Telecommunication Services and Networks: Territorial Trends and Basic Supply of Infrastructure for Territorial Cohesion

ESPON 1.2.2

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CENTRE FOR URBAN & REGIONAL DEVELOPMENT STUDIES

In association with

JOENSUUN YLIOPISTO

CEMET

HERIOT WATT UNIVERSITY

For further information regarding this report, please contact:

Ranald Richardson

Centre for Urban and Regional Development Studies

University of Newcastle Upon Tyne

NE1 7RU, UK

Tel. +44(0)191 222 8004

Fax. +44 (0)191 232 9259

Email – ranald.richardson@ncl.ac.uk

Web: http://www.ncl.ac.uk/curds

ESPON 1.2.2 project partners:

Karelian Institute

University of Joensuu

Centro de Estudios em Inovçao e Dinâmicas Empresariais e Territoriais (CEIDET)

University of Aveiro

School of the Built Environment

Heriot Watt University

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0 INTRODUCTION

This report is the Second Interim Report (SIR) and one of four reports to be delivered under ESPON Project 1.2.2. – Telecommunication Services and Networks: Territorial Trends and Basic Supply of Infrastructure for Territorial Cohesion. Our First Interim Report (FIR) was delivered in October 2002 and the Third Interim Report (TIR) will be delivered in August 2003. The Final Report will be delivered in August 2004.

ESPON 1.2.2 has two overarching aims:

- To provide a better understanding of the relationship between telecommunications infrastructures and services and balanced spatial development, and;
- To create a platform (data, indicators, concepts and methodologies) upon which future research and policy can build.

This report is mainly based on work carried out under WP2, but reference will be made to some initial work under WP3.

The key component of WP2 has been a collection and analysis of data available at the European level on telecommunications network and services. The goal is to enhance our understanding of the territorial distribution of telecommunications networks at the European level. The first interim report of October 2002 provided a sketch of territorial patterns of telecommunications infrastructure at the European level, based on publicly, readily available data. This second report builds on this, through contacts and discussions with numerous organisations and through the collection and analysis of important further data not previously collected. The overarching goals of the report have been (a) to create a more complete picture of the current situation at the European (EU 27) level and (b) to suggest indicators, methods and directions for future work, including recommendations for the Commission and for the statistical agencies.

The Report is divided into two parts. Part 1 follows the headings suggested the ESPON CU in its guidance on report framework. There are three chapters of varying sizes in Part 1. Chapter 1 is an introduction, Chapter 2 gives a summary of the main findings to the report. Chapter 3 is then divided into a number of short sections. These present the approaches and methodologies used (3.1), typologies and concepts (3.2), indicators (3.3), data availability (3.4), mapping (3.5), a short report on the development of a Common Platform across ESPON projects (3.6), a short report on the points raised by the Response to the First Interim Report and on networking underway towards other TPG (section 3.7), a report on the eEurope Action Plan process from the perspective of ESPON 1.2.2 (section 3.8), and finally, updated information on preliminary results and maps envisaged for the Third Interim Report in August 2003 (section 3.9).

Part 2 of the report presents the substantive results from WP2 relating to data collected and analysed on the territoriality of TN&S the European level. Within this, Chapter 4 focuses on the demand side, drawing on European surveys to demonstrate some of the key territorial patterns of up-take and use of telecommunications networks and services. In Chapter 5, we concentrate on enhancing our understanding of the territorial patterns of supply and territorial strategies of suppliers of these networks and services at the pan-European level. Chapter 6 then outlines a series of preliminary policy conclusions and recommendations based on our work in ESPON 1.2.2 to date.

There are four annexes to the report. The first 3 are in support of comments in the text. The fourth (Annex 4) is the SWOT analysis which it was agreed each project would undertake as part of the their Second Interim Report.

Part 1

Chapter 1 Introduction

Part 1 to 1.2.2 Second Interim Report (SIR) follows the structure set out in the "Guidelines for the Interim Report in March 2003", from the ESPON CU, dated the 28th February 2003. It is organised in a series of (mainly) short sections. In turn these are:

- Summary of main findings

- Short presentation of approaches, methodologies, typologies, concepts, indicators, data availability and mapping

- Short report on Common Platform

- Short report on:
    - integration of points raised in Response to First Interim Report
    - networking taken towards other TPG

- Report on eEurope Action Plan process from the perspective of ESPON 1.2.2 (an additional section taking into account comments made in CU/DG Regio response to First Interim Report (FIR)

- Updated information on preliminary results and maps envisaged for interim report in August 2003

Chapter 2 Summary of main findings

In line with the report structure described above the summary main findings are divided into two parts. We first outline the main findings from Part 1, before turning to Part 2.

2.1 Main findings from Part 1

It is clear from our study that that the notion of the Information Society is taking an increasingly firm root in Europe. Our study is primarily concerned with Telecommunications Networks and Services (TN&S). In the European Union context the Information Society has always had a wider focus than mere technological infrastructure. Certainly since the High Level Group on the Information Society Report in 1996, the importance of accompanying policies – investment in human capital, stimulating demand through promoting e-commerce, e-health, e-government and through content development and so on – have always played a significant role, alongside telecommunications liberalisation and other ‘supply-side’ policies.

In the wake of the emergence of new rounds of technology such as broadband, however, there appears to be a reawakening of interest in the technology side. This is particularly so from the regional perspective where it is now widely recognised that, in the case of many regions, the market alone will not provide. Although this message is sometimes obscured by ritual obeisance to market rhetoric, it is becoming increasingly clear. For example, the question of whether Structural Funds can be used for ICT infrastructure seems to have been answered in the affirmative, though the question of when intervention should/can occur is still live, as is the question of what are the appropriate mechanisms through which to make these interventions.

Over recent years policy approaches at the European level have developed and become more structured and focused, (not least of all as a result of the eEurope Action process). Our report reviews the development of that process from an ESPON perspective. The key findings are that:

- The regional perspective has become better articulated as the process has evolved. It was largely missing from 2002 Action Plan and the 2003+ plan. The 2005 plan, however, articulates the regional perspective clearly, though it is still perhaps not as central as those with a territorial interest would like.

- The importance of infrastructure has also become better articulated, particularly in relation to regional disparities.

- The eEurope Action plan process has, however, failed to adequately address the issue of regional benchmarking. No regional benchmarking took place in respect of the 2002 plan or in respect of the 2003+ plan. Only in the most recent plan are regional indicators developed and utilised to measure regional disparities. The timing of the resulting studies – they will report late 2003 or early 2004 – mean that we cannot draw on this resource in time for August 2003.

- Disparities will only be measured in respect of a limited number of priority areas, in essence Internet take up and use, and not, for example, in respect of broadband. Further, and crucially, the only territorial divide which will be measured is that between Objective 1 and non-Objective 1 regions. Clearly it is important to monitor this difference, particularly in relation to policy development and spending of Structural Funds. Our research to date, however, suggests that differences in TN&S investment and take up often need to be explored at a finer spatial scale. We discuss this in more detail below.

Outside the eEurope benchmarking process, studies on behalf of DG Infso, such as the Flash Barometer series (which is being integrated with the eEurope benchmarking process) allow us to say something about urban-rural disparities within EU15, but do not allow a finer sectoral scale.

This leads us to the key finding in relation to Part 1 of our SIR, namely that **there is a paucity of comparable data at the European level, both EU 15 and even more glaringly at EU 27 plus Norway and Switzerland**. This makes detailed analysis, based on comparable data, of regional disparities with respect to TN&S extremely difficult if not impossible within the resources and timescale of this project.

The paucity of data is not a surprise to the authors of the report and we have commented on this before, though we were surprised by the lack of regional benchmarking in the 2005 Action plan.

A number of studies and initiatives are being undertaken, funded by the EU, to rectify this situation, under the IST part of FPS, and through networks of regions (such as ERIS@). None of these studies, will, however, be complete before August 2003. We will seek to draw on whatever results become available, but these are likely to be sparse.

Two studies have, however, been undertaken which do explore regional differences (at NUTS II) and urban and rural differences. First, is an EOS Gallup study on behalf of DG Info carried out in 1999. We analyse this study in Chapter 4 of the report (see Part II main findings, below). We believe that further analysis could be undertaken if we could obtain the national surveys which lie behind the European level report. Unfortunately, we have not yet been able to obtain this data. Second, a follow up study conducted in summer 2002. Unfortunately, this latter study has not yet been published and we have been unable to gain access to its findings. In short two studies exist which would allow us to explore comparable data, at least at the NUTS II level, for EU 15. Both studies lie within the Commission, as does the question of access to these studies for use in ESPON.

We have explored alternative sources, including telecommunications providers and consultants and have obtained some useful data in relation to networks. These are analysed in Chapter 5 of the report (see also Part 2 Main Findings, below).

We are currently undertaking a similar detailed search for data at the national level under WP3 though, as anticipated, there are significant variations in the type of data collected and the territorial levels for which it is collected.

2.2 Main findings from Part 2

Part 2 of our SIR is divided into chapters 4 (analysis of demand side), 5 (analysis of supply side) and 6 (policy recommendations).

Chapter 4 draws on a small number of reports which deal with sub-national differences in TN&S take up and use. It is therefore concerned with the demand side[1]. It should be noted that we were only able to find reports which dealt with EU 15 and so regional variations reported do not take account of Candidate Countries or Accession Countries. The data used mainly comes from the above-mentioned EOS Gallup Report which, although published in 2000, draws on a survey conducted in 1999. It should be borne in mind, therefore, that some technologies, notably the Internet have matured and grown rapidly since this report. Other technologies such as mobile were relatively mature, but, nevertheless have grown rapidly in the years since 1999. There may, therefore, be an 'early mover' effect present in the territorial patterns described. We do also draw on the Flash Eurobarometer series which suggests that in key technology areas, particularly the Internet, disparities identified by EOS Gallup, at least in relation to urban-rural divides, remain.

On the demand side (Chapter 4) the main findings are as follows:

- Territorial patterns relating to the demand side in TN&S are complex and varied. There is often a 'national effect' which appears more important than regional differences across countries. This might be explained by regulatory, cultural or historical factors, or by levels of public intervention. For example, Sweden leads Europe in broadband. It can be argued that this is, at least in part, an effect of state intervention in the provision of broadband technologies. In central and eastern Europe, conversely, the 'rational' effect may very well be being manifested as an under-supply of TN&S.

- The overall picture, in terms of what might be termed ICT-richness (based on the presence in household of the technologies referred to in the following

[1] Of course, levels of up-take can be constrained by supply side deficiencies, and our use of the term 'demand' should, therefore, more accurately be prefixed by 'satisfied' demand. In Europe as a whole, however, variations in levels of up-take of telecommunication services are, in the main, reflecting variation in the demand for such services.

bullets) suggests a divide across the European territory. The '20-40-50 Pentagon' and 'blue banana' captures quite well territorial patterns, although the northern periphery is the equal to these core areas. There are significant variations at the regional level within most countries, favouring capital city regions and regions of high GDP/ph.

- *Fixed telephony* penetration shows a general European north-south divide, but a limited core-periphery trend, as Swedish, UK and Greek regions have high levels of take up and use. Regional differences within countries tend to 'map onto' differences in GDP/ph, albeit with some exceptions. Levels of competition in fixed telephony vary across Europe. The highest levels of competition in fixed telephony are to be found in Sweden where there were few regional differences. Overall, however, households in metropolitan and urban areas are more likely to use competitive fixed telecommunications providers than those in rural areas where the incumbent provider remains dominant.

