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4

Territorial Dynamics in Europe

Trends in Internet Roll-out

EUROPEAN UNION
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INVESTING IN YOUR FUTURE

The ESPON 2013 Programme

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Foreword

Information technology endowment has many faces and can be measured using different indicators. This Territorial Observation 4 focuses on territorial trends related to the Internet and its roll-out in Europe.

The intention is to provide policy makers and practitioners at all geographical levels engaged in the development of their territories with short and concise information on trends shedding light on the following questions:

- Is Europe improving its position at world scale? How do European countries, regions and cities compare to other continents with which they increasingly compete?
- How is the territorial balance within the European Union developing? Is the progress bringing more development potentials in parts with lower endowment or is it highest in already well endowed regions, mainly in the central part of the EU territory?
- How are the trends for specific types of territories? Are they more challenged by their geographical situation being, for example, an island, a mountain or sparsely populated area?

The content and maps in this publication include results from different ESPON projects, in particular an update of earlier ESPON maps[1] providing the most recent data for indicators related to Internet usage and infrastructures. The indicators and derived trends cover (as far as possible) all 27 EU Member States plus Iceland, Liechtenstein, Norway and Switzerland. It has been feasible to provide comparable regional information across Europe, both for NUTS 2 and NUTS 3 regions.

Please note that the latest data available for most of the indicators analysed display the situation until 2009. Consequently, the maps and indicators presented do not reflect the latest trends influenced by the recent global economic downturn with asymmetrical impacts on Europe's nations, their regions and cities.

The ESPON 2013 Programme will continue observing territorial trends and dynamics in Europe providing evidence support to EU Cohesion Policy, including the aim of territorial balance and cohesion. Looking into economic, social and environmental developments will contribute to a better understanding of Europe´s territorial diversity at different geographical levels and support evidence-based policy making and tailor-made use of territorial potentials.

The underlying reports and data are available at www.espon.eu

[1] ESPON (2011), "Update on Map and Related Data on Telecommunication and IT-Rollout", elaborated by Emmanouil Tranos, Andrew Gillespie and Ranald Richardson, Newcastle University, United Kingdom", February 2011.

Table of Content

Territorial Dynamics in Europe

Trends in Internet Roll-out

1 – European Policy Orientations on Digital Networks and the Territory

EU Cohesion Policy contributes to the Europe 2020 Strategy[2]. Investment in regions and cities all over Europe shall support and stimulate an intelligent, sustainable and inclusive growth of the EU.

The ambition is to ensure and enhance European competitiveness in a rapidly changing and connecting world. Knowledge and innovation capacity plays an important role for the economy. The same is the case for the infrastructures that provide connections of businesses and people in a global market place that increasingly makes use of digital networks and information technology solutions.

The Europe 2020 Strategy identifies sufficient use of information and communication technologies as a necessity for growth. Europe is seen not progressing fast enough relative to the rest of the world. A requisite for smart growth is that Europe acts in accordance with a digital society. Currently, the main challenge for Europe is access to high-speed Internet, which affects the ability to innovate as well as the online dissemination of knowledge and the distribution of goods and services.

Europe 2020 sets up a digital agenda for Europe as a "flagship initiative" with the aim of creating a single market on fast/ultrafast Internet and interoperable applications. The goal for 2013 is that all households will have access to high-speed Internet. By 2020 all households should have access to Internet speed of at least 30 Mbps, and 50% of them should have Internet speed above 100 Mbps.

The 5th Cohesion Report issued by the European Commission states that access to Internet services is key for all regions and cities. The infrastructure needed to reach large markets both for businesses and citizens is changing as more and more services are purchased and distributed online, giving e-commerce increasing importance. High-speed Internet access is a must for the e-inclusion of all parts of Europe, however today this connectivity is not universal. Regions with this endowment have direct access to information and markets which is a clear advantage compared to regions without. The roll-out of Internet services to all regions is therefore a European priority.

The Territorial Agenda for the European Union developed by EU Members States with the involvement of the European Commission highlights 6 policy orientations for the use and development of Europe in territorial terms. One important priority is to improve the connectivity of individuals, communities and enterprises. Fair and affordable accessibility to information and knowledge is seen as essential for territorial cohesion. Minimising infrastructure barriers can improve competitiveness of territories affected and at the same time foster territorial cohesion. Apart from infrastructures such as road, rail and air, the Territorial Agenda specifically addresses the importance of securing access to infrastructure facilities such as broadband.

The territorial distribution of Internet infrastructure is important for promoting a polycentric and balanced European territory. For every region and every city, the ability to connect information and activities to the wider world using information technology solutions becomes ever more important for development and growth.

The ability of a place to attract people and investment is relying more and more on whether adequate information technology support is available, particularly Internet connectivity with high capacity and speed. For the territorial balance and internal cohesion of the EU, this development makes a universal roll-out of Internet infrastructures particularly important for remote regions and for specific types of territories, such as islands and mountain areas.

[2] COM (2010), Communication from the Commission, "Europe 2020 – a strategy for smart, sustainable and inclusive growth".

2 – Executive Summary for Policy Consideration

The Internet has been a driving force for the development of the knowledge economy, for innovation and for the generation of wealth. In particular the intense and increasing world-wide networking and new markets of businesses and multinational firms is highly dependent on the Internet.

The current economic downturn puts emphasis on the need for Europe to grow and perform economically and financially in the global market of tomorrow which will increasingly depend on digital networks and the Internet.

E-commerce is gradually growing worldwide and becoming an important factor in economic development. It has the capability to play a key role in the expanding the market places of European regions across borders as well as in fostering competition among suppliers and in providing multiple choices for potential customers. Again being in this market place requires Internet.

The European territory is moving towards a relatively high degree of "geographical e-inclusion". In Europe, the national level is undoubtedly of significance in relation to Internet roll-out and usage. There appears to be strong national paradigms operating, such that all of the regions of a given country will have visible similarities in their levels of Internet uptake. However, a recurring pattern exist that regions containing capital cities tend to have higher levels of Internet uptake than the rest of their national territories.

Advanced Internet infrastructures display extreme levels of concentration in major cities. This is in principle less problematic as these infrastructures are publicly available as hubs for high-speed Internet. However, improved speed and connection to this back-bone capacity can be an issue in remote rural regions and some specific types of regions in order to ensure their e-inclusion.

Trends related to Internet roll-out in the European Union, its regions and cities have to be addressed from 3 perspectives: (1) looking at Europe as an important player connected to the world, (2) addressing the regional distribution of Internet usage by citizens, businesses and households and the regional spread of Information infrastructure provision, and (3) the usage of Internet in specific types of European regions considered an important mean for overcoming deficiencies in physical accessibility by different modes of transportation.

The main conclusions on the territorial trends of Internet roll-out are included in the following points for policy consideration:

- The European Union is still among the world leaders of Internet usage, but main parts of Asia, Russia and Africa are catching up. In order to increase growth and keep the competitive advantage at world level (as stated in the Europe 2020 context) the roll-out of high-speed Internet connection for all citizens should be a priority in all parts of the European territory.

- A widespread and rapid increase in Internet usage is occurring across European regions. Europe's highest levels of Internet usage are found in the Nordic countries, in the Netherlands, Nordrhein-Westfalen, Luxembourg, Southern England and the Highlands and Islands of Scotland.

