tertiary education.

14. *Early school leavers*: In opposition to the above mentioned indicator dealing with tertiary education, this measure refers to the share of early school leavers aged 18-24 of the total population at the same aged which should be minimized in order to ensure a well-trained workforce and prevent unemployment due to inadequate education.
15. *Unemployment rate:* This indicator is defined as the share of population aged over 15 and unemployed over the total active population at this age. The lower the unemployment rate, the better is the performance of a region within this benchmarking. Unemployment rate represents the economic structure of a region as well as the balance/gap between the demand for work with specific educational skills and the actual available work force.
16. *Change of unemployment rate*: Not only the actual unemployment rate is of importance when monitoring a region's economic performance, but also its change. Our indicator here covers the entire 2001-2009 period, not only the evolution from one year to the next, and thus examines the long term development of the work force situation.

3.2 Demography

1. *Young age dependency ratio*: The ratio of the population younger than 15 years over the active population is a classic indicator for demography: it reveals the future demographic structures of a region as well as the ratio of people supporting other parts of the society. Thus, a high young age dependency ratio is positive in terms of future development, just in contrast to the goals for the old dependency ratio.
2. *Old age dependency ratio:* This measure has to be seen in contrast to the young dependency ratio: the higher the ratio of population aged over 64 over the active population, the more people the population at working age has to support. Thus, this implies a challenge for health care systems and the work force's as well as pensioner's situation. Therefore, low values of this indicator result in a better performance.
3. *Old age dependency ratio in 2050*: See 2. This ratio has been obtained using a status quo scenario which means that is has been assumed that there would be no change in age, sex and region specific rates of fertility, mortality, emigration and labour force participation. This ratio shows the long term consequences of

observed demographic and labour market patterns for society in terms of ageing of the population.

4. *Change in labour force 2005*-2050: It gives a prediction of how much the labour force of a region will increase or decrease in the future; which is a major challenge for all regions. This relative change has been obtained using a status quo scenario which means that the prediction has been made assuming that there would be no change in age, sex and region specific rates of fertility, mortality, emigration and labour force participation.
5. *Total population in 2050:* Prediction of the size of the population of a region in 2050. This number has been obtained using a status quo scenario which means that it has been made assuming that there would be no change in age, sex and region specific rates of fertility, mortality, emigration and labour force participation.
6. *Life expectancy at birth:* Life expectancy is the expected number of years of life remaining at a given age, in this case at birth. Thus, this indicator is on the one hand a measurement of the overall health of a population, but on the other hand it also indicates the social system and the advancement in medical and technological aspects. Improvements in health and welfare increase life expectancy.
7. *Median Age*: This is a single indicator that summarizes the age distribution of a population. The median age is the age that divides a population into two numerically equal groups; that is, half the people are younger than this age and half are older. We consider a low median age as positive.
8. *Population growth:* Growth as a measure of the population in one year over the population in another year indicates changes in the demographic situation. Population growth is interpreted as positive since it reflects the attractiveness of a region.

3.3 Climate Change

1. *Soil sealing:* This indicator is defined as the share of the total region's area that has been sealed. Soil sealing refers to the ground being covered with impervious materials. This is typically a result of urban development and the construction of infrastructure, often also implying higher levels of mobility and thus of transport. The ecological soil functions of sealed areas are severely impaired, since for instance soils may be affected by changes in water flow patterns or the fragmentation of habitats, but sealed soils also indicate the absence of carbon sinks. Sealed soils contribute to increasing flood

hazards as the capacity to absorb and store excess water is reduced, and run-off therefore increases.

2. *NATURA 2000 areas:* NATURA 2000 is an EU wide network of nature preservation areas aiming at the survival of threatened species and habitats. This method of protection reduces the impact of fragmentation by urban development in order to ensure the long term preservation of biodiversity and ecosystems; thus, working against climate change, but also leaving the room that species need to adapt to climate change impacts.
3. *Concentration of particulate matter at surface level*: Air pollution levels are directly influenced by changes in weather, such as heat waves. Particulate matter is one pollutant that can highly affect air quality at surface level and thus, for instance, irritates the respiratory system. Thus, this measure can be used as an indicator for climate change and the performance of a region in its prohibitory actions.
4. *Ozone concentration exceedance*: This indicator provides the number of days on which ground-level ozone concentration exceeds the reference value 120 µg/m³ for 8 hours a day. As the ozone levels are linked to both pollution and heat, this indicator serves as a possible measure of climate change impact on regions. The indicator is weighted by the population of each region in order to take into account the population impacted by the ozone.
5. *Heating Degree Days*: Heating degree days are an expression of the severity of the cold as a relation of room temperature to outside temperature on annual basis. Thus, comparing heating degree days from two years (e.g. 1981/2009) reveals trends in temperature (i.e. climate) change, but also serves as an indicator of potential change in energy use for heating.
6. *Change in mean temperature January:* This indicator, calculated from the averages of the years 1994-1996 and 2006-2008, is a measure of long-term change in low temperatures. Data on mean temperature is available for each month in the mentioned time period 1994-2008. We chose the month of January for this indicator as an exemplified representative of the winter month. However, we suggest examining data for each month in a further detailed analysis since temperature changes differ from region to region, as well as over time. This explains our approach of calculating averages over several years for this indicator of change and the choice of the months of January and July. Climate change is expected to have an impact on larger amplitudes between winter