- *Mobile telephony* penetration demonstrates a clear 'national effect', with the northern 'periphery' (Sweden, Finland) leading the way. One common regional pattern is high mobile penetration in capital city regions. There is also high take-up of mobile in *some* rural and / or less prosperous regions in the context of their national economies. This latter point may suggest some degree of 'catch up', a point made in the national context in our FIR, though a time lag of around 6 months between metropolitan and rural areas can still be discerned and (at least in the 1990s) showed no sign of closing. Also competition in mobile telephony is more advanced than for fixed telephony, though new competitors entering the market do appear initially to target metropolitan and urban areas. These are important findings as they may also be reflected in new round of mobile technologies (such as 3G) which will provide access to the Internet.

- *Internet*. There is a general north-south divide in the European territory in domestic Internet access penetration rates, with Sweden again leading the way, and southern countries (plus Ireland) trailing. In France, only Paris has levels close to the leading countries, while low levels in eastern German länder appear to reduce overall German penetration levels. Levels of competition in Internet access also vary, with the UK having the most competitive environment and Portugal the least competitive. Competitive Internet services are also more prevalent in more populated areas, and metropolitan households are almost twice as likely as rural households to have Internet access by competition provider. Rural areas appeared to be around a year behind urban areas in Internet take-up with evidence that this gap was increasing as overall take-up increased. These observations on Internet take-up are supported by the more recent Eurobarometer Flash surveys. These also showed that metropolitan areas have a higher proportion of users making more frequent use of the Internet than rural areas. Metropolitan users are more likely to use broadband technologies (ADSL, cable modem) to access the Internet, although curiously, ISDN is most used in rural areas. Mobile wireless data also shows that rural areas are more advanced than urban ones, even if metropolitan areas lead the way. We can suggest then that mobile wireless technologies may offer significant opportunities for rural areas.

- Overall, the evidence from these surveys suggests that metropolitan and urban areas will continue to lead and rural areas lag. The advent of broadband and the (growing) differential in Internet access may, in fact, widen the gap.

Chapter 5 focuses on the supply side of TN&S drawing on a number of sources.

- The development of telecommunications networks and services across Europe can be increasingly related to a number of parallel, intertwined processes and practices from all scales, from wider economic 'globalisation' dynamics, through national and supra-national regulatory decisions, and urban and regional planning policies, to local availability and accessibility of different technologies.

- The deployment of extensive fibre backbone networks, on which a large proportion of telecommunications traffic now passes, and which are the designated infrastructure for crucial IP data flows, has concentrated on connecting the core urban centres, or 'global cities', where the most profitable business customers of telecommunications carriers are located.

- On a European level, this creates a kind of 'polycentric urban' territoriality of telecommunications focused on the key cities of London, Paris and Frankfurt, but also a series of 'delinked' peripheral regions with limited access to the infrastructural backbones of the global economy.

- Recent downward market trends, and in particular a consolidation of telecommunications companies and their retrenchment in core sectors and areas, has probably aggravated this overall 'territorial' disparity at the European level.

- Population size is a key factor, but is not the only one that needs to be taken into account in analysis of the territorialities of telecommunications networks at the European level. For example, Brussels, Amsterdam and Geneva, with relatively small populations, are on more networks than are some more heavily populated city-regions, suggesting the importance of metropolitan function to explain the degree of network connectivity.

- There are significant differences between nation states with regard to territorial differentiation in telecommunications infrastructure investment. For example, in France, the primacy of Paris remains strong, but other cities such as Lyon, Marseille and Strasbourg also have good network presence, although there is something of a telecommunications 'desert' in the centre of the country. The German distribution is more evenly balanced both between a large number of cities as a whole and between the east and west, and north and south of the country. The UK is dominated by London, with only Birmingham and Manchester having other significant pan-European network presence. Poland has a relatively balanced network presence between cities, with

Warsaw leading the way, but another 9 cities registering at least some presence.

- Our analysis of networks suggests that there are a small number of very extensive pan-European networks which inter-link a large number of cities, and there is a larger number of networks which are either less extensive or simply replicate the routes followed by other networks. This would explain why being on the majority of the networks featured does not lead to a city having many more inter-city connections. For example, while Hamburg and London appear on six or seven times more networks than Brno, they are linked to less than 20 extra cities.

- The inter-city connections with the most number of networks passing along them are in a very concentrated core area which extends no further south than Frankfurt. The predominance of large north western German cities, and in particular Dusseldorf, stands out here.

- In terms of the capital city territoriality of pan-European telecommunications networks, the broad pattern is one of 'central' or core capital cities on a European level (London, Amsterdam, Paris, Brussels, Berlin) having more networks present and more inter-city connections than more peripheral capitals (Athens, Riga, Bucharest). We can also highlight the greater importance of national capitals which dominate their respective telecommunications markets (London, Paris, Brussels) compared to those capitals which are either not the most important city in their country for telecommunications (Bern, Rome) or are part of a relatively balanced national urban system in which no city really dominates (Berlin).

- While the 'core' cities of Europe tend to exhibit an almost homogeneous pattern of territorial connectivity, with some of them exceeding 100 network connections to other places, and nearly all the other 'core' cities having more than 90 links, there are, in contrast, different territorial peripheralities in telecommunications network provision. For example, a Greek or southern

Italian city present on 1 or 2 networks is thus only linked to 5-7 other places, e.g., Athens, Patrai, Naples and Bari. Meanwhile, however, cities in the Baltic region like Riga and Vilnius are also only present on 1 network, but that network connects them to 57 other places.

- Analysis of a detailed map of pan-European inter-city network bandwidth confirms the predominance of the core area of the EU (the pentagon) as a cluster of bandwidth connections / communication corridors, and of the cities at the top of the traditional European urban hierarchy as being the focus for a majority of these connections.

- Both the number of intercity bandwidth connections and the bandwidth capacity of connections (and therefore overall telecommunications accessibility) diminish gradually with distance from the core area. Peripheral (and / or rural) areas of the ESPON territory have therefore relatively reduced accessibility to these intercity bandwidth connections.

- We can note, however, the emerging importance of urban centres outside the core area of the EU for attracting bandwidth connections (eg Prague, Toulouse, Leipzig, and, to a slightly lesser extent, Dublin, Oslo), some of which may be viewed as 'gateway cities' for telecommunications bandwidth connections, in the way in which they act as links between the core area and more peripheral areas, eg Copenhagen for Scandinavia, Berlin for Poland, Vienna and Prague for south eastern Europe.

- Like the number of inter-city network connections, the largest inter-city bandwidth links are concentrated in the 'core' area, with a German dominance (7 of the 12 densest routes are between German cities).

- The cities which concentrate many pan-European networks are also the main Internet exchange point locations in Europe, permitting communications to pass between different backbone networks. However, the presence of Budapest, Prague, Bratislava and Warsaw, as more important exchange points than the likes of Madrid, Berlin, Barcelona or Helsinki, suggests how the need of telecommunications and IT companies for network interconnection locations in eastern Europe appears to be growing.

- The similarities and differences in the networks and strategies of pan-European telecommunications companies from a territorial perspective is explored through two representative examples of such companies to illustrate that even within the concept of ‘pan-European’, there exist strategic differences which are founded on territoriality. The example of Cable & Wireless illustrates a territorially extensive pan-European telecommunications strategy made up of ‘polycentric’ network ‘cores (global nodes) and network ‘peripheries’ (local nodes). The example of Sonera illustrates a territorially focused pan-European telecommunications strategy based upon major presence in the markets of the Baltic region rather than extensive presence across the whole of Europe. The network deployments of BT Ignite, Colt, WorldCom and Tiscali are also briefly discussed, highlighting a general ‘core’ region focus, beyond which more peripheral cities are served by more limited technological infrastructure and / or fewer connections, suggesting some degree of ‘friction of distance’ within telecommunications territoriality across Europe.

We now turn to the main points arising from Chapter 6, on preliminary policy recommendations.

Our line of thinking, in respect of policy, has not changed radically since the first interim report and so readers are referred to the chapter 7 of that report – Preliminary Policy Directions.

We mainly concentrate on Broadband technologies. Broadband has been identified as a key technology (or set of technologies) in facilitating the growth of the Information Society. The concept of “broadband for all” can be applied here, which brings together the idea of providing broadband services in a cost effective way for both households and firms, irrespective of location (urban/rural, profitable/non-profitable areas) and social class.

Infrastructure questions should be addressed in tandem with other questions including demand stimulation, content provision, education and training, e-government and so on, as, indeed, is the case in the eEurope Action Plan 2005.

Chapter 3 Presentations on approaches, methodologies, concepts, indicators, data availability and mapping.

3.1 Approaches and methodologies

The approach which has been adopted in 1.2.2 to date, at the behest of the CU and DG Regio, has been to try and unearth *comparable* data relating to EU 27 plus Norway and Switzerland. This is a time consuming and resource intensive process involving a number of elements. The focus of WP2 (to which this report mainly relates), as stated in our project proposal, is to search out publicly available data on T&NS, and, where such data is not publicly available (which is normally the case) we have contacted a range of organisations in order to uncover data. The following types of organisations have been contacted in the search for regional and other territorially disaggregated data at the European level:

- The European Commission
- Other organisations working on telecommunications at the European level (e.g., OECD)
- Consultants working in the field of telecommunications
- Academics working in the field of telecommunications from a regional perspective.
- Consortia working on related European projects (e.g., SIBIS, BISER)
- Telecommunications companies

A full list of organisations and individuals contacted (within WP2) appears in Annex 1. We have spoken to and corresponded with a range of officers in the Commission, particularly in DG Regio and DG Infso. These officers are listed in Annex 1. These interchanges have largely been helpful and we have followed up all leads provided.

Discussion and correspondence regarding eEurope plans and the benchmarking processes associated with them was particularly helpful, if only to confirm the view that no relevant data at a regional level will become available in time for our Third Interim Report (TIR). Overall, it is clear that the sources located through this process can only form a context for ESPON 1.2.2. They have not resulted in uncovering new data sources of which we were previously unaware in the field of TN&S. The exception to this is that we have become aware of the existence of a follow up survey to the EOS Gallup 1999 Survey (we present an analysis of the 1999 survey in Chapter 4 of the present report). As we are unable to access the data from the new report, however, this has led to frustration rather than enlightenment.

We have contacted Eurostat, ITU and OECD and other international organisations and consultants which produce or report data on TN&S in Europe. None of these groups produce regionally disaggregated data. We have, however, been able to purchase network maps from the latter group and these are analysed from a territorial perspective in Chapter 5 of this report.

We have also contacted a range of academic colleagues working in this field and consortia (of academics and consultants) currently working on the development of indicators and data sets for TN&S in Europe. This process is elaborated on further in 3.7.2 below.

As can be seen from Annex 1, we have contacted a number of key telecommunications companies, which have (or until recently had) pan-European ambitions. We have sent letters (including a letter of introduction from the ESPON Secretariat) to the companies and followed up emails and telephone calls. To date, the results of this process have been disappointing and we have not been able to talk to the relevant people in any of the companies targeted, though in the past few days interviews have been arranged with two companies we identified. We have, however, carried out searches of the web sites of the key telecommunications companies. This has enabled us to collect some important information regarding roll-out strategies. This data is reported on in Chapter 5 of this report.