- A small group of regions in South-Eastern Europe, including regions in Greece, Bulgaria and, particularly Romania, however, seems not to share in the rise in Internet usage, indicating a need for targeted policy stimuli. While most of the remaining parts of Southern and Eastern Europe experience a moderate expansion, the development in Central Europe is somewhat higher.

- The territorial pattern of Internet infrastructures is dominated by the major European cities London, Paris, Amsterdam and Frankfurt, which also perform important roles in the global digital network. Other highly significant centres, including Madrid, Milan, Stockholm and Vienna, perform more specialised gateway roles at regional level. In addition, cities from all parts of Europe are catching up, including cities like Lisbon, Barcelona, Palermo, Athens, Budapest, Warsaw, Tallinn, Helsinki, Hamburg and Dublin.

2 – Executive Summary for Policy Consideration

- The solid position of the largest European cities and the current developments cementing this position is to be considered positive for the European economy and global competitiveness. A prerequisite for the large cities to play their role as major drivers in the European economy is constant improvements in terms of high-speed Internet infrastructure.

- The provision of Internet infrastructure, in particular the international Internet backbone capacity which enables Internet traffic between the countries and across the continents, is very concentrated to the central part of Europe. However, these Internet facilities are also used by all other regions throughout Europe. The main challenge at regional level concerns the linkages available for local enterprises and citizens to the Internet infrastructure, in particular via high-speed Internet.

- Specific types of regions as mentioned in the Lisbon treaty, often with limited accessibility, appear to have a lower level of Internet infrastructure than more urbanised parts of the EU. However, over the last 3 years most of the European regions, irrespective if they are metropolitan, urban, rural, mountainous, coastal, border or sparsely populated, have experienced an expansion of their Internet infrastructure.

- These specific types of regions have experienced, just like all regions across Europe, a rapid growth of households using high-speed Internet connections. A notable feature of the diffusion of the digital networks and Internet usage in Europe is the fact that a high level of GDP per capita does not seem to be a prerequisite for taking part in this development.

- To achieve the objectives of the digital flagship of the Europe 2020 Strategy concerning high-speed Internet roll-out set for 2013 and 2020, some specific type of regions might nevertheless require policy attention and additional investments. Enhanced roll-out of high-speed Internet in these regions may produce long-term benefits by stimulating economic growth based on intensive usage of Internet communication among enterprises, and by increasing the Internet provision of welfare services, such as distance learning and telemedicine. This would most certainly support a territorially balanced regional distribution of Internet usage in Europe.

3 – The Internet and Global Competitiveness

One of the most remarkable features of the development of society during the last two decades has been the rapid improvements in the global networks for transfer of information and transport of goods and people. Combined with substantial deregulations this has created an incessant flow of information, commodities, and financial and human capital resources across the globe. As a consequence, the economic integration and deregulation of financial markets have challenged the "place significance" of global cities. The emergence of an information and networking economy operated by electronic markets and driven by financial global "circuits" constitute the market place of our age.[3]

The fundamental changes in the global economy have dramatically increased the demand for knowledge and spurred a radical transformation of the conditions for knowledge production. In particular, digital networks and the Internet has reduced the costs of international communication of information and intensified international exchange and communication in R&D and innovation. As a result, the costs of research and scientific activities as well as innovation have decreased drastically and at the same time increased the volume of accessible digitalised knowledge.

Increasingly governments around the world have come to regard the digital networks, not only as a strategic domain of innovation, but also as a necessary tool to cope with changes in the global productive process and the increased global competition confronting countries, regions and businesses. Since the 1990's huge public and private investments have been made to support the development of digital networks such as telecommunication infrastructures and Internet connections. To an increasing extent this has been accompanied by wide-ranging national and regional policies and strategies. At EU level, the Europe 2020 Strategy put strong emphasis on the development and role of the digital networks and the Internet for realising the strategic objectives for competitiveness and cohesion.

One measure of the rapid global diffusion of digital networks is the growth of Internet users during the last decade. In 1999, as shown in Map 1, the highest share of Internet users, between 20% and 50% of the population, was found in Northern countries of the EU, the US, Australia and New Zealand. For the rest of the EU countries the figure was between 10% and 20%, while the rest of the world was below 10%.

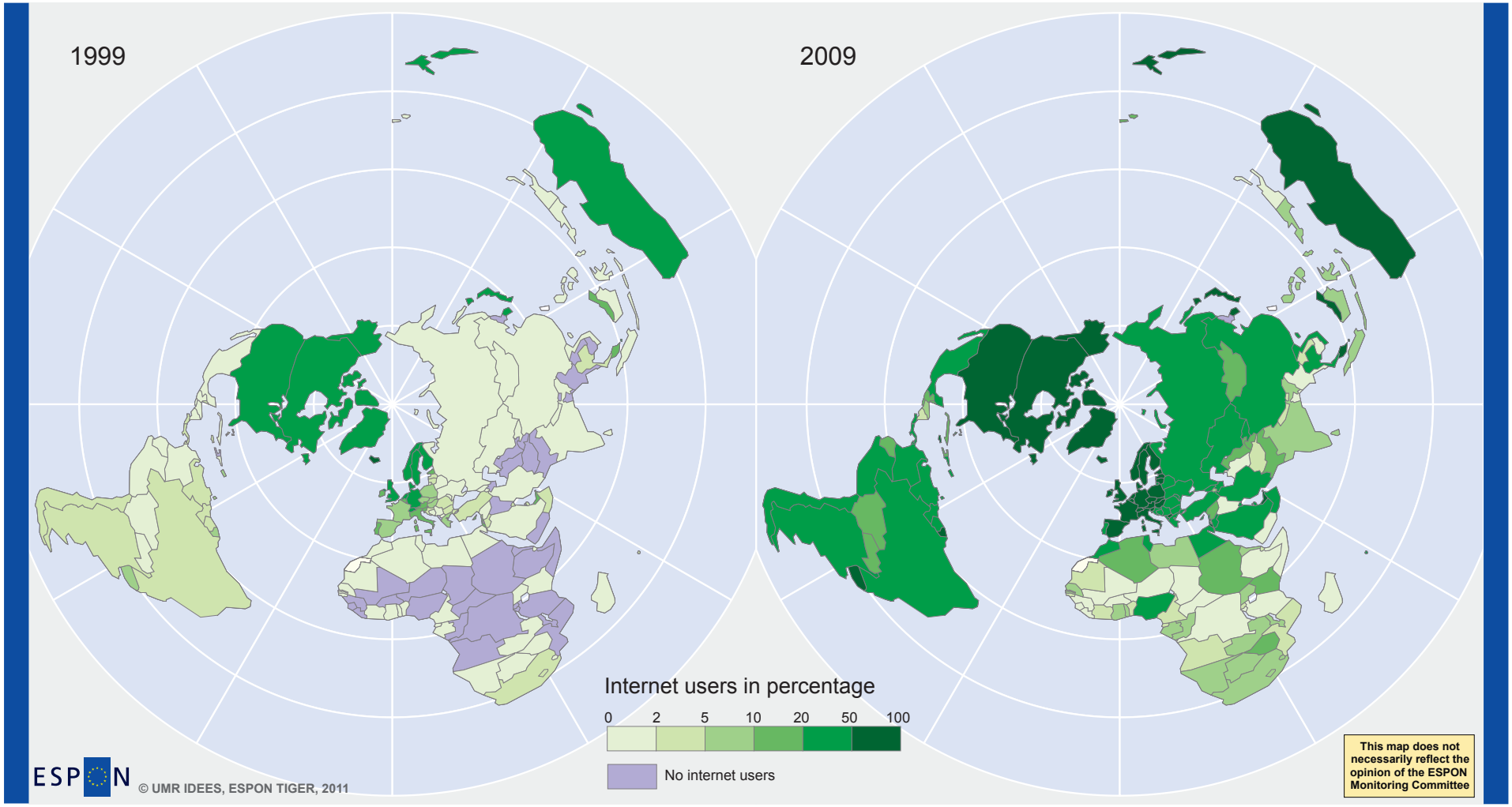
A decade later, the share of Internet users has increased extensively throughout Europe to between 50% and 100% supporting that EU countries maintain and even reinforce their top position and competitive advantage in the world together with other developed countries. However, the increase of Internet users in the rest of the world has been even more rapid, going from 5% and 10% to between 20% and 50%.