and summer temperatures as well as an increase in temperatures. In this perspective, a decrease over time of this indicator can be considered as positive. All temperature indicators listed here could, however, also be interpreted as indicators for potential energy consumption since extreme temperatures or changes in mean temperature might introduce changes in need for cooling or heating in some regions.

7. *Change in mean temperature July:* As mentioned above for the indicator of « change in mean temperature in January », impacts on climate vary from region to region. Hence, both winter and summer temperature indicators have been chosen for this benchmarking to comprise both directions of change. This indicator could have also been examined for every other month, but July represents the summer months here, in which an increase in the mean temperatures is interpreted as negative since it tends to extreme temperatures which might lead to negative impacts, e.g. hazards.
8. *Change in annual mean temperature:* The two indicators above explore the long-term changes towards temperatures during the coldest and hottest months respectively. However, the overall change of temperature is also a relevant indicator of climate change: this indicator as a measure of change in the annual mean temperature indicates if the temperature in one region rather tends to increase or to decrease. In terms of impacts of climate change, we see warming as negative development since it indicates global warming and is likely to bring about e.g. higher concentrations of ozone and an overall higher impact on air quality, whereas cooling is generally proved to implicate better air quality.
9. *Change in annual mean precipitation in summer months:* This indicator is one of the two indicators which show the evolution of the global amount of precipitation. Changes in precipitations will strongly affect, among others, the geographical distribution of wetlands and the coastal ecosystems, with effects on tourism, freshwater supplies, fisheries and biodiversity. Since the seasonal variation of the precipitation in Europe differ from region to region, it is useful to analyse the amount of rainfall both, and separately, in the summer and in the winter months. In the regions where precipitation tends, globally, to increase, its seasonal variability will probably increase in the same time. Conversely, where the precipitation is expected to decrease, its seasonal variability will also, probably, decrease.
10. *Change in annual mean precipitation in winter months*: See 9.

11. *Change in annual mean number of days with heavy rainfall:* Along with the changes in annual mean precipitations, this indicator explores the long-term change in rainfalls, which is strongly related to temperature change. Climate change will possibly affect both frequency and intensity of the amount of precipitation, with more extreme rainfall events in some places, causing possible floods. The severity of these floods will vary from region to region. The human consequences of these hazards depend among others on population density. In the regions where these changes are important, they also will affect ecosystem, hence primary productivity.

3.4 Energy

1. *Solar energy resources:* In regard to rising energy prices or changes in energy consumption, the analysis of a region's potential for generating electricity from renewable sources is important. While there are various sources of renewable energy which vary from region to region, we see the potential of the two main ones, wind and solar, as most relevant for this benchmarking. The solar energy potential for NUTS 3 regions is here calculated as average on the yearly sum of global irradiation on optimally-inclined surface (kWh/m²), thus representing the number of hours per year.
2. *Wind power potential:* As the above explained indicator « solar energy resources », this indicator also describes the potential of a region to use one kind of renewable energy source as energy generator, in this case wind power. The measure is expressed in number of onshore full load hours at 80m hub height. Although the resulting pattern for high energy potential at first sight reflects a region's location close to shores and mostly in the Northern parts of Europe, we value this indicator as a good measurement of wind energy potential.
3. *Fuel costs of freight traffic as % of GDP:* This indicator highlights the issue of (de)coupling between economic production and transport. The higher this indicator, the more the economic production of a region is dependent on transport. At the same time, it is also an indicator of energy cost. Transport costs might be passed on to customers and businesses, thus higher costs might have a negative impact both on individuals, but also on businesses. Therefore, we see this indicator as a measure for energy consumption as well as economic development and favour a lower share that fuel costs of freight traffic make up of the GDP.

4. *Employment in energy intensive industries:* This indicator represents the share of total employment that is related to jobs in industries that are energy intensive, i.e. regional economies, in which wealth creation depends heavily on industries that spend high shares of their production cost on energy purchases. Since energy is assumed an important cost item, this indicator is a measure of a region's vulnerability to a continued rise in energy prices. The position of a region with an overall high share for this indicator is interpreted as worse than a region with a lower share.

4 Typologies

Besides EU and national averages, typologies of each of the four themes are used as reference values for benchmarking. Each region can thus be benchmarked in relation to other regions which belong to the same typology regarding each theme. In the following, we described each typology in terms of its underlying indicators, the defined types and a brief explanation of these types.