The 1.2.2 partnership has also been making progress under WP3. A set of indicators has been developed (see section 3.3, below). A number of countries have been allocated to each partner. Each partner has contacted the relevant agencies in their allotted countries, either directly or through subcontracting to appropriate experts in those countries. Each partner has extensive networks in the field covered by 1.2.2. To date the results of this process have been variable and there are considerable differences both in respect of types of data collected and the territorial levels at which data are collected across countries (see Annex 3 for an example of differences in availability of data in two illustrative countries). This issue is explored further under the data availability section of this report (see section 3.4 below).

3.2 Typologies and concepts

In this section we concentrate on 'concepts' and 'typologies' which, in our view, have relevance to ESPON 1.2.2.

Clearly the *Information Society* is a critical concept for our project. The concept of the Information Society can be seen as an attempt to extend the notion of the information economy, formulated by Daniel Bell and Alain Touraine, which argued for the centrality of information processing, into a broader societal context. The concept is somewhat dated and has been superseded or at least rolled-into more recent concepts such as the Knowledge Society or the New Economy, notwithstanding its continued frequent use. Since the mid-1990s commentators have moved away from a focus on technology towards the central importance of knowledge and learning and have emphasised the importance of policies related to the development of human capital and so on, rather than infrastructure, and on the importance of human networks rather than electronic networks (see, for example, CEC 1996, Castells, 1996). This change of emphasis has been apparent in EU policy, for example, in the eAction Plans which embrace a number of policy areas and not just technology. Further, in the European context, the Information Society is understood to encompass social cohesion and inclusion goals, in addition to those relating to economic objectives. Project 1.2.2 is focusing on only one element, and perhaps not the most important element, of the information society, that concerning the underpinning infrastructure of TC&S.

Of crucial importance in respect of TN&S in a liberalised market is the concept of '*spatial selectivity*'. This concept is not mentioned in the various documents which we have received from CU or BBR, but is implicit in such concepts as accessibility, connectivity, global zones of integration and so on. Spatial selectivity, as well as social selectivity, is, of course, common across most types of infrastructural investment in capitalist economies. In respect of telecommunications infrastructure it can be seen as a multi-scalar process and can be witnessed at many levels from selected Points of Presence on global or European wide networks to the roll-out of broadband services to domestic consumers. At least some telecommunications companies develop sophisticated models which factor in, for example, population, socio-economic characteristics, presence of competitors, in essence potential return on investment, when deciding which territories to invest in. It should also be borne in mind that many companies operate beyond a single national territory and they can operationalise 'spatial selectivity' and can compare and contrast potential return on capital invested across a number of places. This concept, in our view, is crucial in understanding private sector strategies, as it does not assume that all markets will eventually be served if left to the market. It also has implications for public policies in response to these strategies. It may, for example, have implications for how Structural Funds are used.

Accessibility is another key concept for 1.2.2, but it is a complex one. It is most commonly used to denote the ability to access services. In the context of TN&S this implies access via networks to services. It is increasingly being related to the speed, reliability and cost of access. The notion of an information society for all seems to embrace the view that all citizens should have equal access to network technologies, though there remains a debate as to what the basic levels of access should be – should all citizens and, from the ESPON perspective, all regions and sub-regions, have access to the most advanced technologies (broadband), as implied in the eEurope Action Plans or is access via older technologies sufficient, as in the Universal Service Directive? Another key issue is whether users have the *access to the knowledge* required to use the technology to enhance their economic or social position or their quality of life more generally (see Information Society concept, above).

Connectivity is also an important concept. There is a need, however, to explore further what is meant by connectivity. As is shown in chapter 5 of our report there are different ways of measuring connectivity – number of networks present in a city, quality of networks, redundancy in the network, number of places connected to by the network and thickness of connection (i.e., number of linkages) to particular places.

Territorial cohesion is another important concept for ESPON 1.2.2. In theory TN&S can contribute to territorial cohesion, by which we assume greater equality, however measured, across territories. TN&S, in themselves, however, are unlikely to address the underlying and increasing disparities within Europe and a range of other policies will be necessary. *Territorial fragmentation* is an opposing concept which we would introduce, again this can occur at multiple scales.

Polycentric Development is another concept which is important for ESPON 1.2.2. TN&S, again, can in theory contribute towards processes of polycentric development at various spatial scales, for example, by making production more mobile. At the same time, however, it may be that the command and control potential of ICTs means a diminution of polycentricity at least at levels beneath the core European cities. There may be polycentricity in terms of closer networking across the wires, but we would need to explore the power relations between nodes of the networks in order to fully explore the concept. Polycentricity can also be applied to network topologies, in the sense of how strongly nodal or multi-nodal are Pan-European telecommunications networks.

Centre-periphery is a key concept for ESPON 1.2.2. A central concern is whether peripheral regions of Europe will be able to compensate for their physical remoteness from markets and services through TN&S. Our initial findings already suggest some level of differentiation between certain peripheral parts of Europe and the core, particularly in relation to advanced technologies. However, the reverse can be said to be true in respect of the “Nordic Periphery” which in many respects has the most developed penetration of TN&S in Europe with levels above the areas (the Polygon) regarded as being core.

Global integration zones is a useful concept. We see this concept as analogous to that of the global city or global city region. TN&S connectivity may provide clues to which cities or territories are becoming global integration zones, though again caution is required. We would need to know what kind of connections and what kind of (i.e., the content of) flows in order to determine the role of cities in the global economy.

Gateway Cities is also an important concept for 1.2.2 as our analysis suggests that telecommunications *may* be helping to create a new set of gateways (or perhaps reinforcing existing roles) for several cities.

The concept of *territorial corridors* is one which may prove useful for charting networks and the meaning of networks. We use this concept in chapter 5 of this report and there are some preliminary indications of new corridors being developed along telecommunication networks in eastern Europe.

3.3 Indicators

A set of indicators has been established following discussions with the CU and with BBR. As suggested to us during those discussions we have narrowed the range of indicators to a few key indicators. The key indicators mainly relate to more 'advanced' technologies, such as broadband. This reflects the thrust of eEurope Action Plan 2005. It also reflects the findings of our research to date which suggests that it is the more advanced technologies where territorial differences are most pronounced. We do retain some indicators relating to more basic technologies, such as fixed telephony. This is in recognition of the fact that (a) fixed telephony remains the key basic technology for access to the Internet for most people and (b) that in some accession and candidate countries access to even this basic technology cannot be taken for granted.

Annex 2 contains a list of indicators which we have developed. Those highlighted in bold are our key indicators. We are still, however, seeking information on the other indicators. This is in recognition of the fact that information on our key indicators may not be available. As suggested in section 3.7.3 of this report we do not believe that concentrating on a small number of indicators will necessarily lead us to comparable data, simply because not all countries collect TN&S data at the regional level.

3.4 Data availability

In our proposal, in subsequent negotiations with the CU and DG Regio, and in our FIR we made it clear that the prospects for gathering comparable data at NUTS 2 level and below, for EU 27 + 2, in the field of telecommunications, within the scope of project the size and scale of ESPON 1.2.2 were slim. This would have been so even without the accelerated pace which has been imposed on the project by the requirements for results by August 2003. Nevertheless, we have made, and continue to make, exhaustive efforts to uncover data, which is or can be made comparable.

This sub-section summarises our efforts and reflects on the (lack of) regional data available. It points out that there is a potential source of comparable up-to-date information, at least on the demand side, at NUTS 2 level, but only for EU 15. This source is the European Commission and our access to that data rests entirely in the hands of the Commission.

We have followed up all sources suggested to us in the CU/DG Regio response to ESPON 1.2.2 First Interim Report (FIR). We have also followed up all contacts and potential information sources provided by officers from DG Regional Policy and DG Information Society in our various meetings in Brussels.

Table 3.1 shows a representative sample of kinds of responses we have received from respondents from various agencies concerned with telecommunications networks or services. As can be seen the reservations which we have expressed in earlier phases of the project have been confirmed.

Table 3.1. A representative sample of replies to enquiries seeking to uncover comparative regional data at the European level (WP2)

Respondent Organisation	Summary of Enquiry	Summary of Response
Gerard Williams, Eurostat Datashop	Is telecommunications data collected at the NUTS II level or below by Eurostat?	Eurostat communications statistics only operate on the national level, without any regional breakdown.
Richard Deiss (formerly) IS statistics Eurostat and Martii Lumio Eurostat	Can you tell us of any sources for telecommunications statistics at the regional level in Europe	Not aware of sources for regional data other than the ones mentioned in your email (i.e., EOS-Gallup Survey, BISER, DEEDS)
Martii Lumio, Eurostat	What is the state of progress on the Eurostat Household Survey on ICT usage and enterprise usage survey and do they cover regions?	A regional aspect, which will allow breakdown of results by objective1/of which ultra-peripheral regions/other regions, has been added to enquires in 2003. Countries (EU15 only) will conduct surveys in second quarter of 2003 and deliver results in the last quarter. *Results should be available early 2004.*
Frank Mather, DG Information Society	(In relation to eEurope 2005 Action Plan) is it correct that: a) the only sub-national level reporting will be objective 1 versus non-objective ? b) data at sub-national level will only be reported for Internet Indicators? c) data will not be available until October 2003?	In each case the answer is Yes
Frank Mather, DG Information Society	Would the Eurobarometer Flash 'table of results' which support the analytical reports allow us to analyse regional differences within member countries?	Unfortunately, you will see (from attached tables) that you cannot make regional estimates from the sample used (2000 per Member State). It was decided last year that it would be too expensive to provide regional statistics but that the surveys would give separate data for Objective 1 regions.
Maria Carbone, DG Information Society, responsible for benchmarking eEuorpe+ (candidate countries)	In respect to benchmarking eEurope+ 2003 (covering Candidate/Accession countries), has any data been collected at the regional (i.e., sub-national) level either for the Progress Report on eEurope 2003 or subsequently?	No data has been collected to explore the regional dimension of eEuorpe+

John Dickie, European Competitive Telecommunications Association (ECTA). ECTA represents large telcos operating in Europe. It produces an annual 'scorecard' on TN&S based on member surveys	Has ECTA done any work on differences in telecommunications networks and services at the sub-national level within the European Union or Candidate Countries	I am afraid that we do not go to sub-country level – getting national data is hard enough in itself!
Dimitri Ypsilanti, Head of Telecommunications Sectin, OECD	Has OECD done any recent work gathering data at the sub-national level?	On the telecommunications side we only track national data on a consistent basis and we have not undertaken any work recently on sub national issues.
Michael Minges, International Telecommunications Union	Does ITU collect any data at the sub-national level? Do you have any suggestions as to who else might?	We only collect data at national level. Some national regulators have some of the key indicators (e.g., telephone lines) at the region/state level but they are few and far between.
Marc Bogdanowicz JRC-IPTS (currently carrying out a series of monographs on Accession/Candidate countries)	When will monographs be ready? Are you aware of any regional data in candidate countries?	December 2003 We are confronted by the severe scarcity of reliable data at national, and even more, at regional level.
Danny Brown, consultant, Analysys (Telecommunications' industry analysts)	Do the fixed and mobile European Market Intelligence Databases of Analysys provide any regional / sub-national data within either analysis of operator strategies or profiles of individual countries? Are you aware of any other Analysys research reports which provide this kind of data for Europe?	Analysys do not focus on or provide sub-national level data in either the databases or reports because this is very difficult to obtain, and they would only have a limited editorial capacity with regard to this. In addition, this type of data goes out of date very quickly, and their aim is to offer market profiles which appeal to a wide variety of clients. They would not provide reports which are only going to interest a minority of these potential clients.