Method for Internet users in the world:

The International Telecommunication Union provides national data on the proportion of individuals using the Internet starting from 1999. Surveys have been used to gather data and the indicator has been calculated by dividing the number of individuals who used the Internet (from any location) in the last 12 months by the total number of individuals. The result is then multiplied by 100 to be expressed as a percentage.

[3] ESPON (2011), "TIGER Project - Territorial Impact of Globalization for Europe and its Regions", Interim Report, February 2011.

Map 1 Internet Users in the world, 1999 and 2009



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Source: IUT, 2010
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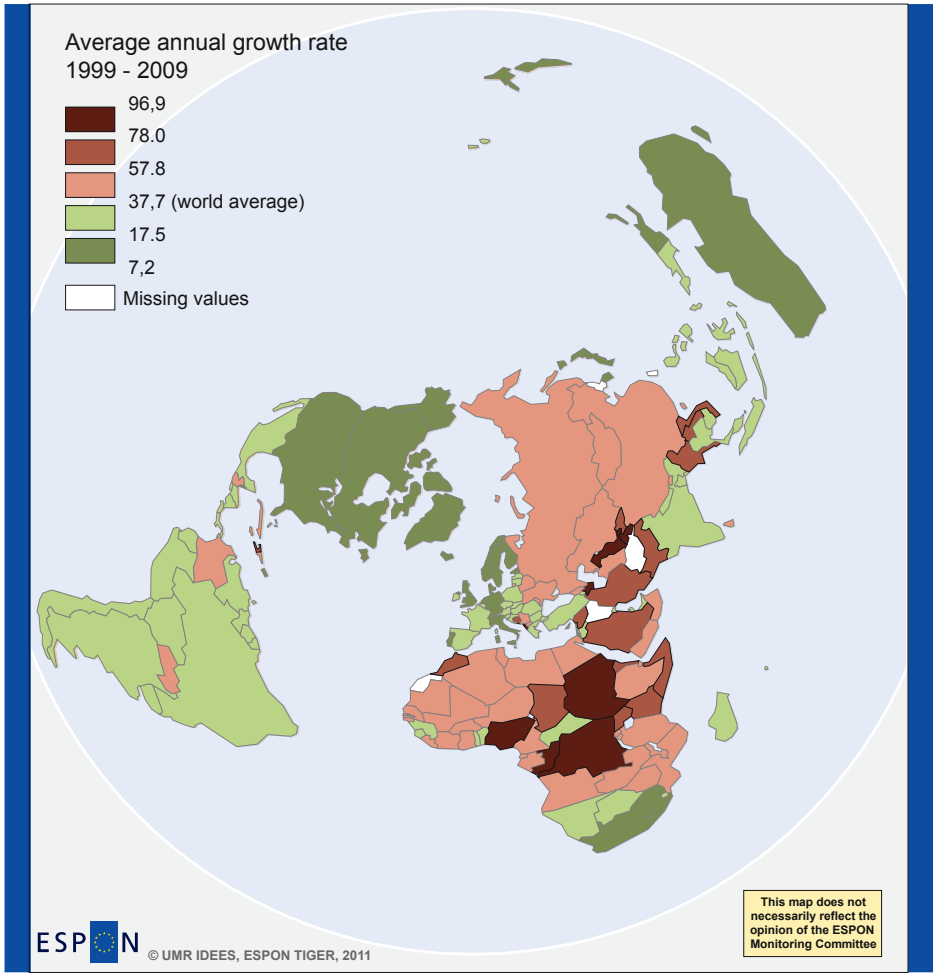
Map 2 Internet Users in the world, average annual growth rate from 1999 to 2009



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Source: IUT, 2010
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This development is further accentuated in Map 2 showing the average annual growth rate in Internet users around the world between 1999 and 2009. While Europe display quite remarkable growth rates of between 7% and 37%, this is still under the global average. In fact, the growth rates in Europe are surpassed by the major parts of Africa, Russia and Asia, where some countries experienced average annual growth of Internet users between 40% and 75%.

In terms of Internet users it is evident that the EU has maintained its position as world leader along with other major developed countries, and even reinforced this position. Accordingly, the competitive position of Europe in the world in terms of connection to and use of digital networks appears favourable.

However, the exceptionally high growth rate in the rest of the world in terms of Internet users clearly indicates that the gap is rapidly narrowing and this previous global competitive advantage is decreasing and at the same time opening new economic opportunities. With more people connected to the Internet around the world, the potential for European businesses to reach larger markets is growing as commodities and services increasingly are being purchased and distributed online.

The indicator on Internet users is one important aspect of the diffusion of the digital networks. However, improvements and investments in Internet infrastructures and connections are equally important to take into account. In this respect, the number of IP addresses and the Internet back-bone capacity are indicators that can provide information on the supply of infrastructure across the regions of Europe.

4 – Internet Infrastructures of European Regions

4.1 Number of IP Addresses

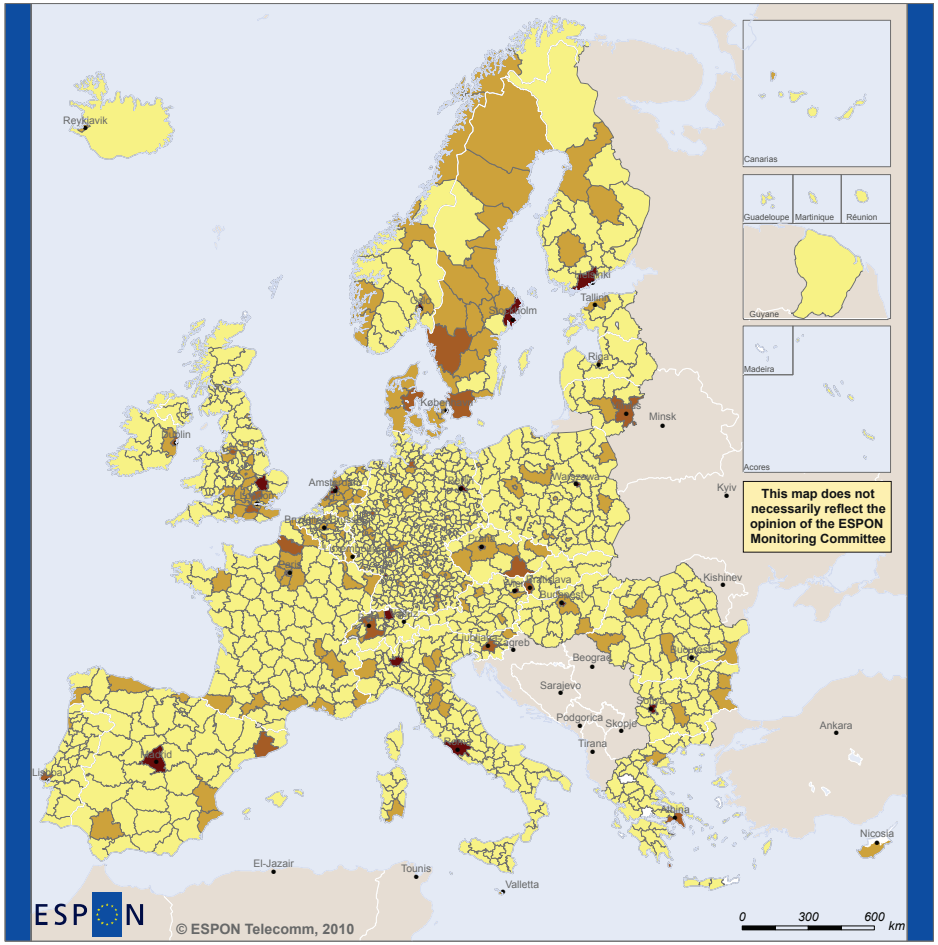
One way to measure the development level of the Internet infrastructure is the number of IP-addresses. Every computer connected to the Internet has a unique identifying number, called an IP address (Internet Protocol address), and if a country, region or city has a high number of IP addresses, this means that this territory has a high number of computers actively connected to the Internet.