A) Globalisation

Typology of regions according to their specialization and competitiveness in the exportation of goods at regional level (ESPON Project TIGER, 2012)
N.B. Regional level only for countries where possible, some countries are at NUTS 0 level.

Underlying indicators :
Share of product categories in total exports (2007 – 2009 average to smooth the effect of the economic crisis of 2008) translated into the NACE classification (The Statistical Classification of Economic Activities in the European Community) at 2 digit codes.

Types
1. Specialization in Medium and high technological goods (electronic, machinery and /or transport equipment).
2. Specialization in metal industry.
3. Specialization in chemical goods (with or without diversified medium and high technological goods).
4. Specialization in electronic goods and Transport equipment
5. Specialization in electric and electronic goods.
6. Specialization in transport equipment.
7. Specialization in primary goods, including extraction.
8. Specialization in primary goods combinated with medium technological goods.
9. Specialization in primary goods with textile and clothing.
10. Specialization in primary goods and Transport equipment.
11. Specialization in textile and clothing.
12. Specialization in textile goods with technological goods
13. Diversified external trade

Table 5: Explanation of ESPON globalisation typology

B) Demography

Typology of the demographic status 2005 *(ESPON Project DEMIFER, 2005)*

Underlying indicators

a) Share of population aged 20-39 in 2005
b) Share of population aged 65 and over in 2005
c) natural population increase per 1000 inhabitants in 2001-2005
d) net migration per 1000 inhabitants in 2001-2005

Types

1. Euro Standard
2. Challenge of Labour Force
3. Family Potentials
4. Challenge of Ageing
5. Challenge of Decline
6. Young Potentials Overseas

Explanation of types

1. Close to overall average; age structure slightly older than average; positive net migration; stagnating natural population balance
2. High share of population in young working ages; slight population decline; negative natural population development
3. Age structure: younger than average; high natural population increase; positive net migration rate
4. Older populations; natural population decrease; overall strong net migration surplus
5. Negative natural population and migratory balance; demographic ageing
6. Young age structure; positive population increase; strong migratory surplus
7. High shares in young ages; lowest share of elder population; strong natural population increase but negative migratory balance

Table 6: Explanation of ESPON demography typology

C) Climate Change

Typology of climate change *(ESPON Project Climate Change, 2011)*

Underlying indicators

a) Performance of cluster analysis over eight climatic variables:
b) Change in annual mean temperature
c) change in annual mean number of frost days (min temp >0°C)
d) Change in annual mean number of summer days (max temp >25°C)
e) Relative change in annual mean precipitation in winter months (December to February)
f) Relative change in annual precipitation in summer months (June to Aug)
g) Change in annual mean number of days with heavy rain fall (above 20kg/m²)
h) Relative change in annual mean evaporation
i) Change in annual mean number of days with snow cover

Types

1. Southern-Central Europe
2. Northern Europe
3. Northern-Central Europe
4. Mediterranean Region
5. Northern-Western Europe

Explanation of types (main characteristics)

1. increase in mean temperature; Strong decreases in frost days; strong decrease in precipitation in summer months
2. increase in mean temperature; Strong decreases in frost days; increase in precipitation in winter months
3. Strong decreases in frost days, strong decrease in precipitation in summer months; strong decrease of days with snow cover
4. increase in mean temperature; Strong decreases in frost days
5. no main characteristics identifiable, average change in all variables

Table 7: Explanation of ESPON climate change typology

D) Energy

Typology of Energy Poverty *(ESPON Project ReRisk, 2010)*

Underlying indicators

a) Climate conditions
b) economic structure
c) transport dependency
d) social vulnerability
e) production potential of renewables

Types

1. a. With problems and potentials
1. b. Well-off, with trouble ahead
2. Struggling, looking for jobs and a brighter future
3. Wealthy and commuting
4. Cool and windy, but working

Explanation of types

1.a. low exposure to rising energy prices for industry; two groups: service oriented urban centres and semi-rural

1.b. central, industrial regions, low potential for developing wind and solar energy; competitiveness easily affected by rising energy prices if improvement in energy efficiency in industry and transport fail, but good starting position

2. most vulnerable regions in terms of social cohesion, high energy demand for heating and cooling; mostly peripheral regions; potential for renewable energy systems, but lack of resources

3. "Pentagon hinterland": wealth creation dependent on accessing near-by centres of economic growth; main challenge: affordable mobility; few possibilities for using wind and solar power

4. energy poverty; concern: heavy industrial base, extreme peripheral location on the coastline and high energy demand for heating; opportunities for further development in wind energy

Table 8: Explanation of ESPON energy typology

The following table indicates for each of the five stakeholder regions of the project the relevant type of each of the typologies.