In short, comparable data at the European level for sub-national territories, however defined, is in extremely short supply. The exceptions to this are reported in chapters 4 and 5 of this report. As can be seen from table 3.1 (see also observations on eEurope Action Plan in section 3.8, below) we anticipate that some comparable data will become available within the time frame of ESPON 1.2.2, but (a) is unlikely to be available by August 2003, (b) the regional dimension will relate only to objective

1/non-objective 1 and, with the exception of the DG Infso survey which has a regional angle, (c) will cover only EU 15.

As we have stated elsewhere in our report the best hope for relatively up-to-date comparative data at the European level, albeit only for EU 15, for regions (albeit only at NUTS II level) is the recent survey carried out by DG Information Society as a follow up to the 1999 EOS survey.

The lack of comparability of approaches and data is not surprising. Indeed, it has already been recognised by the Commission, hence the funding of a number of relatively well-resourced projects, under the IST element of FPS. Projects such as BISER are exploring how to overcome these problems in a measured and methodical manner. These studies are discussed further under 3.7.2.

Turning to the question of data availability relating to regions collected at the nation state level under WP3, this process is on-going and will be covered in more detail in our Third Interim Report. A number of points, however, can be made about the process to date.

First, it is extremely labour and resource intensive to try to uncover the sort of data we are seeking under ESPON 1.2.2 from national sources. As can be seen from the observations in table 3.1 organisations which have specialised in telecommunications data gathering for a number of years have not gathered data at the regional level because of the resource and cost implications. Further the Commission itself has apparently not undertaken such work (EOS Survey and follow up excepted), beyond the limited focus on objective 1/non-objective 1 regions, and does not intend to do so, for cost reasons.

Second, as anticipated, it is already clear from our research that the approach of different national authorities towards the collection of regional (and indeed other) data varies considerably. We will not present a detailed picture of this here but the tables in Annex 3 are presented to highlight the types of differences which exist between countries in relation to data availability around our key indicators. The Finnish case represents the 'best case scenario' in that a recent 2001 survey was specifically commissioned and a lot of regional data is available. The Hungarian example contrasts with the Finnish case with very little data being available at the regional level. In the Finnish case data can be purchased, but a key question facing our project is whether we spend resources to obtain data for one country which cannot then be compared with data from other countries. These and other issues are considered in 3.9, below.

It is interesting that we can find no evidence of the Finnish survey being replicated in other Nordic countries. An excellent report 'Nordic Information Society Statistics 2002' covering Denmark, Finland, Norway and Sweden provides comparative data on number of socio-economic criteria[2]. However, the regional focus is limited. It does contrast Metropolitan (i.e., capital region) areas with the rest of their respective countries, in terms of Internet access, and finds that in Finland the difference is 11 percentage points, in Denmark and Norway 6-8 percentage points, but in Sweden there is hardly any distinction.

Third, again as anticipated, in respect of data from telecommunications companies – "telcos" – we are largely confined to published sources to build a picture of the supply side. This is because data is regarded as commercially sensitive by the telcos. As a result we are able to build an indicative picture for at least some technologies and for at least some countries, but largely without the base data from which to carry out rich analysis. We are still, however, pursuing this source.

Fourth, the resources spent on chasing data which often does not exist means that limited resources, particularly the resource of *time*, will be available for data modelling and for a reflective and thoughtful use of case studies.

3.5 Mapping

Until recently we have had difficulty in accessing and using the mapping facility created and sent to us by BBR. These problems are now resolved.

[2] See: http://www.stat.fi/tk/yr/tietoyhteiskunta/nordic_iss_02.pdf

The main issue we now have with mapping is that we do not have access to basic data in respect of NUTS II level and below which allows us to utilise the mapping system which BBR has created. As we understand it, without attribute data we cannot complete the cells in the BBR mapping package. The maps presented in Chapter 4 of this report, relating to telecommunications demand, are pictures which replicate maps produced in the EOS report. Without access to the data which appears in the background national reports we can do little in terms of creating new maps.

Maps presented on the supply side in Chapter 5 replicate maps which we have purchased from consultants or which are drawn from publicly available resources. We intend to produce further maps showing particular aspects of network penetration later in the project. We are not clear, however, whether the BBR base maps are the most appropriate host for network maps. We have already had discussion with BBR, who have been very helpful on this topic. We will explore with BBR how we can best map the data we have so as to make it compatible with a common ESPON approach.

3.6 Report on application of Common Platform

Ranald Richardson, PI from the Lead Partner of the TPG on 1.2.2, attended the 26th of February meeting in Brussels. The meeting was interesting and he was able to exchange experiences and concerns with the LPs of other TPGs. He also delivered a short presentation describing progress of 1.2.2 to date. Following the meeting a short paper on anticipated results was submitted as requested. Feedback on indicators and typologies was also submitted.

In terms of a Common Platform there appears to be a clear will amongst ESPON TPGs to evolve such a platform. BBR together with the CU is clearly devoting considerable resources to this process. In our view this is a sensible approach for a Programme such as ESPON to adopt. There is, however, a contradiction between this approach which requires intensive collaboration between TPGs and a high degree of intellectual endeavour and the short term demands which are being imposed on TPGs to deliver substantive results by August 2003. In our own case the 'dash for data' which we have been obliged to undertake risks further undermining these laudable aims.

In more concrete terms, we still await the urban typology discussed in Brussels. For our SIR we have used the UN typology of cities, supplemented by other sources, to map network data. We are also awaiting more precise definitions of key concepts.

3.7 Report on integration of response to First Interim Report and Networking

The Response to the 1.2.2. First Interim Report (RFIR) by the CU and DG Regio was found to be generally helpful. This section of the report addresses each of the substantive comments made in the RFIR in turn, either dealing with them in detail here or referring the reader to the section of the report where the point has been responded to.

3.7.1 General comments

"The project should reflect policy papers of the Commission, notably the eEurope 2005 action plan".

- We have undertaken a detailed analysis, in relation to territorial issues of the e-Europe documentation in respect of the original plan (e-Europe 2002), eEurope+ 2003 (for candidate countries) and e-Europe 2005.

- We have taken account of the indicators proposed to accompany each of these plans, particularly those relating to eEurope 2005 in construction of our final list of indicators (see appendix 3).

Section 3.8. below sets out our analysis of the eEurope process from the perspective of ESPON 1.2.2

3.7.2 Cooperation with ESPON and other related projects

The 1.2.2 has been involved in networking activities within and outside the ESPON process. The latter networking has been undertaken to add value to ESPON.

The LP has been represented at the kick-off meeting and the 26th of February meeting in Brussels, as well as the Mondorf-les-Bains meeting in November where networking with other partners took place.

The two main ESPON projects with which 1.2.2 has collaborated are 3.1 (BBR), around mapping, indicators etc., and 2.1.1. In the latter case we have cooperated through:

- Providing detailed comments on the draft methodology for ICTs TIA and development of indicators

- Professor Gillespie met with Roberta Capello in Milan in February and discussed the above

- Exchange of information on availability of reports and data

- Correspondence on indicators and typologies

We anticipate that the collaboration between 1.2.2 and 2.1.1 will intensify during the next stage of the project.

The EU Cross Program Action CPA4 of IST was designed to obtain indicators of the New Economy to be exploited by Eurostat. The motivation behind this was identified in the Statistical Indicators for the New Economy (SINE) discussion or guidance paper published by the DG Infso and Eurostat (CEC, 2000f). It outlined key areas for conceptual and statistical research on the New Economy, viz:

- The real characteristics of the digital economy;

- The content and structure of the digital economy;
- The impacts on society, including quality of life issues.

The document proposed that work on indicators should be seen as at the intersection of three areas of policy: technology, socio-economic research and statistics. It suggested that research look at 'the new reality' (p5) from four perspectives:

- Technology Domain
- Industry Domain
- Economy Domain
- Social Domain

These areas in turn related to the policy domains defined by the Lisbon Council. Under each domain a set of preliminary groups of indicators were suggested. The most relevant of these from an ESPON perspective were:

- ICT infrastructure;
- Internet infrastructure
- Internet penetration indicators
- Internet economy indicators

The document pointed out that:

> "..the new economic environment poses huge challenges for statistical measurement instruments and processes. Classical methods need to be adapted and more automatic and intelligent data sources would need to be developed. More rigorous, relevant, reliable, timely, comparable and user-friendly statistics are needed for providing indicators in all domains" (p7).

It is notable that the document makes no explicit mention of territorial issues or the regional problematic. Nevertheless a number of studies were commissioned which addressed regional issues, notably BISER – where regions were the key focus, NEsis – where regions were one focus, and Regional IST – which had a regional focus. A review of the appropriate pages on CORDIS (http://www.cordis.lu/ist/cpt/statistical.htm) showed that other projects under the

Statistical Methods and Indicators were not of immediate interest with respect to ESPON, the exception being SIBIS which we reported on in our FIR. We are keeping a watching brief on SIBIS. SIBIS+ which explores IS indicators in the Accession and Candidate Countries will be of particular interest, albeit that the study adopts only a national perspective. Also of interest is the recent Themis Report carried out by Technopolis Ltd on behalf of the Commission which suggests that Structural Funds are making a significant contribution to promoting the information society (this is covered in more detail in section 3.8 of the report).

We have developed close links with the Benchmarking the Information Society: e-Europe Indicators for European Regions (BISER) and New Economy Statistical Information Society (NEsis) projects. Professor Gillespie who is a member of the 1.2.2 Lead Partner team at CURDS is on a panel of expert advisors to the BISER project, and has commented on a number of their deliverables. Contacts have been maintained with the Work Research Centre in Dublin and with EMPIRICA over the BISER Project. Concerning the NEsis project, Professor Gillespie participated in a workshop in Milan in February 2003 on Regional effects of the new information economy: towards a revision of regional disparities indicators, which was organised by the NEsis project. At the workshop, we presented some early results from the ESPON 1.2.2 project.

BISER is the most interesting project in the area of regional TN&S indicators and data from the perspective of 1.2.2 . BISER's remit is beyond TN&S, but it has a clear TN&S component. We have drawn on the BISER project's indicators as part of the process of constructing our own indicator set. The BISER project has now moved from the indicator construction stage to the stage of operationalising the indicators through two surveys: a population survey and an establishment survey. The household surveys were due to be carried out in February and March 2003, involving almost 20,000 interviews in 28 *selected* regions and to have a specifically regional perspective. Interviewing was expected to finish in March and first results to be available in the course of the summer of 2003. It is unlikely that we will be able to utilise these results in time for our August 2003 report, though we will try, and we would hope to access them for our final report.

NEsis provides a useful review of the availability of indicators and is useful from a conceptual point of view. By and large, however, our association confirms that there is a paucity of data on TN&S at the regional level and that there is a lot of (incomplete) work being done to construct suitable indicators to explore new economy/information society developments.

Digital Europe: e Business and Sustainable Development (DEESD) is another interesting study and is concerned with the IS and social responsibility. One of the DEESD project's three main strands is concerned with 'eBusiness and Sustainable Regional Development'. The project's methodology includes corporate case studies, and some modelling of the European spatial dynamics of ICT-intensive activities. Due to the paucity of regional data, however, this modelling has carried out only at the national level, with some limited exploratory regional analysis undertaken for Italy. Professor Gillespie is one of three expert reviewers appointed to oversee the DEESD project. The project's final deliverables are due in May 2003, and any material relevant to ESPON 1.2.2 will be incorporated in our TIR.