The regional geography of Internet infrastructure in Europe is revealed in Map 3, showing the absolute numbers of IP addresses in European regions (at NUTS3 level) in 2009.

Method for number of IP addresses:

The data for this indicator has been derived from the DIMES project from Tel Aviv University by using Internet measures, such as trace route and ping, from which the geography of IP addresses could be retrieved. The trace route exercise is based on randomly spread agents around the world leading to a portion of the total active IP addresses. In terms of the calculation of the number of IP addresses, the data was initially provided at city level. Therefore an aggregation took place at the level of NUTS3 regions. In addition, the data, being available for weekly intervals, was aggregated to the annual sum for each region leading to the actual number if IP addresses.

Map 3 IP addresses, 2009



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Regional level: NUTS 3
Source: ESPON Telecomm, 2010
Origin of data: Dimes, 2010
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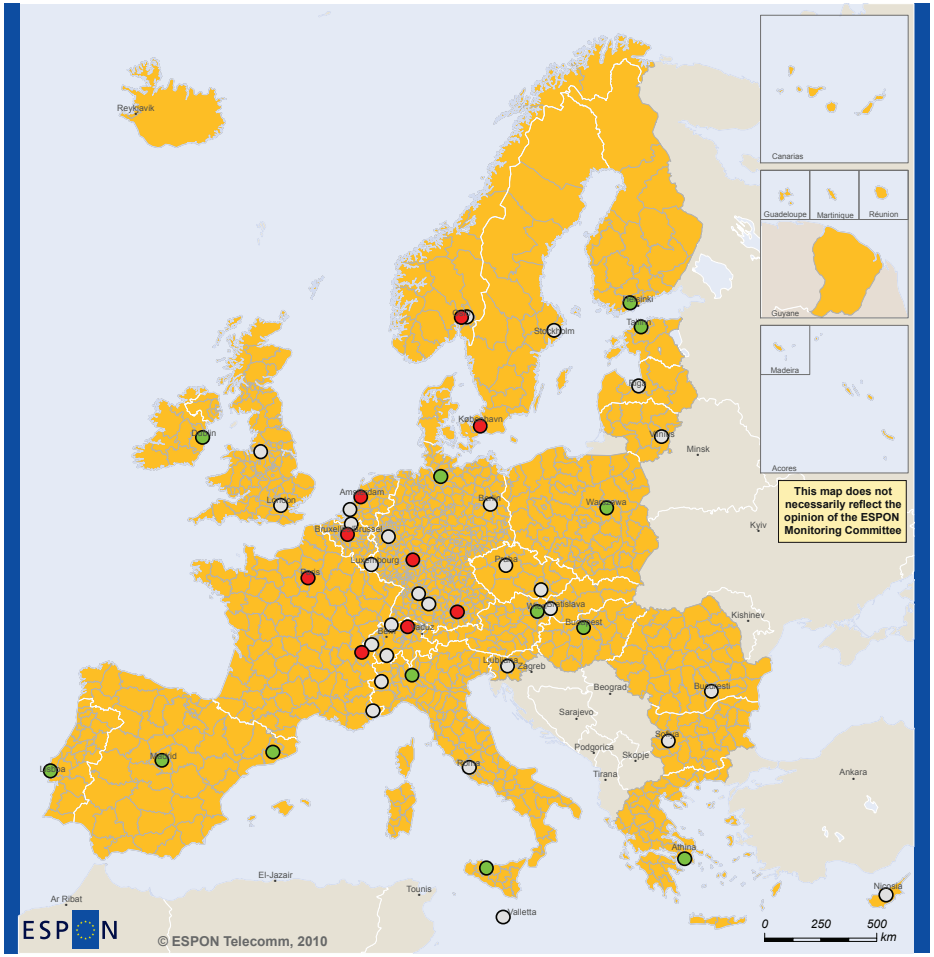
IP addresses, 2009

- low (1 - 10000)
- moderate (10001 - 50000)
- high (50001 - 100000)
- very high (100001 - 601134)
- no data

Map 4 Internet backbone capacity in Europe, change from 2001 to 2008



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Regional level: NUTS 3
Source: ESPON Telecomm, 2010
Origin of data: TeleGeography, 2009
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International Internet capacity
Relative change, 2001 - 2008

- relative decrease (-23.3% - -1.5%)
- relative stable (-1.4% - 1.5%)
- relative increase (1.6% - 6.7%)

Not surprisingly the regions with the highest concentration of IP addresses in 2009 are the main metropolitan regions and capital cities of Europe. The first group of IP address hotspots include cities such as London, Paris, Amsterdam, Stockholm, Milan and Madrid, but also the capital cities in newer EU Member states such as Warsaw, Sofia and Bucharest are among the cities hosting a significant share of Europe's IP addresses.

Another striking observation is that a large number of regions across the EU territory score a low or moderate number of IP addresses. This includes intermediate and peripheral regions as well as low-density populated, mountainous and islands regions. However, one exception seems to be the Scandinavian countries, where a more territorially balanced pattern is present. These specific types of regions are discussed in more detail in Chapter 6.

4.2 Internet Backbone Capacity

Another indicator used to measure the Internet infrastructure is the Internet backbone capacity, which refers to the principal data routes between large, strategically interconnected networks and core routers in the Internet. These data routes are hosted by commercial, government, academic and other high-capacity network centres that interchange Internet traffic between the countries and across the continents.