Typologies	*NRW*	*Flanders*	*Dublin (NUTS 2)*	*Catalunya*	*Navarra*
Globali-sation	Medium and High technological goods, Diversified (electronic, machinery, transport equipment	Chemical goods (with diversified mediuml& high techno logical goods)	NUTS 0: Chemical goods (with diversified mediuml& high techno logical goods)	Diversified	Transport equipment
Demogra-phy	Euro Standard	Euro Standard	Young potentials	Young potentials	Young potentials
Climate Change	Northern Central Europe	Northern Western Europe	Northern Western Europe	Mediterrane an Region	Mediterrane an Region
Energy	With problems and potentials	Wealthy and commuting	Cool and windy, but working	With problems and potentials	Well-off, with trouble ahead

Table 9: Position of stakeholder regions in ESPON typologies

5 Policy objectives as reference values

Other reference values for benchmarking exist, notably in the form of political objectives defined in quantitative terms. These values can be used for evaluating whether the region contributes to reaching these goals. The table below shows the most relevant European quantitative policy objectives, coming mostly from the EU2020 strategy.

Indicator	*Policy reference value*	*Source*
Employment	75% of the 20-64 year olds	EU2020 Strategy
Expenditure in R&D	3% of GDP	EU2020 Strategy
School drop out	below 10%	EU2020 Strategy
Third level education	40% of 30-34 year-olds completing third level education	EU2020 Strategy
Greenhouse gas emissions	8% reduction by 2008-2012 (compared with 1990 levels)	6th Environment Action Program (EAP), 2002
Greenhouse gas emissions	20% reduction	20-20-20 targets in EU2020 Strategy
Renewable energies	20% on renewable energies	20-20-20 targets in EU2020 Strategy
Energy efficiency	20% increase	20-20-20 targets in EU2020 Strategy

Table 10: Quantified European policy objectives

In the map atlas all those indicators for which quantitative EU policy objectives are available were mapped using those objectives as reference value. Those regions that are in green have already attained the objective, those in yellow are close to attaining it, and those in red are furthest away from attaining it.

It is important to note that a position of a region in these benchmarking examples does not necessarily mean that it is within the responsibility or competence of that region to change that position. This obviously depends on the division of tasks between different levels of governance within the respective country and the specific situation of the region.

6 Some elements of caution in the use of quantitative data

6.1 Mixing data from different scales and sources

Working with data for a regional scale often implies mixing data from different providers at different scales as some data might only be available at NUTS2-level while other information might exist at LAU2 (municipal) level. Sometimes the same indicator is available at different scales and can be used at one scale for comparison or benchmarking beyond the regional border and at another scale for the analysis of spatial differentiations within the region.

In this situation, it is extremely important to tread cautiously with the data as several elements might render comparison between indicators at different scales difficult:

- definitions of indicators might change from one level to another
- origin of data (i.e. data collection) might be different ranging from (more or less exclusive) census data to survey data, passing by administrative data which might have different meaning at different scales
- depending on the institutions publishing the data, data quality might also be different, due to different quality standards, different available resources for quality checks and maintenance of data

As a general rule, one should thus avoid using data for comparison between regions if the comparability of the data has not been established by some trustworthy institution. If nevertheless one has to use data from different sources and scales, such comparisons should be used with caution and should probably be only made for ratios and evolutions, but less for absolute static numbers.

6.2 The effect of class breaks in maps and monitoring tools

In benchmarking, and especially in the visualisation of its results, class breaks play an important role and can significantly change results. If a quantitative objective exists, the easiest obviously is to just differentiate those regions that have reached the objective from those that have not. However, this entails that it is impossible to distinguish between a region just below the objective from another that is far away. Many benchmarking schemes thus opt for at least three classes, often represented in the three colours of a traffic light (red, yellow, green), or three states of a smiley (smiling, indifferent, frowning), but this already raises the question which regions should be in the middle class. One might

consider this to be a minor detail, but when distribution of public funds might depend on the performance of a region, these choices can have important consequences. They, thus have to be well reflected and, even more importantly, made explicit, both in the debate leading up to the choice as well as in the actual visualisation made of the results (i.e. thresholds have to be made explicit).

In order to demonstrate the effect of such thresholds and of increasing the number of classes, we present here five different maps of the same indicator, early school leavers. Four of these maps use the red-yellow-green benchmarking colour scheme, comparing each region's performance to the EU2020 objective of reducing the rate of early school leavers to below 10%. The maps differ in terms of number of classes (2-5) and in terms of thresholds, mainly for the yellow class (within 10% of the objective vs within 25% of the objective. The effect is clearly visible.

Comparing a classification into two classes (objective achieved or not) to a 5-class system (see map 1) allows to see the increasing differentiation, notably in France and Germany, where many regions are within 25% of the threshold and so appear in light red instead of red on the second map, meaning that their situation might not be as bad as it would seem on the 2-class map. But one can also see regions such as Bavaria and most of Austria, where regions are just above the threshold, and so their situation warrants close monitoring to make sure that they do not fall under the threshold.