Another IST project with a regional dimension is Best eEurope Practices (BEEP), which aims to construct and disseminate a database of best practice case studies, including those related to regional development in the e-Economy. It has no direct relevance, however, to the ESPON 1.2.2 project (confirmed by Professor Gillespie who is an expert reviewer of the project).

In addition we have been in correspondence with the following projects:

- Key Elements for electronic Local Authorities' Networks (KEeLAN). As the title suggests this project relates to processes of implementing electronic government and establishing best practice in that sphere. It is not of direct relevance to ESPON 1.2.2 but forms a useful context.

- Regional-IST - the aim of the project is to study e-government and e-business implementation in European regions by measuring, monitoring and benchmarking the production, deployment and use of ICT in different contexts.

The project relates to ESPON in that it has a regional dimension, though in practice the subject matter differs. Nevertheless, we will seek to build on initial contacts with the project in order to exchange findings.

Another potentially interesting process with which we are keeping in touch is the "Regional Indicators for Benchmarking the Information Society" which involves a number of regional consortia and which is attempting to define and establish indicators to support Regional Policy actions and to provide a voluntary set of benchmarking tools. This is an extremely interesting process from the point of view of ESPON. We feel, however, that it is unlikely that concrete results, which can be used by ESPON, will be ready in time for our August report or perhaps even for our final report.

We will continue to network with actors involved in this benchmarking process and seek to inform their deliberations using our ESPON findings.

3.7.3 Indicators and data

"Data availability and data comparability is a main concern, as already discussed. IS-related data are scarce and seldom available at the sub-national level".

We agree with this statement, though merely restating the point does not get us beyond the lack of availability or the lack of data comparability which we have reiterated several times. The findings emerging from WP2 merely reinforce this point.

We have adopted the "pragmatic approach" suggested in the response in relation to data and indicators:

First, *"By checking carefully whether other data sources can be identified for the sub-national level, using additional sources".*

- We have reflected on what is meant by additional sources. We have come up with two potential additional sources:

- The first is ICT consultant reports. Unfortunately and as anticipated based on our previous knowledge, however, these focus only on the national level. We have drawn on maps produced by consultants and have analysed these from a territorial perspective.

- Another potential source would be reports produced by or on behalf of European regions, but such studies do not examine the same indicators and do not necessarily adopt similar methodologies, and we do not have access to the data on which they are based. They are not, therefore, comparable. Further, such studies cover a fraction of EU27 plus. Initiatives are in place to begin to overcome these problems. For example, ERIS@ and other consortia of regions are involved in a process exploring benchmarking in the regions, but these processes are unlikely to be completed in time for our August report.

- In effect, focusing on the relatively small number of regional studies available would in our view amount to a case study approach. We are happy to refocus our effort to this end (but cannot also continue our present data chase). However, we are aware that CU and DG Regio has consistently said that this should not be our goal.

Second, by establishing a priority list of indicators (see indicators in bold in Annex 2 to this report). However, whilst concentrating on a smaller, more select, group of indicators may allow for easier comparability, it does not overcome the issue of data availability. As is demonstrated in Annex 3 the same data is not collected in all countries or at the same level in all countries.

"Particular attention has to be paid to the comparability of data".

This is our intention. Figure 21 in our FIR was provided for illustrative purposes only. Again, however, as we have stated several times the key issue is the availability of data.

"The CID index" was produced to show one approach to building models using indicators and data and to make the further point that the concept of the Information Society is complex one involving a number of policy areas. More was not made of CID in our FIR (and will not be made of it subsequently) because (a) it deals only with national differences, and (b) ESPON 1.2.2 is tasked only with TN&S and not with broader IS issues, which we presume will be covered in the Information Society project later in ESPON.

3.7.4 Data access points

We are grateful to the CU DG Region for drawing our attention to the *"major pan-European study"* carried out by EOS Gallup. The contact information was helpful. We did, in fact, mention the study in our FIR report. We found the study in the ISPO archive and had intended to analyse the study in our SIR. We were surprised that the study had not been more widely disseminated.

RISI. The reason that we did not systematically investigate RISI in our FIR (apart from the fact that we had about 6 weeks to write the FIR) was that it is of little relevance to our project in terms of indicators and data gathering. Our understanding is that the ex-post evaluation has not yet been completed, though we are following this up. RISI may provide a wider policy context later in the project. We have contacted the RISI secretariat who point out that the mid-term evaluations took place so long ago that they will shed little light on areas of interest such as the Internet, mobile telephony or broadband. Further, we believe that none of the RISI projects concerned infrastructure development *per se*. We are trying to get hold of on-going evaluations. However, given the data chase which we are engaged in, limited resources will be available for analysis of such documentation. In short, we consider that evaluation of programmes such as RISI are beyond the scope of our project unless there is a clear linkage.

IST in FP5 and SINE are discussed from the perspective of ESPON 1.2.2 in section 3.7.2 (above).

We are in contact with ERIS@ with whom we have close links. They may have useful comments to make on the policy area, though they are unable to help on the data front. They are involved in attempts to draw together regions in order to develop common indicators for benchmarking the information society, but this process is at an early stage. ERIS@ can also provide examples of infrastructure initiatives now underway. However, this again, falls into the 'case study' category which the CU/DG Regio have repeatedly said does not interest them. We will continue to maintain contact with ERIS@.

3.7.5 Policy recommendations

We will bear these comments in mind when submitting our TIR

3.7.6 Further questions

Of course, we recognise the speed of technological change and there is clearly a temporal dimension. This is illustrated, for example, in the FIR figure 14 which provides growth rates for 1995-01 for cellular subscribers. We searched for time series data in WP2 and are exploring the availability of time series data in WP3. However, we face the same problems of data availability at the regional context as reported elsewhere in this report. Even where 'series' such as EOS-Gallup's 'Internet and the Public at Large' do exist the tendency to alter questions between surveys makes direct comparison difficult.

3.8 Review of eEurope process from the perspective of ESPON 1.2.2

3.8.1 Introduction

The following section provides a brief overview on the evolution of eEurope. We focus particularly on the question of indicators and benchmarking which forms an integral part of the eEurope Action Plans. The key point which emerges from our analysis is that: insufficient attention was paid to the regional question in eEurope 2002 Action Plan and eEurope+ 2003. In eEurope 2005 more attention is paid to the regional question, but the benchmarking approach adopted pays insufficient attention to the regions.

From the perspective of ESPON two other problems emerge. First, the process of integrating accession and candidate countries and the Member States into a single process and producing common indicators and data is only in its early stages and thus has not produced common data sources. Second, it is unfortunate that the first results of eEurope 2005 benchmarking will not be available until the end of 2003 or the beginning of 2004.

In short, although the eEurope process is an extremely valuable one, from an ESPON perspective its main utility is in respect of indicator development. It does not help us in the collection or analysis of regional data.

3.8.2 eEurope 2002

Evolution and Key points of eEurope 2002

In March 2000, the Lisbon Council set the objective for the EU to become the most dynamic knowledge based economy in the world by 2010 (CEC, 2000a). It set out ten policy areas where progress needed to be accelerated in order to achieve this ambitious goal. These were:

- European youth in the digital age
- Cheaper Internet access
- Accelerating E-Commerce
- Fast Internet for researchers and students
- Smart cards for secure electronic access
- Risk capital for high-tech SMEs
- eParticipation for the disabled
- Healthcare online
- Intelligent transport
- Government online

Following the Lisbon meeting a document entitled "eEurope 2002 An Information Society for All: Action Plan" (CEC 2000, b) was prepared by the Commission for discussion at Feira European Council. A plan was agreed by the Council. The refined plan was clustered around 3 main objectives:

1 Cheaper, faster, secure Internet

a. Cheaper and faster Internet access (liberalisation, competition, LLU etc.)
b. Faster Internet for researchers and students
c. Secure networks and smart cards

2 Investing in people and skills

a. European youth in the digital age
b. Working in the knowledge-based economy
c. Participation for all in the knowledge-based economy

3 Stimulate the use of the Internet

a. Accelerating e-commerce
b. Government online: electronic access to public services
c. Health online
d. European digital content for global networks
e. Intelligent transport systems

The crucial point about the 2002 Action Plan is that it instigated a common framework to eEurope which could be followed by all Member States (EU 15) and set out what should be done by whom and when. It put forward three main methods for achieving common goals:

- Setting up an appropriate legal environment

- Supporting new infrastructure and services – mainly private sector but some funding support from EU

- Applying the open method of co-ordination and *benchmarking* – it stated that a limited number of targeted eEurope benchmarks would be defined by end of 2000. It also suggested that special specific studies and surveys would be used to supplement existing data (from Eurostat, member states stats offices, industry associations and private consultants).

Regional and territorial perspective of eEurope 2002

There was little explicit mention of regional differences in the Lisbon discussion document though, for those interested in the regional problematic, this could perhaps have been inferred from references to social cohesion and inclusiveness and through mentions of inequalities between member states. The only policy area where sub-national territorial differences were explicitly mentioned was in respect to access to the Internet through PIAPs (Public Internet Access Points) for young people ‘including in less favoured areas’. The 2002 Action Plan did make reference to the territoriality of Europe and to the regional problematic, focusing on less favoured regions. It suggested that:

- “A two speed Europe must be avoided”.

- It is vital that citizens living in remote regions enjoy equal access to the modern communication networks.

- “Ensuring that less-favoured regions can fully participate in the information society is a priority for the Union. Projects encouraging up-take of new technologies must therefore become a key element in regional development agendas. Public investment in information society infrastructure in less favoured regions may be justified in cases of market failures, where private investment alone cannot be profitable. These investments must be made in a way that does not distort competition and is technologically neutral.

> Investment must be determined by each region on the basis of their particular economic and social structure" (p6).

Monitoring and benchmarking eEurope 2002

A number of benchmarking indicators (23) were subsequently developed, as part of the 'open method of coordination' and presented in a note from the French Presidency (CEC, 2000e). From the perspective of ESPON the indicators developed under the "Cheaper, Faster Internet" heading, relating to use of the Internet are of most relevance.

It is noteworthy, however, that in spite of the eEurope 2002's (admittedly limited) rehearsal of the regional question the benchmarking indicators developed relate only to the national level. This is understandable to some extent as the process of harmonising the approaches of national statistical institutes and building on existing data sources, which themselves had no or only limited regional focus, was a priority. Nevertheless, it is unfortunate that, from an ESPON perspective no regional benchmarking was undertaken.

The report "eEurope 2002: Impacts and Priorities" (CEC, 2001a) reported on progress towards eEurope. This report mentions the regional issue, but in a rather unfocused way. It raises the possibility of a growing divide between regions but does not suggest monitoring such divides through the development and application of benchmark indicators. It does suggest, however, that all regional plans should include an information society plan.

The extent of the problem of developing indicators and harmonising national data sources, referred to above, becomes apparent in the eEurope Benchmarking Report (CEC, 2002e). The report draws on a number of sources and reports – e.g., Eurobarometer, OECD, Teligen. It notes that "*Ideally, the complete and harmonised data would have been provided by the National Statistical Authorities. However, this was not possible in the time available*" (italics added). We highlight this point to illustrate that as late as February 2002 (20 months after the Feira Council) harmonised data could not be collated on information society issues at the **national** level, even for

EU15. This puts into perspective the problems faced by ESPON 1.2.2 when seeking comparable regional data for EU 27 plus 2.