Map 4 present the changes in the regional capacity of the international intercity backbone links over the period of 2001-2008. The rather "place selective" nature of the location of this infrastructure remains intact over the period, with only 66 NUTS3 regions (of a total of 1351 NUTS3 regions) connected through

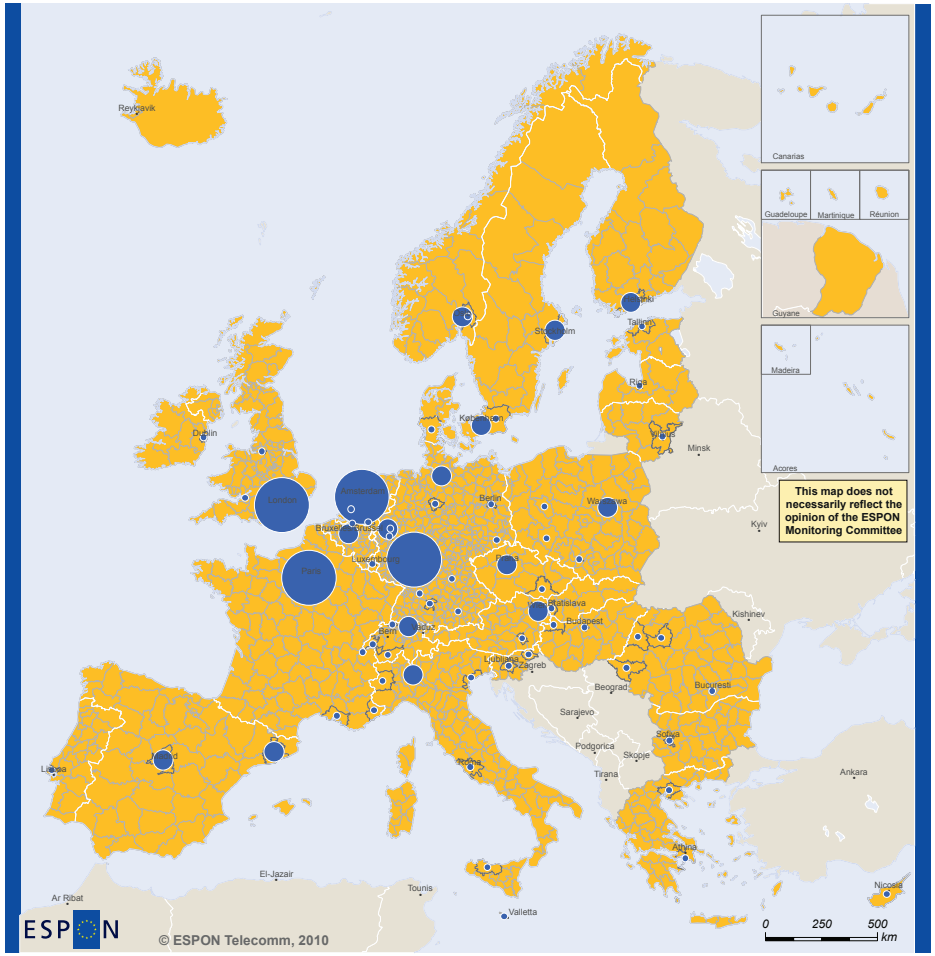
such infrastructure in 2001 and still only 70 regions in 2008. Another striking feature is the concentration of a high share of Internet backbone capacity in a few regions; over the period around 60% of all the European capacity is accumulated in London, Paris, Amsterdam and Frankfurt. These cities act as the main hubs for Internet communication in Europe as well as they perform important roles in the global network as such.

Of the big 4 cities of the so called Internet diamond, London appears unchanged overtime. This is simply because it remains the city with the highest capacity. In absolute terms, London's capacity increases and in relative terms increases faster than the other three main hub cities. This increased concentration over time of the Internet backbone capacity in London is the reason why Paris, Amsterdam and Frankfurt appear to lose in relative terms.

Another interesting territorial observation that emerges, displayed in Map 5, concerns the cities that are relatively peripheral in Europe. They seem to be performing better in terms of relative increases in Internet backbone capacity than cities in the centre of Europe. These cities are: Lisbon, Madrid, Barcelona, Milan, Palermo, Athens, Budapest, Vienna, Warsaw, Tallinn, Helsinki, Hamburg and Dublin.

Some cities of the second group with high Internet backbone capacity in Europe perform more specialised roles. For instance, Stockholm is relatively well endowed with high-speed digital networks and performs a gateway role for the Nordic and Baltic regions. Similar gateway roles are identified for Madrid, Milan and Vienna.

Map 5 Internet backbone capacity in Europe, 2008



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Regional level: NUTS 3
Source: ESPON Telecomm, 2010
Origin of data: TeleGeography, 2009
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International Internet backbone capacity, 2008
(max capacity = 100%)

- low (0% - 5%)
- moderate (5.1% - 35%)
- high (35.1% - 100%)

4.3 Composite Indicator for Internet Infrastructure

In order to present a condensed overview of the advancement of Internet infrastructure in European regions, a composite indicator for the Internet infrastructure in Europe has been constructed. This composite indicator has been made by taking the average of the following three indicators:

- International Internet backbone capacity (maximum capacity = 100%),
- Traffic through Internet exchange points (IXPs) (Gbps),
- IP addresses (numbers).

In 2009 only 10 NUTS2 regions (of a total of 286 NUTS2 regions), all of them metropolitan, constitute the "hot spots" of Europe's advanced Internet infrastructure. Figure 1 presents these regions and also shows that the number of hotspots slightly increased between 2006 and 2009. The four regions that score highest in both years, Inner London, North-Holland, Ile de France and Darmstadt, appear getting closer to each other in terms of Internet infrastructure provision. Moreover, the 4 additional regions in 2006 are accompanied by two additional regions in 2009. This second group of regions are located outside the core of Europe covering the north with Stockholm, the east with Mazowieckie and Bucharest and the south with Madrid, Lombardia and Lazio.

Irrespective of the indicators being used to display the Internet infrastructure in European regions – IP addresses, Internet backbone capacity or the composite index for Internet infrastructure, the same picture emerges: Internet infrastructure in Europe is heavily concentrated in the metropolitan regions, particularly in the Internet diamond consisting of London, Paris, Frankfurt and Amsterdam. At the same time, a number of cities more peripheral to the centre, including Stockholm, Madrid, Milan and Vienna play important specialised gateway roles.

The fact that there is a territorial concentration of the digital networks in Europe does not necessarily pose a problem for regions with a lower infrastructure endowment. These Internet facilities are most often also used by other regions. Instead their main challenge concerns the linkages to the digital networks, in particular high-speed Internet, and whether it can be easily accessed and used by businesses, households and individuals throughout Europe. Furthermore, the concentration in the metropolitan regions can be an important competitive advantage in terms of the agglomeration of heavily specialised and cost-intensive infrastructures and competencies.

Method for composite indicator for Internet infrastructure:

Data for each of the three indicators is available from different sources, Telegeography, European Internet Exchange Association and DIMES project respectively. Data for International Internet backbone capacity and traffic through IXPs are only available at city level and have been aggregated to NUTS2 level. For the indicator on International Internet backbone capacity only data for 2008 was available. After taking data for the year 2008 for this indicator of the composite indicator no data gaps exist. The composite indicator for each year has been made by first normalizing the three indicators using 100 as the maximum value and then taking the average.