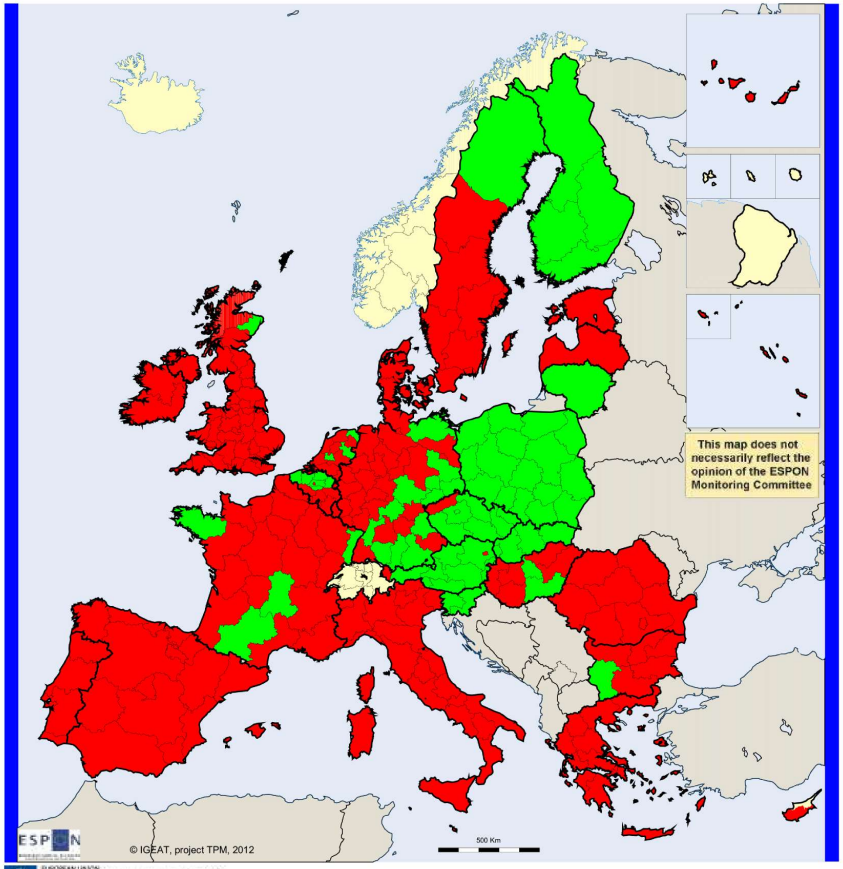
A similar effect can be observed when comparing the two 3-class maps, one using 10% above the threshold as limit for the yellow class, the other 25% (map 2). In France, Germany and the Netherlands several regions appear in a better position with the 25% threshold.

When no objective is given, or the choice is to not represent regions compared to such an objective, class thresholds can also make a difference. In this case, we decided to map indicators with simple quintile class breaks, meaning that every colour class contains more or less one fifth of the regions, and the central region represents a median class (see map 3). Such class system and the accompanying colour scheme appears as more politically "neutral" as it does not immediately imply a political judgement.

There is obviously no "correct" choice, but only the most adequate choice depending on the general objective of the monitoring and its visualisation. If one wants to have a quick view of those regions that have reached an objective and those that haven't (possibly because financial support is linked to that objective), threshold mapping with red-green colour scheme and few classes is most appropriate. If a more differentiated view of the

regional situations is desired, but still in comparison to a given policy objective, a red-yellow-green colour scheme with an increased number of classes can be helpful. The definition of the exact limits is then again a policy choice. If the situation requests a more (apparently) neutral representation, simple quantile mapping with a continuous (as opposed to binary) colour scheme seems a good choice.

Early school leavers.