3.8.3 eEurope+ 2003

Evolution and key points of eEurope+ 2003

The Joint High Level Committee (JHC) on Information Society was formed after the third EU/CEEC Information Society Forum to make recommendations to the European Ministerial Conference in Warsaw in May 2000. At that conference the CEEC countries recognised the strategic goal set by the EU-15 in Lisbon and "agreed to embrace the challenge set by the EU member countries with eEurope by deciding to launch an "eEurope-like Action Plan" by and for the Candidate Countries. In February 2001, the European Commission invited Cyprus, Malta and Turkey to join the other candidate countries in defining this common Action Plan.

The eEurope Action Plan 2003+ was launched by the Prime Ministers of the Candidate Countries at the Göteborg European Summit on 15-16 June 2001. This parallel action was intended to allow players in the EU and the Candidate Countries to co-operate, exchange experiences and best practice.

In order to facilitate comparison and exchange of information not only amongst the Candidate Countries but also with the EU Member States, actions were clustered around the same three main objectives identified in eEurope 2002 and the same indicators selected by EU 15 under the eEurope 2002 were adopted for monitoring and benchmarking progress. "As far as possible", the relevant institutions of the Candidate Countries (notably the statistical offices) were to work closely with those of the EU Member States with the aim to develop a common methodology and approach in the collection and presentation of relevant benchmarks. In recognition of the different levels of technological and regulatory development, however, eEurope+ added an additional objective to those set out in the eAction Plan (cheaper, faster, secure Internet; investing in people and skills; stimulate the use of the Internet), namely to "accelerate the putting in place of the basic building blocks for the Information Society". This has two components; (a) accelerate the provision of affordable communication services for all, and (b) transpose and implement the acquis relevant to the Information Society (see eEurope+ 2003 Action Plan, p2).

Regional and territorial perspective of eEurope 2002

There is only limited reference to the regional perspective in eEurope+ 2003, but of particular relevance to ESPON is the statement in eEurope+ 2003 (under cheaper, faster internet access) that, "Infrastructure roll-out needs to be speeded up in the Candidate Countries in order to provide the basic backbone for the Information Society, *especially in less favoured regions*. Projects encouraging less-favoured regions are a key element in cases of market failures, where private investment alone cannot be profitable" (p8, italics added). As is pointed out below, however, only national benchmarking has taken place.

Monitoring and benchmarking eEurope 2003+

The implementation of the eEurope+ actions plan is based on a common set of actions contained in national eStrategy Plans in each CC and is also linked to eEurope 2002 in order to ensure a broader European relevance. Funding was provided to carry out extensive surveys on agreed indicators. These surveys were expected to produce their first results towards the end of 2002. They have not as yet materialised (see below).

A Statistical Working Group (SWG), made up of experts from the relevant national statistical offices and technical ministries of the candidate countries, was created to oversee collection and interpretation of data coming in from the candidate countries. This Group, also supported by Eurostat and researchers from the EC's Joint Research Centre, reports directly to the JHC (First Progress Report on eEurope+ 2003, p8).

In June 2002 the first Progress Report on eEurope+ 2003 was published. Although a useful document in general terms in setting out processes and problems, this document is of limited utility to ESPON 1.2.2 in terms of accessing data. A limited set of data is presented and only some of that data comes from the countries themselves, as opposed to data from sources, such as ITU, to which we already have access. No regional data is presented.

Of particular interest from the perspective of ESPON 1.2.2 is the following statement which reflects on the difficulties faced during the monitoring and benchmarking process of eEurope 2003+.

> "The collection of data for Information Society indicators and the application of an agreed methodology of collection and analysis is a challenge worldwide. National statistical offices are struggling to develop and validate the methodologies and elaborate the necessary data collection tools. In the case of the candidate countries, this is no exception: relatively little data is available either in the public sector or in the private sector (e.g., as a result of commercial surveys), methodologies are largely not available or untested, and analysis remains a complex matter…The objective is to have reasonably consistent data set at the time of presentation of the last eEurope+ report, towards the end of 2003" (eEurope+2003, Progress Report June 2002, pps 8 + 9).

The progress report concludes that there is "…the need for increased capacity of national statistics offices and research insitutions to enable adequate measuring and analysing of the Information Society indicators as input to policy development" (eEurope+2003, Progress Report June 2002, p37)

Our follow up enquiries with the Commission (passages within quotation marks in the following bullets are extracted from correspondence with the Commission unless otherwise stated) suggest that these concerns were justified. From the perspective and goals of ESPON 1.2.2 the following points are the most relevant.[3]

- The benchmarking process in eEurope 2003+ continues to utilise benchmarking indicators in line with eEurope 2002. It is intended to integrate the Accession Countries (and the remaining Candidate Countries?) with eEurope 2005 during the year 2004.

- The data is collected by National Statistical Insitutes in each country "using a variety and combination of methods". "Each country has undertaken its own methodology for data collection". We have not been able to establish how comparable or compatible that data is.

[3] Our correspondence is continuing and we still awaiting clarification and amplification on some points.

- “The only data available is that presented in the [first] Progress Report” and “no specific statistical reports were made available from the candidate countries”. As indicated above this of extremely limited utility for our project.

- The First Progress Reports suggests that “extensive surveys of agreed indicators” were expected to produce their first results towards the end of 2002 (see First Progress Report), but these are now expected to be available in mid-July 2003. Data collection has been delayed. If the new deadline is met and the results are made available then we may be able to include these in our TIR though we anticipate that the data will only be at the national level.

- The difficulties of obtaining data in order to benchmark progress was highlighted in the First Progress Report which stated that “In a number of cases and for a variety of reasons it has not always been possible to obtain relevant data. However, work is underway to obtain this data in time for the next report (p8)”. This data is to be collected by an external contractor on the basis of “at least 4 specific surveys”. The appointment of external contractors suggests that the prospects of obtaining comparable and useable data from all the accession and candidate countries through its NSIs has proved problematic, even for national level data.

- As of late February 2003 the contractors had not been appointed and the question of how many eEurope 2005 indicators were to be included in the surveys had not yet been decided.

- No data has been collected to explore the regional dimension of eEurope+ 2003. This situation is comparable with eEurope 2002 where no regional data was collected. The First Progress Report does allude to territorial differences within states, *viz*: “In some countries the penetration rates for fixed telephone services are distorted by differences in penetration between urban and rural areas. There are many rural areas, small towns and villages where there is no telecommunications service at all but larger towns and cities have almost

100% penetration on new digital exchanges" (eEurope+2003, Progress Report June 2002, pps p16). This statement is, however, based on '*qualitative* data submitted by candidate country representatives'. We have not been able to find quantitative data to support this statement, though we do not doubt its accuracy.

3.8.4 eEurope 2005

Evolution and key points of eEurope 2005

In May 2002 "eEurope 2005: An information society for all" was presented in view of the Sevilla European Council (eEurope Action Plan, 2005). The objective of the new Action Plan was "to provide a favourable environment for private investment and for the creation of new jobs, to boost productivity, to modernise public services, and to give everyone the opportunity to participate in the global information society. eEurope 2005 therefore **aims to stimulate secure services, applications and content based on widely available broadband infrastructures** (p2, emphasis in original)."

The plan insisted that generally, investment should be left to the market, but admitted that "there is a problem: funding more advanced multimedia services depends on the availability of broadband for these service (sic) to run on, while funding broadband infrastructure depends on the availability of new services to use it (p2)". A two-fold (and mutually reinforcing) set of actions is suggested in response to this problem – stimulate services, applications and contents and address underlying broadband infrastructure and security matters.

Monitoring and Benchmarking eEurope 2005

The question of benchmarking again emerged. The plan stated that to improve the quality (of statistics), "measurement of eEurope 2005 indicators should make greater use of official statistics from the National Statistical Institutes and Eurostat. To allow for regular and comparable data collection in Member States, a legal base is needed for information society statistics. The Commission will propose this legal base before end 2002" (p20).

- By the end of 2002 the Council will adopt a list of indicators and a methodology for the benchmarking exercise.

- By the beginning 2003, the Commission will publish an evaluation of the eEurope action plan.

- The Commission will carry out benchmarking, will publish an interim report early in 2004, and regularly update the benchmarking data on the eEurope web site.

The list of benchmarking indicators was published in November 2002 (see table 3.2. below). From 2004 onwards, i.e., after the end of eEurope+, the new indicator list will also serve as a basis in the Accession Countries (and Candidate Countries). At the time of writing, however, we have not been able to trace the evaluation referred to above.

Regional and territorial perspective of eEurope 2005

The eEurope 2005 Action Plan again places greatest emphasis on competition. It recognises, however, that in respect of Broadband access in less favoured regions:

> "Member States, in co-operation with the Commission, should support, where necessary, deployment in less favoured areas, and where possible may use structural funds and/or financial incentives (without prejudice to competition rules). Particular attention should be paid to outermost regions."(p17).

Although the regional question is grasped, therefore, the situation regarding benchmarking is less clear. On benchmarking and indicators the document notes (p19) "*Where appropriate,* regional indicators will be developed" (p19, italics added). It would appear from our analysis of the benchmarking process, confirmed by correspondence with the Commission, that only two sets of indicators are to be applied at the sub-national level (see table 3.2.) and the only differentiation taken into account is that between Objective 1 and non-Objective 1 regions. It is particularly strange that no regional benchmarking is included in the process in respect to broadband, given that this is the area which the Action Plan suggests is crucial for the development of less favoured regions.

At the same time the eEurope 2005 Action Plan states that “the Commission and Member States will encourage the development of regional benchmarking, especially with less developed regions in relation to the development of national and regional information society strategies” (p20).

Table 3.2: Indicators for benchmarking eEurope Action Plan 2005

	Broad Indicator	Source	Date of 1st Deliverable	Regional coverage reference
Internet Indicators	A: Citizens' access to and use of the Internet	Eurostat/NSI household survey	October 2003 (ref period 1st quarter 2003)	Objective 1 and non-Objective 1
	B: Enterprises' access to and use of ICTs	Eurostat/NSI ICT Enterprise Survey	October 2003 (ref period 1st quarter 2003)	Objective 1 and non-Objective 1
	C: Internet Access Costs	Commission Study and OECD for non-EU comparison	October 2003 (ref period 1st quarter 2003)	None
Modern online public services	D: e-government	Commission study in co-operation with Member States	October 2003 (ref period 1st quarter 2003)	None
	E: e-learning	Commission study, Eurostat/NSI household/enterprise survey	October 2003 (ref period 1st quarter 2003)	None
	F: e-health	New Survey, eurostat/NSI household survey	October 2003 (ref period 1st quarter 2003)	None
A dynamic e-business environment	G: Buying and selling on-line	Eurostat/NSI enterprise survey/household survey	October 2003 (ref period 1st quarter 2003)	None
	H: e-business readiness	Eurostat/NSI enterprise survey	Pilot study 2003 – an e-business index (composite indicator to be defined in 2003).	None
A secure information infrastructure	I: Internet users' experience and usage regarding ICT security	Eurostat/NSI ICT household/enterprise survey	October 2003 (ref period 1st quarter 2003)	None
Broadband	J: Broadband penetration	Commission study/Eurostat/NSI ICT household/enterprise survey	October 2003 (ref period 1st quarter 2003)	None

Source: Communication from the Commission to the Council and the European Parliament eEurope 2005: Benchmarking Indicators (Brussels 21.11.2002, COM (2002) 655 final.