Figure 1 Internet infrastructure: European regions with high relative scores (above 15%)

NUTS2 regions	Internet Infrastructure Year 2006	NUTS2 regions	Internet Infrastructure Year 2009
Inner London (UK)	85 %	Inner London (UK)	89 %
North-Holland (NL)	68 %	North-Holland (NL)	68 %
Ile de France (FR)	51 %	Darmstadt (DE)	67 %
Darmstadt (DE)	50 %	Ile de France (FR)	60 %
Stockholm (SE)	25 %	Stockholm (SE)	30 %
Madrid (ES)	25 %	Madrid (ES)	23 %
Bucharest (RO)	18 %	Mazowieckie (PL)	19 %
Lombardia (IT)	16 %	Lombardia (IT)	18 %
		Lazio (IT)	17 %
		Bucharest (RO)	16 %

5 – Internet Usage in European Regions

5.1 Composite Indicator for Internet Usage

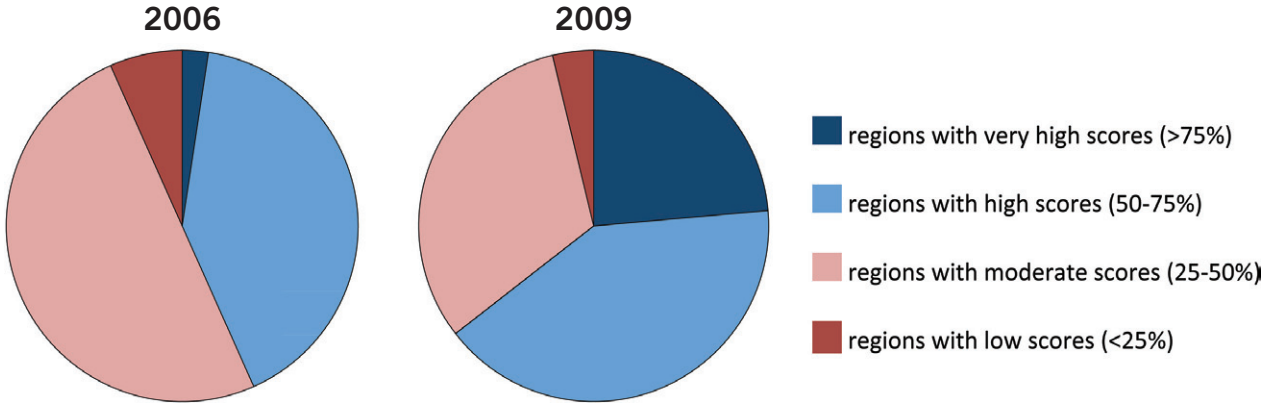
People using the Internet require an IP address, which is the physical address of the connection of their device, i.e. computer, PDA or laptop, to the Internet. A high number of IP addresses in a region does not immediately give an indication on how much the Internet is being used in that region as the IP address can be hosted in a different location from the user. In order to analyse the Internet usage in European regions data has been gathered that provide a more appropriate indication of the level of Internet usage. Data has been gathered on the following five indicators:

- Households with access to the Internet at home (% of households),
- Households using a high-speed Internet connection (% of households),
- Individuals who accessed the Internet, on average, at least once a week (% of individuals),
- Individuals who ordered goods or services over the Internet (% of individuals),
- Individuals who have never used a computer (% of individuals, inverse value)

Due to data gaps, Internet usage is analysed as the average of the five indicators. Figure 2 presents the data on Internet usage in four different classes and as such indicates the relative performance of the European regions over a 3 years period.

Notably, the share of regions with very high scores (dark blue sectors) for Internet usage increased significantly. Regions accounting for this increase can be found in Northern Europe, across the UK, Netherlands, Luxembourg and in central parts of Germany. As part of this development, the share of regions with a moderate or even low score (light and dark red sectors) declined from over half of the regions to one third. Regions increasing from very low scores to high scores can be found in the Southern Italy. The other regions improving can be found in Northern Spain, Austria, Slovakia, Poland, Estonia and Latvia. Only a small number of regions in South-Eastern Europe remain having low levels of Internet usage. Overall, there is clearly a strong underlying trend of increasing Internet usage across Europe's regions.

Figure 2 Internet usage, change from 2006 to 2009



Method for composite indicator for Internet usage:

Data for all five indicators are collected in yearly surveys administered by EUROSTAT. In those cases data was not available for the years 2006 and 2009, data for the year 2007 respectively 2008 has been taken. Even then, data for a large number of regions was missing. A composite indicator has been made by taking the average of the five indicators.

5.2 Households using a High-Speed Internet Connection

One of the flagship initiatives for smart, sustainable and inclusive growth in the Europe 2020 strategy concerns "a digital agenda for Europe". The aim of this initiative is to create a single digital market based on fast and ultrafast Internet and interoperable applications. The aim for 2013 is to have high-speed Internet access for all. For 2020 the aim is that all have access to much higher Internet speeds.

The indicator on households using a high-speed Internet connection, used above to measure and show the level and trends of Internet usage in Europe, is a way to measure the progress of this aim. The territorial distribution of this indicator captures the diffusion of an advanced Internet technology in everyday life and provides an interesting perspective on the social distribution of a new technology.

Map 6 presents the average percentage of households using a high-speed Internet connection for the years 2006 to 2009. The territorial distribution of this indicator displays evident signs of country effects, naturally introduced by the country-wide Internet infrastructure projects that both public as well as private companies launch and manage[4]. Regions in which high-speed connections show higher penetration rates belong to the Nordic countries and the Netherlands. Moreover, capital regions show strong performance in this measure of innovation diffusion, compared to other regions of the same country.

South-Eastern regions in Romania, Bulgaria, Greece, Italy, Cyprus and some in Spain present a rather consistent lag when compared to regions in North-West Europe. However, striking evidence occur when comparing Polish and Baltic regions, with relatively lower standards of living, with richer regions such as the Irish and Northern Italian. This comparison presents similar rates of high-speed penetration, thus illustrating the case of a non linear relationship of the technology curve adoption as a function of the region's development stage.

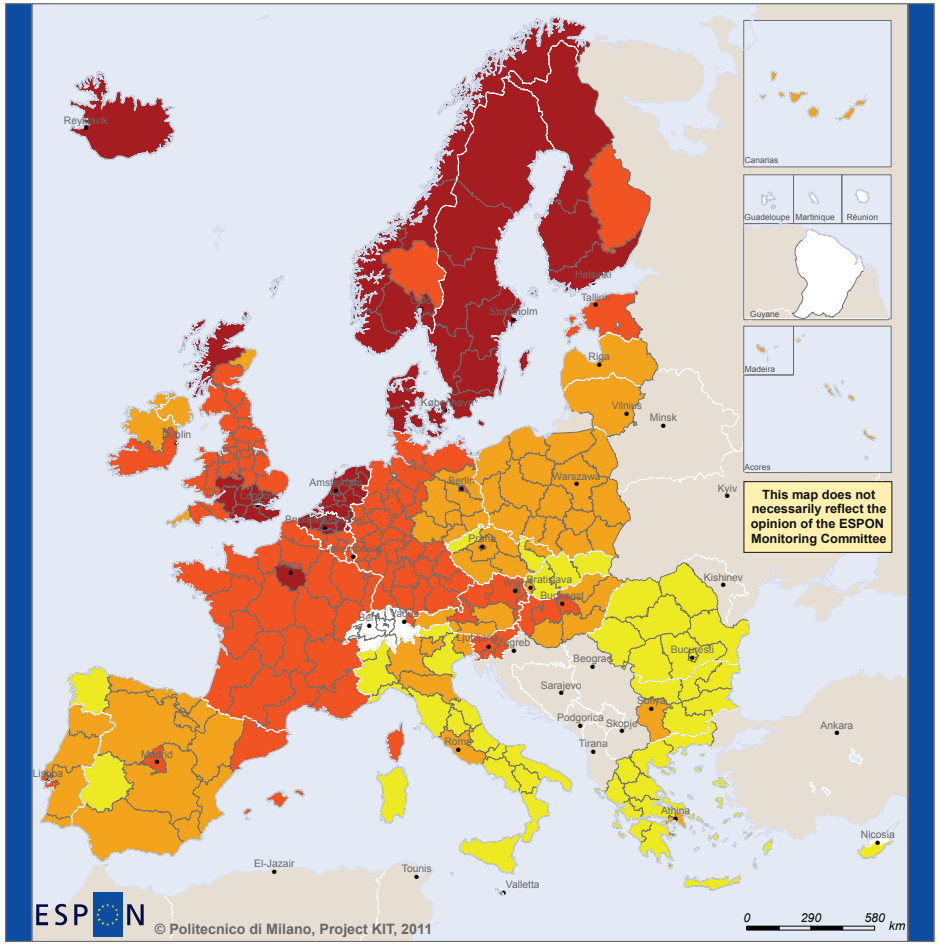
It is obvious that Internet usage is diffusing rapidly across the European regions. Although Northern Europe stands out, more and more regions are being integrated into the digital networks and moving into higher levels of access and usage by its citizens. An interesting feature of this development is the fact that high living standards do not seem to be a prerequisite to take part in this development. Thus, in terms of Internet usage, the Internet rollout in Europe appears proceeding very favourably both in scope and scale.