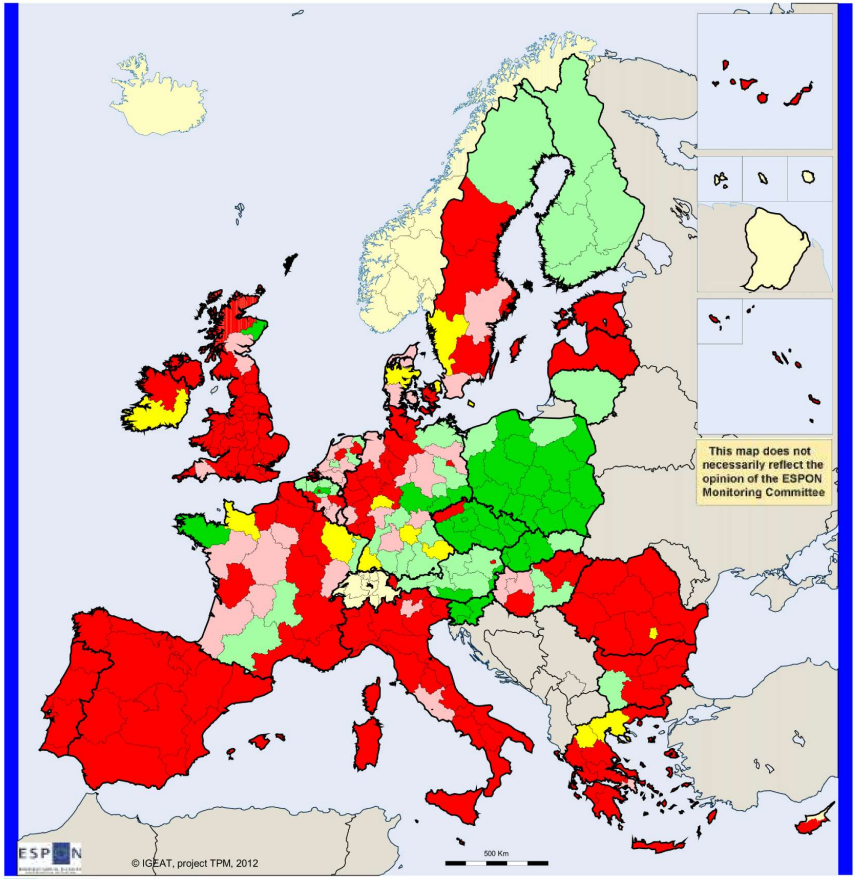


Early school leavers aged 18-24
% of population aged 18-24 - 2007-2009 average
(people with at most lower secondary education and not in further education or training)

12.5 - 51.0
2.0 - 10.0 EU2020 objective : < 10 %
No data

Source : 5th cohesion report, 2010
Origin of data : Eurostat, 2011

Early school leavers.



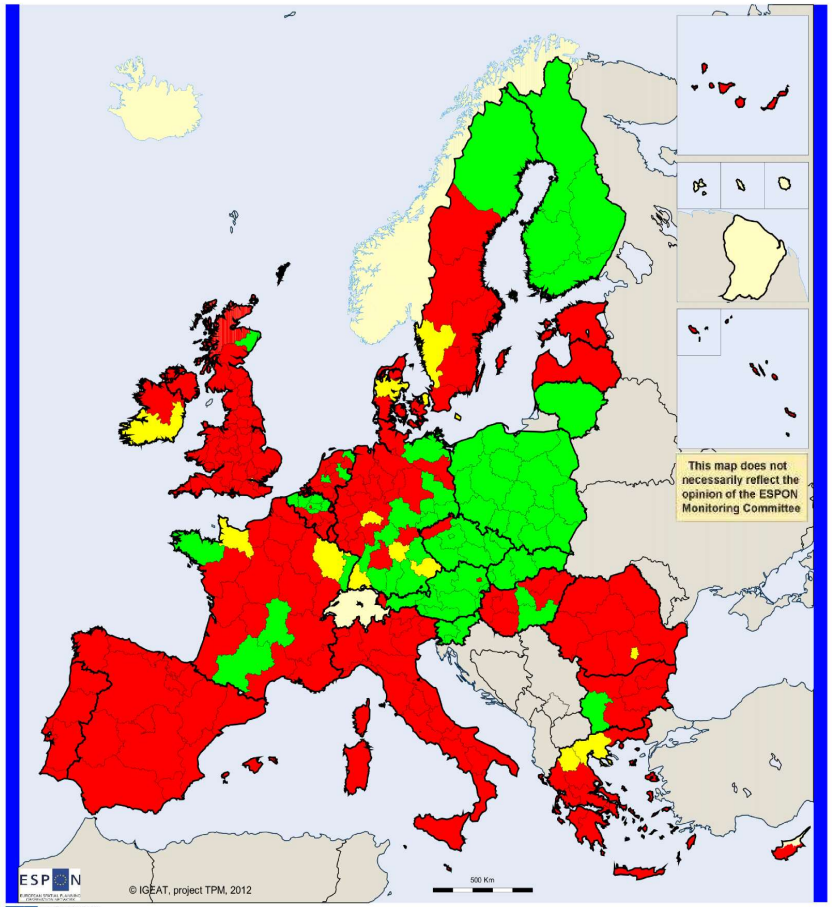
Early school leavers aged 18-24
% of population aged 18-24 - 2007-2009 average
(people with at most lower secondary education and not in further education or training)

12.5 - 51
11 - 12.5 Within 25 % of EU2020 objective
10 - 11 Within 10 % of EU2020 objective
7.5 - 10 EU2020 objective : < 10 %
0 - 7.5 Better than EU objective by over 25 %
No data

Source : 5th cohesion report, 2010
Origin of data : Eurostat, 2011

Map 1: Comparison between 2-class and 5-class map comparing to objective

Early school leavers.