The importance of broadband is stated even more strongly in a recent Communication from the Commission "Electronic Communications: the Road to the Knowledge Economy" (CEC, 2003, pp 6-10). Again competition is seen as the main tool for accelerating the pace of change. Again, however, it is recognised that in many rural and remote regions, geographical isolation and low density of population can make the cost of upgrading telephone lines to broadband capability unsustainable. Here it is suggested:

> “..the Structural Funds can be used to increase infrastructure availability….[and suggests that]…As the mid-term review of Structural Programs will take place in 2003, this would provide an opportunity for Member States to give greater emphasis to this priority on the basis of an assessment of the regional needs” (p7).

As can be seen, then, the regional problematic in relation to the information society in general and telecommunications networks and services in particular has moved up the agenda as the eEurope process has evolved. The regional benchmarking mechanisms remain narrowly focused in terms of indicators and also in terms of territories which they seek to cover, namely Objective 1 versus the rest. We suggest in our preliminary policy recommendations section that, in some respects, there may be a need to introduce a more fine-grained approach when exploring territorial differences in TN&S. In the case of broadband roll-out, for example, significant territorial disparities may occur within regions, including regions which are currently designated Objective 2 regions and even in some regions which are not currently covered by ERDF.

One recent study which has thrown light on information society developments at the regional level, the Themis Report, undertaken on behalf of DG Regio, suggests that Structural Funds are increasingly being used to promote the Information Society in the regions. The study estimates that between 2000 and 2006 some €10 billion, amounting to 7.3% of the Structural Funds, will go to measures in this field. This represents an increase from 2% in the period 1994-1999. The increase may be due, in part at least, to the recent clarification by the Commission that public support for broadband and mobile telephony infrastructures is possible without breaking competition rules (Barrier, 2003).

The study compared data [4] from 150 regional and three national programmes supported by European funds. It suggests that attitudes to the information society vary across regions (and across countries), with, for example, Lower Saxony devoting only 0.6 Euro per inhabitant to the IS, whilst in the Border, Midlands and West Region of Ireland as much as 358 Euro per inhabitant was spent (or rather planned to be spent). This may, of course, reflect the fact that other forms of infrastructure (roads, transport

[4] It should be noted that the study analysed prospective plans and not actual spend.

etc.) have also been starved of investment, whilst in places such as Ireland large amounts of structural funds and other investment have already modernised these traditional basic infrastructures. The study concluded that without the necessary hardware investments, the realisation of the objectives set at Lisbon will be slowed down. The other key findings of the study were:

- about half of the regions, of which a high proportion are Objective 1 regions, give priority to the information society which is a dimension that is taken into account across the entire programme;

- in some cases cities are the key players, as in Spain for example, where a digital city concept has been developed ("Infoville");

- the scale and ambition of regional programmes promoting the information society is determined by a variety of factors, such as the degree of maturity of the market, population density, availability of skills and planning capacity;

- amongst the top 20 regions, ranked according to information society expenditure per capita, six are Greek, four UK and two Spanish. Seven are island regions or regions with a mainly insular character.

The study recommends the following improvements:

- regions should invest more in strategy development and building regional capacity, especially in the assessment of regional needs and project selection;

- regional information society priorities should be driven by regional demand and supply-side measures, and should offer a balance in terms of the development of telecommunications infrastructure (e.g. broadband networks), access, applications and services, digital content and skills;

- *specific indicators and data should be developed, especially at regional level, in order to monitor progress in terms of bridging the "digital divide" within and between regions*

We have highlighted the final bullet to underscore both the importance and the lack of progress in developing indicators to explore the regional dimension of the Information Society. As is reported above, efforts are underway to try to rectify the situation. A number of organisations are involved in this process, both under IST and other funding mechanisms. It is to be hoped that the various projects are being coordinated in a manner which will ensure that results are consistent and are disseminated widely to potential users. An ongoing process of collaboration between ESPON 1.2.2 and these other studies is in train.

3.9 Updated information on preliminary results for 3rd Interim Report

This section sets out an outline of what we would hope to deliver in out August 2003 report. We cannot, however, say exactly what will be produced as we are dependent on the cooperation of other actors, not least of all the Commission, to provide us with data which is not in the public domain.

It is anticipated that the 3rd Interim Report of project 1.2.2 will have a number of components.

3.9.1. Further Elaboration of European Level Data

To date we have collected two types of data at the European level – demand side data and supply-side data. On the demand side our aim would be to produce fresh data and further analysis. This, however, largely depends on the Commission. There are three potential sources:

- We would hope that we will be able to carry out further detailed analysis on the demand side data behind the 1999 EOS/Gallup Report, based on meso-level data which we believe to be available. It was hoped to carry out analysis of that data for the SIR but we have not received the data despite repeated requests

- We would hope to have access to the EOS/Gallup study carried out in 2002 commissioned by DG Infso. Access to this would allow us to draw a relatively up-to-date picture (2002) of up-take and use of ICTs at the NUTS 2 level. Access to background data would allow us to carry out further analysis, time and resources permitting. This, as we have mentioned before, is *the* key document if we are to produce a recent 'snapshot' of the situation in Europe, as it covers recent technologies such as the Internet and Broadband, albeit only at EU 15. We have drawn this to the attention of DG Regio and the CU but are not aware of any progress having been made in gaining access to this data.

- We would hope to gain access to the relevant report from the eEurope Action Plan Benchmarking exercise. This will not have such comprehensive regional coverage as the study referred to above, but will distinguish between Objective 1 and non-Objective 1 regions. Our understanding is that this report will not be published until October 2003. If useable data could be made available earlier, however, we could carry out some analysis, time and resources permitting, which would be useful for ESPON. Again the benchmarking process covers only EU 15.

Another potential source of partial, but probably representative, demand data on the situation in EU 15, is the BISER study. We will attempt to gain access to this data, but the reporting period – Summer of 2003 – may make this difficult.

The data we have collected on the *supply side* will allow us to undertake modelling exercises – for example, gravity models – that will allow us to assess the relative presence of certain networks in cities in Europe, relating these findings to their socio-economic, demographic and geographical characteristics. We will continue to try and obtain further data from telcos, but issues to do with commercial sensitivity are likely to make this difficult.

3.9.2 Elaboration of National Data

The second component will use data collected at the national level. That data will be mapped and modelled, again taking particular account of the concepts being elaborated by ESPON. The success of this exercise will depend on the availability of data. Our research to date tells us that comparable data at a sub-national level will not be available for EU 27 plus 2. Our findings to date suggest that data collected at the regional level is generally partial and that there it is patchy coverage across EU 27 plus. Not only is this clear from our own efforts to track down data from national agencies, it is clear from the efforts of other organisations. This was made clear in our FIR and is confirmed by the analysis presented in 3.4 and 3.8 (in particular of this study).

Given the accelerated timetable imposed on us – results for August 2003, there is clearly an issue as to how the amount of time we spend on data collection and time spent on data analysis. The trade off is this. We either spend a huge amount of time and resources trying to track down comparable data for 29 countries at NUTS II and III levels, leaving little time for analysis. OR we use the data which we have collected to date (or by some agreed end point – say end April 2003) and then subject it to detailed modelling, analysis, typology constrictions and mapping drawing out lessons which can be applied widely.

Some of the problems we currently face, on the demand side, can be seen by examining the tables in Annex 3 which contrast the data availability in two countries (this does not take into account the difficulties obtaining a response from some countries). As we can see, the availability of data for the various NUTS levels is vastly superior in Finland compared to Hungary. For Finland, there is a possibility of obtaining data on our first set of indicators, the development of TN&S, down to the NUTS 5 level, and for up-take and use of TN&S perhaps as far as NUTS 3. By contrast, for Hungary, there are even some indicators for which it is likely that we will be unable to find national level data (NUTS 1 in Hungary). Certainly, for the majority of indicators, it is unlikely we will obtain any data below the NUTS 1 level.

The two tables, then, highlight the difficulty of our task in obtaining sub-national data on TN&S down to the NUTS 5 level for 29 countries. We face also the problem of ensuring a significant degree of comparability across all data for all countries, which is made harder by cross-national differences in NUTS levels (whilst NUTS 1 in Finland and Hungary relates to the national level, this is not the case in other countries such as the UK and France).

The Finnish table is supplemented by a number of notes qualifying the estimations of data availability, in particular relating to 'probably available' data. Many of these notes would be equally relevant for the Hungarian table too, although for many of the indicators, sub-national Hungarian data is unlikely to be obtainable because it does not exist.

In addition, it is noted that data at the NUTS 2 and NUTS 3 levels for the indicators relating to up-take and use of TN&S is 'probably' available, but that this would have to be purchased from the national statistical agency. This raises a question of the focus and resource utilisation of our project as a whole. We are covering 29 countries in this project. The purchase of important sub-national data for individual countries, when that data is not publicly available by some other means, brings up the question of whether the data to be purchased in different countries would be comparable. Just as importantly, we must ask whether the budget allotted to this project could hope to cover the purchase of significant amounts of data for individual countries if we are attempting coverage of 29 countries. Given our experience of the telecommunications industry sector, it is likely that sub-national data available to be purchased would be quite expensive.

It may be possible to purchase relevant data sets for some of our countries, and reconcentrate our efforts on exploring and comparing the territorialities of TN&S at the sub-national level for a smaller number of countries. This data could also be mapped and modelled, with some resulting in-depth analysis of key trends, which would shed significant light on the territorial development and implications of telecommunications networks and services across Europe. However, a decision would need to be taken as to whether we pursue this route, or whether we continue to focus our efforts and resources on attempting further 'across the board' data collection. Limits on time and budget resources would prevent us from having the capacity to undertake both methodologies in parallel in the short period before the August report, for which our main findings need to be ready.

On the supply side we also face problems. Our experience to date is that telcos do not respond. When they do they are unprepared to release data which they regard as commercially sensitive. We have had some success in using publicly available data to draw out patterns and we may be able to repeat this for *some* individual member states in the next phase.

During the next phase of the study we will liaise with ESPON project 2.1.1, bringing together our date gathering exercise with their modelling expertise, as well as testing our own models. The degree of modelling we will be able to undertake, however, will be constrained if too much resource is utilised in a search for data which we are sure does not exist or that we will not be able to access.

It is anticipated that many of the maps which we produce will be based on data which we will not have direct access to for confidentiality reasons, for example, ADSL roll-out. In such cases we will have to liaise with BBR to explore ways in which we can produce maps which are consistent with those of other partners.

Some common points already seem to be emerging from WP3 which will inform our findings in our TIR. These are:

- That the roll-out of DSL and other technologies shows similar territorial patterns (where state intervention has not occurred), namely focusing in urban areas initially.

- That there is a need to study the roll-out of TN&S at a very fine spatial scale. There may be an inter-regional element to roll-out, but a more important pattern emerges at the intra-regional scale, with the distinction between urban and rural areas being particularly significant.

- That mobile telephony has the potential to radically improve the territorial coverage of ICTs (though we do not yet know whether the same pattern will be true of 3rd Generation Mobile) with topographical features (e.g. mountainous terrain) being the main barrier to penetration.

These points, however, are based on data from a relatively small number of countries where data availability is relatively good.

3.9.3. Elaboration of Policy Conclusions and Recommendations

The third component of the 3rd Interim Report will be policy conclusions and recommendations. This will consider, *inter alia*:

- Whether a more regional and local focus is required amongst statistical agencies, DGs, competent ministries and telecommunications regulators in order to provide better information about the penetration of ICT networks and services and about the regional dimensions of eEurope. We can already say most definitely that this is the case. We will also consider what the appropriate level of data collection and analysis is.

- Whether policy intervention is required in the field of ICT infrastructure and networks in order to facilitate the priorities of the ESDP, Cohesion Policy and a regionally-inflected e-Europe Action Plan.