[4] ESPON (2011), "KIT Project – Territorial Dimension of Innovation and Knowledge Economy", Interim Report, February 2011.

Method for households using a high-speed Internet connection:

Data for the percentage of households using high-speed internet connection are collected in yearly surveys administered by EUROSTAT. High-speed Internet connections are defined here as those Internet connections that have a capacity equal to or higher than 144 Kbits/s. For each of the years between 2006 and 2009 large data gaps exist. The map therefore presents a four year average of the 2006 to 2009 surveys. Moreover, in some countries, namely France, Poland and Germany, data are collected at NUTS1 level.

Map 6 Households using a high-speed Internet connection, average percentage over the years 2006 to 2009



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Regional level: NUTS 2
Source: Politecnico di Milano, 2011
Origin of data: EUROSTAT ICT surveys, 2006-2009
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Households using a high speed Internet connection
Average percentage over the years 2006 to 2009

- low (9.00 - 29.50)
- moderate (29.50 - 45.25)
- high (45.25 - 61.00)
- very high (61.00 - 84.00)
- no data

6 – Trends related to Specific Types of Regions

To further uncover the regional dimensions of the diffusion of Internet infrastructure in Europe, the number of IP addresses has been analyzed for different types of regions. To what extent do urban regions differ from more rural regions? Do mountainous regions have a higher or lower number of IP addresses than non-mountainous regions? These are some of the questions related to Europe's regions with specific characteristics.

As figure 3 clearly confirms, predominantly urban regions have the highest number of IP addresses, which is not surprising. A more remarkable observation is that the remote intermediate regions seems to be a bit better off than intermediate regions close to a city. Although the latter type of region is for sure also catching up with an increase of 174% between 2006 and 2009, compared to 119% for the remote intermediate regions. For the predominantly rural regions the differences are not that clear. However, the predominantly rural regions close to a city do have the largest increase of IP addresses from 2006 to 2009 (276%).

Figure 4 once again verifies the urban character of the Internet showing that metropolitan regions have a higher number of IP addresses than non-metropolitan regions. Moreover, the bar graph also shows that the bigger the metropolitan regions, the higher the number of IP addresses.

Figure 3 IP addresses in different types of urban-rural regions

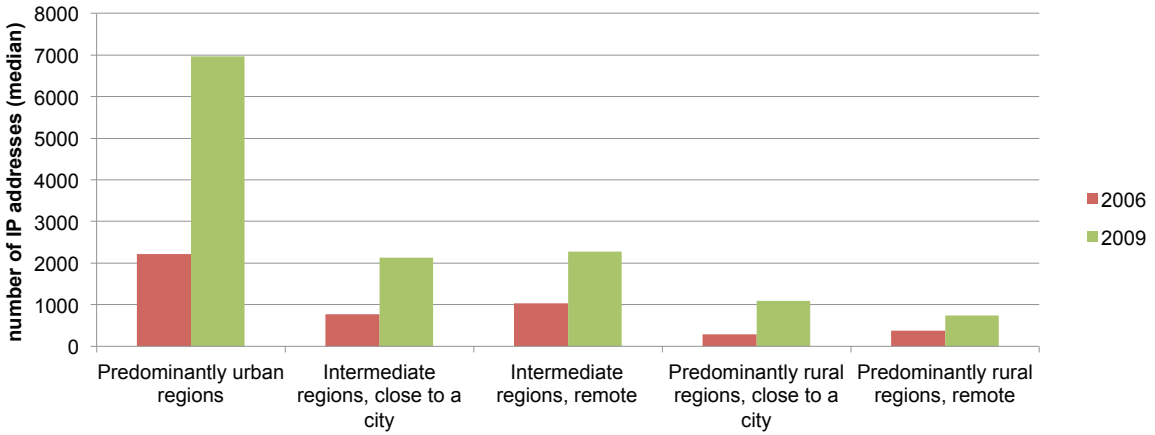
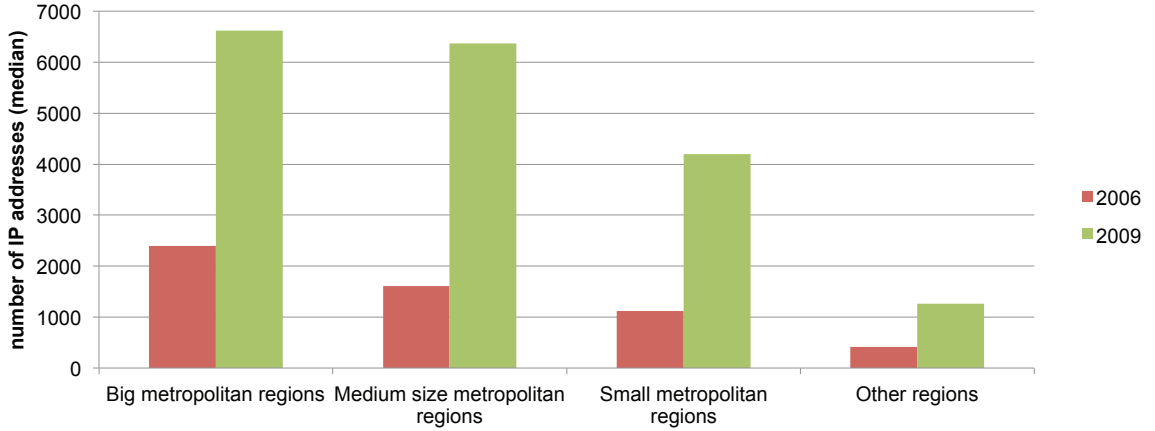


Figure 4 IP addresses in different types of metropolitan regions



6 – Trends related to Specific Types of Regions

With regard to mountainous regions, figure 5 shows that remote mountainous regions have the lowest amount of IP addresses irrespective if they are predominantly or moderately remote. Mountainous regions under urban influence, however, perform significantly better.