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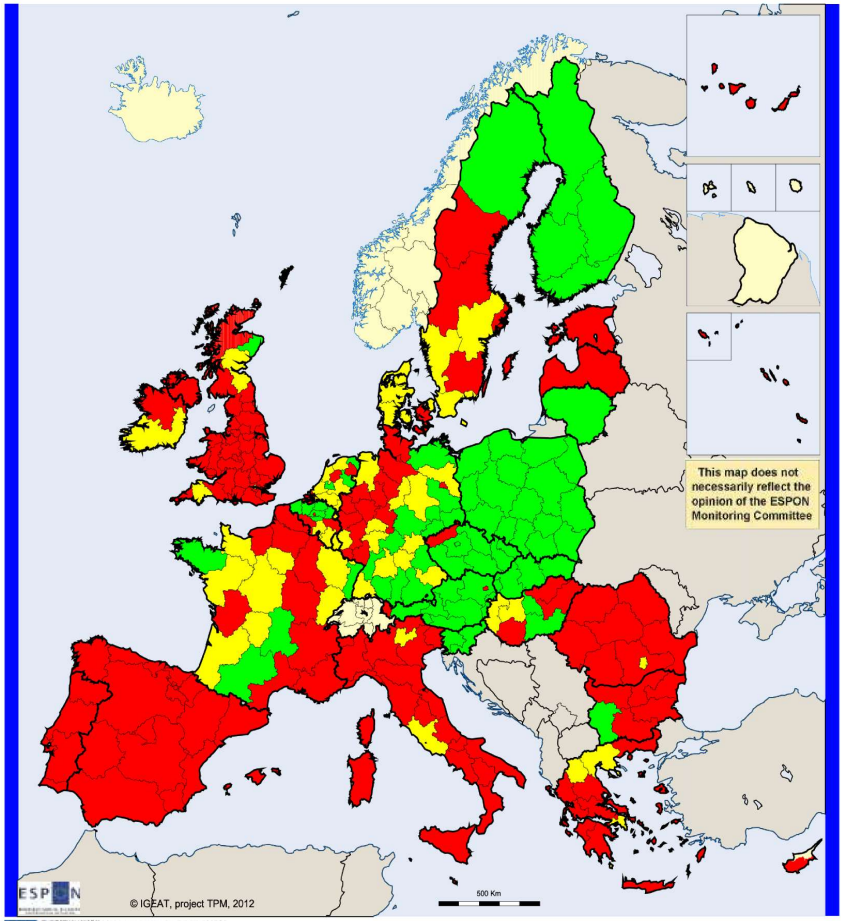
Early school leavers aged 18-24
% of population aged 18-24 - 2007-2009 average
(people with at most lower secondary education and not in further education or training)

- 11 - 51
- 10 - 11 — Within 10 % of EU2020 objective
- 2 - 10 — EU2020 objective : < 10 %
- No data

Source : 5th cohesion report, 2010
Origin of data : Eurostat, 2011

Early school leavers.



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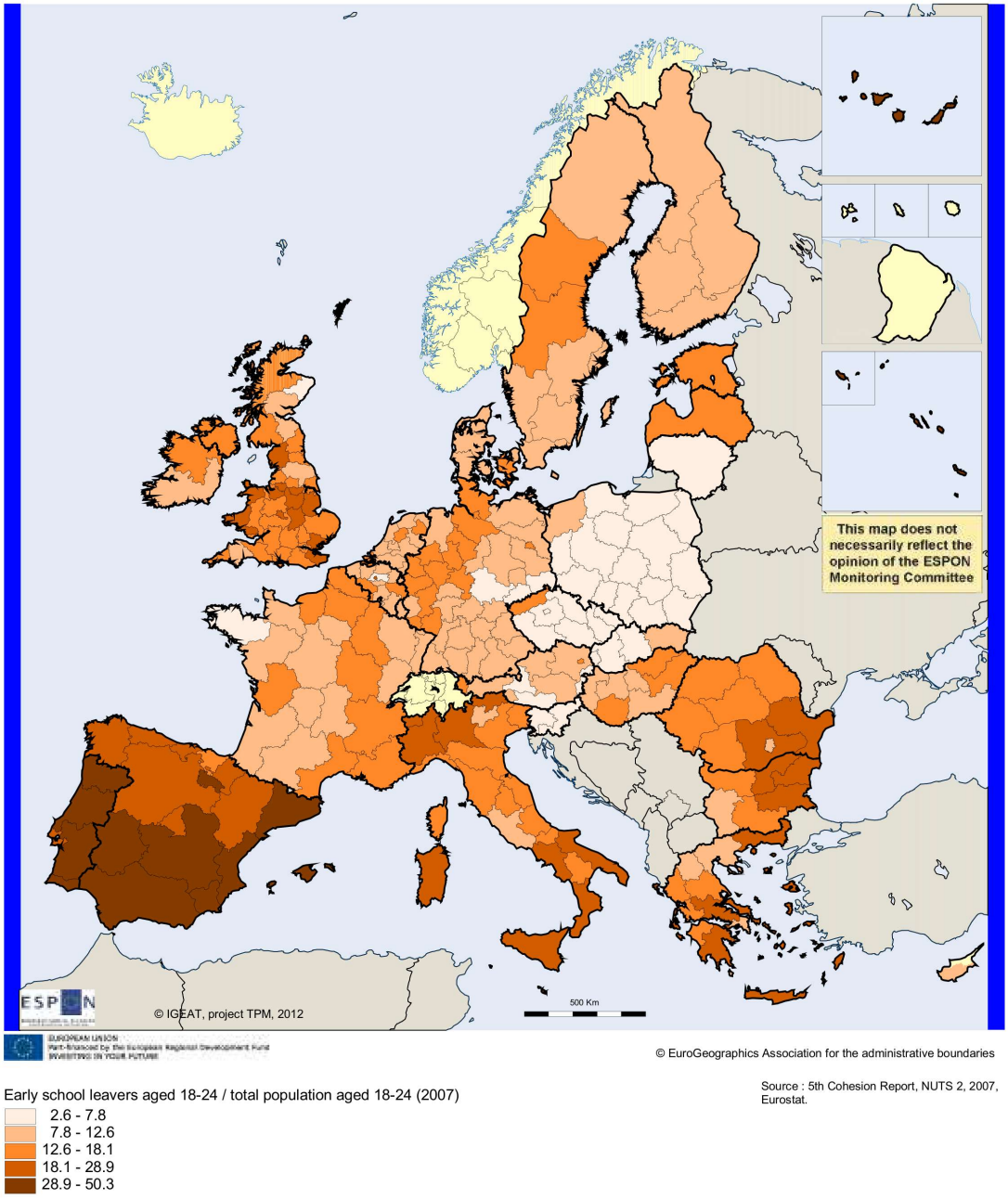
Early school leavers aged 18-24
% of population aged 18-24 - 2007-2009 average
(people with at most lower secondary education and not in further education or training)