Figure 5 IP addresses in different types of mountainous regions

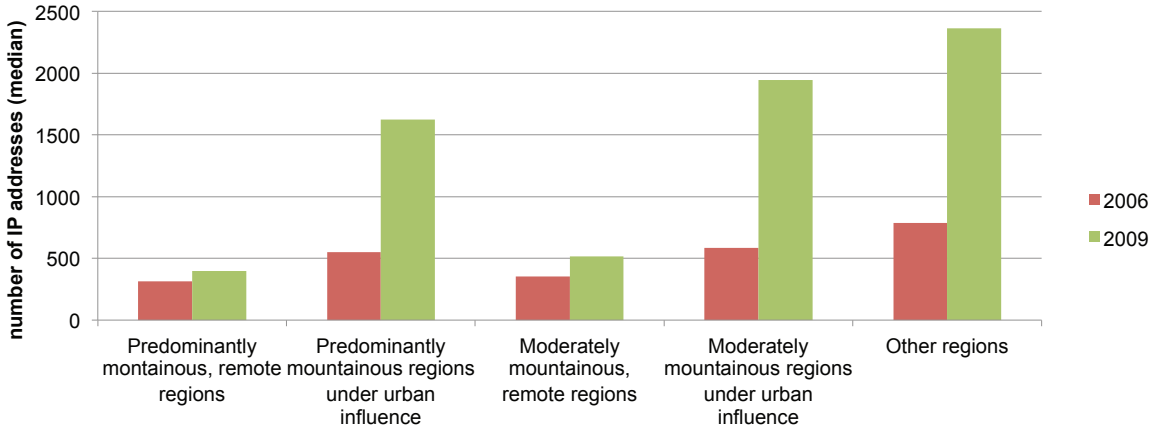
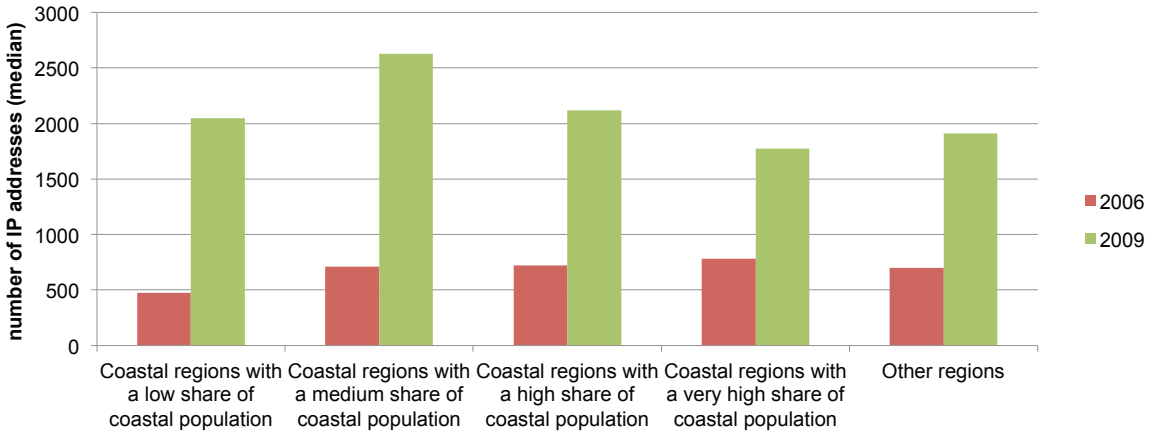


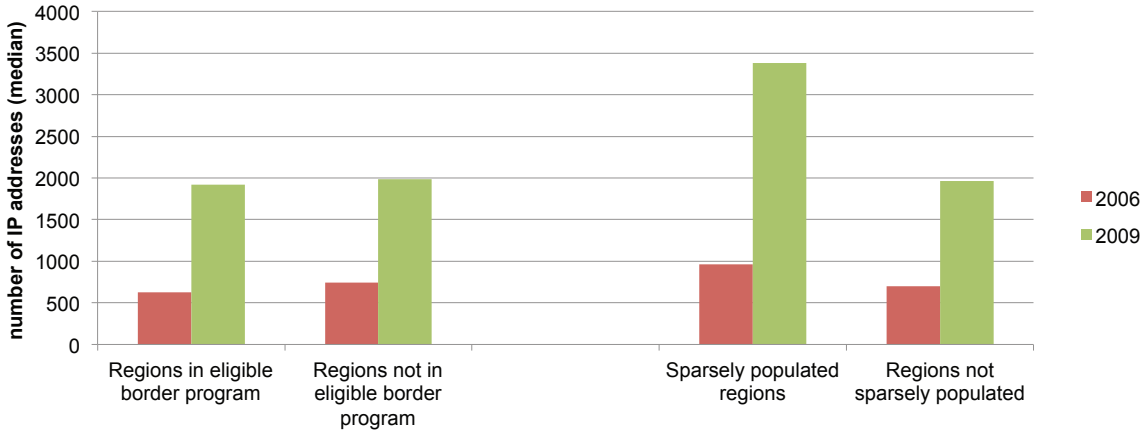
Figure 6 shows that most coastal regions display comparable or even better results than regions not classified as coastal. For the year 2006 only the coastal regions with a low share of coastal population had less IP addresses than the non-coastal regions. In 2009, only the coastal regions with a very high share of coastal population had a lower number of IP addresses. Accordingly, coastal regions are performing equally or better than non-coastal regions.

Figure 6 IP addresses in different types of coastal regions



Finally, Figure 7 shows that the performance of regions is hardly influenced by the fact that they are in eligible cross-border programmes, although the increase in the number of IP addresses in these regions is somewhat higher (206% compared to 166% for those regions that are not in eligible border programmes).

Figure 7 IP addresses in border regions and sparsely populated regions



In comparison, the sparsely populated regions, show more differentation. Not only are the absolute numbers of IP addresses higher for sparsely populated regions, but also the increase from 2006 to 2009. On the one hand, this might be in contradiction with the higher numbers of IP addresses found for urban and metropolitan regions. On the other hand, it should be noted that the sparsely populated regions to a large extent are the regions of Northern Scandinavia, which in general have a high level of welfare and integration in digital networks.

No significant differences can be found between regions in various types of regions in industrial transition. Data availability for island regions and outermost regions, especially for the year 2006, is not sufficient to draw any conclusions on their status compared to regions that are not categorized as an island.

By shifting focus from the European regions in general to specific types of regions, the positive picture of the diffusion of digital networks in Europe is reinforced. Irrespective if we consider regions that are metropolitan, urban, rural, mountainous, coastal, border or sparsely populated, the trend is clear: In a period of only 3 years, all these areas experienced an impressive growth of between 100-300% in the number of IP addresses. However, in order to achieve the objectives of the digital flagship of Europe 2020, some specific type of regions might be in need of additional investments in order to be able to reach the objectives concerning high-speed Internet roll-out set for 2013 or 2020.

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The ESPON 2013 Programme is part-financed by the European Regional Development Fund, the EU Member States and the Partner States Iceland, Liechtenstein, Norway and Switzerland. It shall support policy development in relation to the aim of territorial cohesion and a harmonious development of the European territory.

ESPON shall support Cohesion Policy development with European-wide comparable information, evidence, analyses and scenarios on framework conditions for the development of regions, cities and larger territories. In doing so, it shall facilitate the mobilisation of territorial capital and development opportunities, contributing to improving European competitiveness, to the widening and deepening of European territorial cooperation and to a sustainable and balanced development. The Managing Authority responsible for the ESPON 2013 Programme is the Ministry of Sustainable Development and Infrastructures of Luxembourg.

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