- 12.5 - 51.0
- 10.0 - 12.5 — Within 25 % of EU2020 objective
- 2.0 - 10.0 — EU2020 objective : < 10 %
- No data

Source : 5th cohesion report, 2010
Origin of data : Eurostat, 2011

Map 2: Comparison between threshold of yellow class at 10% and threshold at 25% of objective

Early school leavers.



Map 3: 5-class quantile map with "neutral" colour scheme

7 Introduction to the ESPON HyperAtlas

7.1 General introduction to the tool

The ESPON HyperAtlas is an online mapping and analysis tool that allows the use to see the spatial distribution of two variables and their ratio as well as the situation of each region in comparison to other regions at different scales, or to a reference value given by the user. It thus allows to quickly situate the "performance" of a region in a particular indicator. In its current version, it comes with a series of predefined datasets, but can also be feed customized data sets, such as the two datasets delivered with this report, one for NUTS2 and another for NUTS3.

Amongst others, the ESPON HyperAtlas can be used in the following tasks:

- Rapid and easy mapping of Europe's regions for a series of basic variables, including a choice of class thresholds and colour scheme; the output includes maps and datatables that can be fed into other software for further analysis
- Benchmarking of your region in comparison to the European, national or supra-regional mean, to its neighbours or to some chosen value; possibly multi-scalar analysis combining all these scales
- Testing of different hypotheses concerning choice of thresholds, scale, indicator, etc determining distribution of funds
- Allowing other users or stakeholders to view and analyse your data without having to implement your own web mapping and analysis system; data can be distributed in form of MS Excel sheets or directly in form of binary input files to the HyperAtlas

7.2 Basic steps for using the ESPON HyperAtlas

1. Go to http://hypercarte.espon.eu/, agree to the license agreement and click on "Submit" (if the application does not start, you might have to install Java)
2. Chose a study area, the NUTS level you wish to work at, an indicator (combination of nominator and denominator), and choices for three levels of comparative analysis ("Contexts").
3. Explore the different visualisation tabs, possibly altering thresholds and colour schemes. Move the mouse pointer over a specific region to see its data.

4. Create a complete report with all tables and maps via *File->Build Report*.
5. Save parameter settings for a future session via *Session->Save session parameters*.
6. Chose another predefined dataset via *File->Datasets*.
7. Load a custom binary input file via *File->Open*.

For a detailed manual of the ESPON HyperAtlas, see http://hypercarte.espon.eu/ESPON_HyperCarte/helpLink.action.

7.3 Creating a custom binary input file

Any registered user[1] can create custom binary input files for the ESPON HyperAtlas for a series of predefined geographical areas and NUTS levels by following these steps:

1. Go to http://hypercarte.espon.eu/
2. Login with your credentials
3. Go to HyperAdmin and click *Start*
4. Chose a region and NUTS level
5. Download the input data template (a MS Excel file)
6. Fill out all the sheets in the input data file
7. Upload the input data file
8. If you get an error, correct the error in your data file and upload it again
9. Download the resulting binary input (.hyp) file
10. Load that file into the ESPON HyperAtlas.

For detailed instructions concerning the use of the HyperAdmin module, see the relevant section in the manual available at http://hypercarte.espon.eu/ESPON_HyperCarte/helpLink.action.

[1]For registration, send a mail to database@espon.eu.

www.espon.eu

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