- What suggestions as to what measures such intervention should involve, who should intervene and at what levels. Crucially, whether structural funds should be used and under what circumstances.

Part 2

Supply and demand in telecommunications networks and services at the European level

Part 2 - Introduction

The section is in two parts. The first part reviews existing data to explore regional patterns in demand for and take up of telecommunications networks and services. The second part reviews existing data exploring differential take up and use of data based on degrees of urbanisation, using a three-fold categorisation – metropolitan, urban and rural.

The territorial distribution of telecommunications networks at the European level is at once a *presupposition*, a *medium* and an *outcome* of complex, intertwined supply and demand-side dynamics. Existing coverage can determine where further supply is needed and whether demand is generated and preserved. It can also be seen as the means by which telecommunications services are supplied and demand is met. In addition, and perhaps most importantly, territorial distribution is a result of investment decisions taken by suppliers based on market demand. This main part of the report highlights, therefore, some of the main facets to the relationships between telecommunications networks and services in Europe and the territorial patterns bound up in the supply of and demand for these networks and services.

The demand side is the focus of chapter 4, where (several) important European surveys are drawn upon and analysed to demonstrate the regional and urban-rural territorial patterns of uptake and use of telecommunications networks and services by households. In chapter 5, we focus on enhancing our understanding of the supply and suppliers of telecommunications networks and services across Europe, and in particular the relationships between these and distinct, but interrelated, notions of territoriality. This is done primarily through detailed discussion and analysis of data on the distribution, coverage and capacity of numerous pan-European telecommunications infrastructures and identification of broad, underlying trends to the territorial strategies of the main providers.

Chapter 4 – Review of Demand Side Data from a Territorial Perspective

4.1 Regional patterns of demand and up-take of telecommunications networks and services.

This section draws heavily on a report published in 2000 by DG Information Society which was based on a survey carried out in 1999. Given the rapid growth of T&NS the study is clearly dated. We reproduce the key findings of the study for two main reasons. First, it represents the only European study which attempts to look at the regional picture for T&NS. Second, it may be able to stand as a benchmark against which to gauge changes in or continuities at the regional level. As mentioned in Part I of the present report, a new survey has been commissioned by DG Infso. This survey was carried out in the late summer of 2002, but the results are not yet available. If we were able to gain access to the study results, in addition to reporting that study, we would be able to carry out some time comparisons at regional level across EU 15. This could only be done, of course, if a similar methodology has been applied and if we are able to access the national level reports on which the results reported at the European level are based.

In 1999 the Information Society Directorate-General of the European Commission (DG Infso) appointed EOS Gallup Europe to carry out two related surveys looking at the situation of telecommunications services in the European Union. Both surveys covered only EU15. One survey examined citizens' up-take and use of telecommunications services. The second survey surveyed SMEs uptake and use. Only the former had a regional component and we, therefore, concentrate on that survey.

The EOS Gallup Europe Residential Survey[5] (CEC 2000d) was carried out in the second half of 1999. This was based on a household interviews of over 44,000 households in 130 regions. At the time the study claimed to be "the largest survey at a European level that has been undertaken in the sector".

[5] For the rest of the present report we will refer to the EOS Gallup Europe Residential Survey as the EOS Survey.

The main aim of the survey was to "systematically collect and present data describing, in particular, the household use of fixed and mobile telephone services and Internet, and to link data with appropriate socio-economic indicators such as household size, income and regional location" (EOS Survey: Forward). The survey looks at the demand and usage side of telecommunications. It covers a number of different aspects: the communications equipment and services used by households, reasons why services were not used, choice of operators and service providers, the year in which recent services such as mobile telephony and Internet were taken up, expenditure patterns and also plans to take up services.

In regional terms analysis was carried out at the NUTS 2 level for all countries save Luxembourg, where it was carried out at NUTS 1. A number of regional maps are presented in the EOS report and some are replicated below. The regional maps are drawn at levels chosen by the Commission during preparation of the EOS report: Nuts 3 in Denmark and Ireland, Nuts 1 in Luxembourg, and Nuts 2 everywhere else. Our report reproduces a number of the key maps from the EOS report. However, we have been hampered from carrying out more detailed analysis because we have not been able to obtain the national level quantitative reports, though we have made several requests to DG Infso.

In addition to the regional component, the EOS survey uses a threefold territorial classification to report findings namely:

1 Metropolitan (the principal centres including at least the capital)
2 Urban (corresponding to secondary towns and urban centres)
3 Rural (corresponding to the smallest localities)

We also report key findings relating to these categories in section 4.2 below.

The EOS survey covers 5 technologies of interest to ESPON 1.2.2:

- Fixed telephone
- Mobile telephone

- Television via cable or satellite
- PC equipment
- Internet access

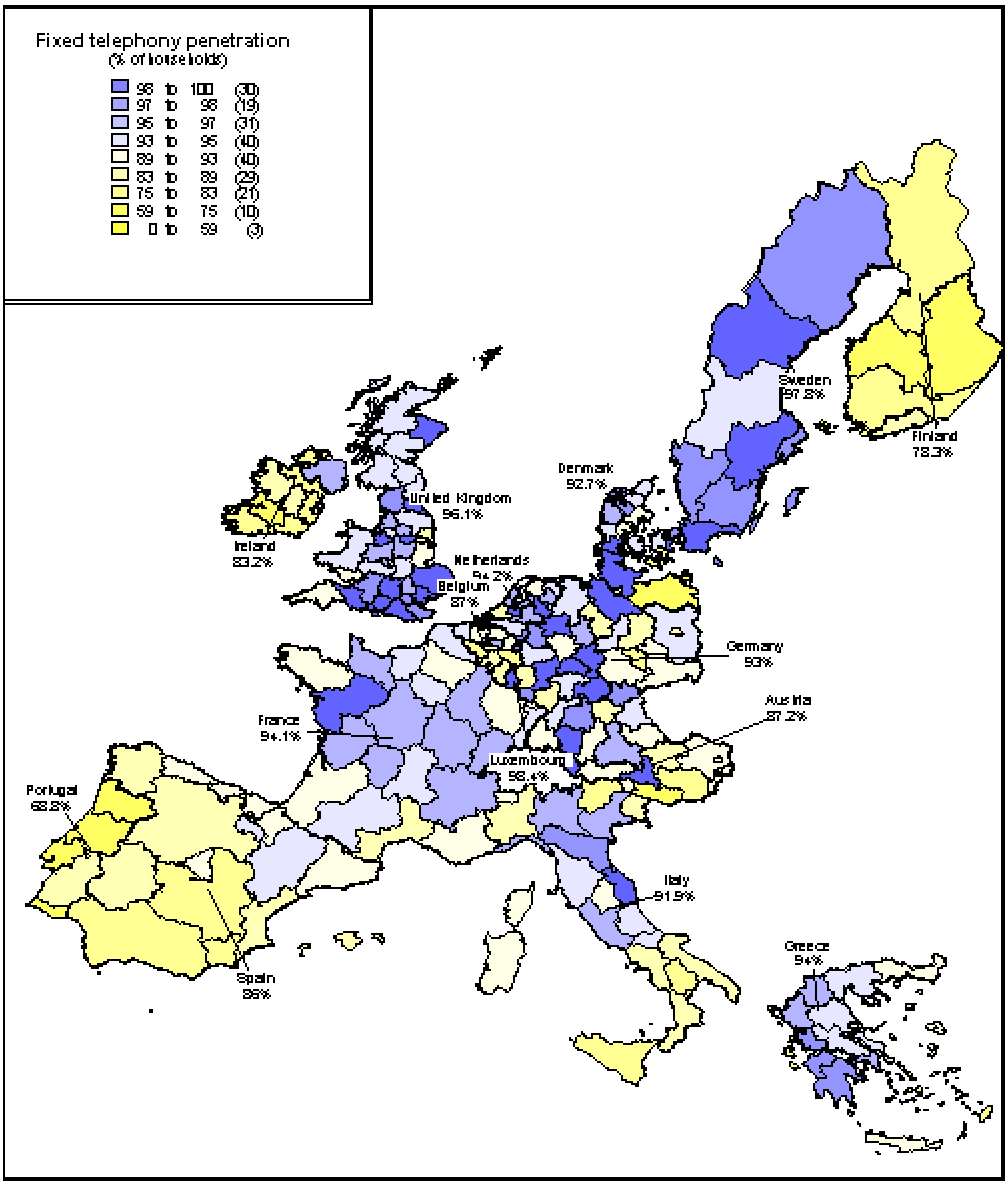
Unfortunately, the EOS report pre-dates the roll-out of broadband technologies. Further, it only captures the relatively early days of Internet adoption. Clearly, the updated study undertaken for DG Infso in 2002 would allow us to paint a more up-to-date picture.

We reproduce the key maps and provide a commentary on each, from an ESPON perspective. Each country's overall % level is indicated in a text label, with Luxembourg's offset on to Switzerland in order not to obscure the neighbouring Lorraine and Ardennes regions. The maps are designed to allow comparison between countries and regions in relation to penetration of a particular technology. Overall levels of penetration differ between technologies, e.g., between fixed telephony and the Internet. The scales used, therefore, vary from map to map, and although the same colours are used to show spatial variations in penetration, they indicate different absolute and proportional differences across maps. So care must be taken when interpreting and comparing maps.

We first look at the situation regarding fixed telephony. Figure 4.1 shows fixed telephone penetration by household. Fixed telephony represents of course a highly mature technology within the European context,[6] and in some countries can be regarded as a genuinely universal service. In most countries, however, universal service (in the sense of household penetration levels approaching 100%) has not been attained, due to income constraints and, in central and eastern Europe, deficiencies in the supply of telephone lines due to decades of under-investment in telecommunications networks.

[6] Though within the world as a whole, as evidenced by the fact that half the world's population have yet to make a phone call.

Figure 4.1: Fixed telephony penetration at regional level (% of households – EU15)



Source: EOS Gallup Survey (CEC 2000d)

From the ESPON perspective, the significance of fixed telephony is that it provides, through dial-up lines, a very basic 'entry point' to the Internet and other information society services. As can be seen in general terms there is a north-south divide in Europe. The core-periphery distinction does not hold for fixed telephone penetration, as all Swedish regions appear in the top three bands as do the UK peripheral regions, and parts of Greece. Three Cohesion peripheral countries (Ireland, Portugal and Spain), however, do show low levels of penetration. Outside the cohesion countries, Finland is the most surprising 'laggard' until it is realised that (as suggested in our first interim report) mobile telephony has begun to replace fixed line telephony.

Without access to the National Quantitative Reports it is difficult to say too much about regional differences within countries[7]. Regional results are banded in the Analytical Report and, it is not possible to say with precision how great actual differences between regions are. On the whole the differences within countries are relatively small (being contained within a small number of bands). We can, however, point to some significant differences across regions within countries, most notably in Germany, Italy, Ireland, Austria and Belgium. These include the not unexpected north-south divide in Italy. Also the west-east divide in Germany, with, for example, pronounced difference between contiguous territories, such as that between Schleswig-Holstein and Mecklenburg-Vorpommern.

Another, not totally unexpected, regional divide is in Ireland where the divide is between Dublin and its hinterland and the rest of Ireland. This may be changing as Ireland has one of the fastest growth rates in fixed telephony in EU15 in the year 2001 (though we cannot say for sure that this evened out the regional divide). Belgium presents a more complex picture with a patchwork effect, but with lower penetration levels in the south of the country. In Austria the key regional difference is between Salzburg and the rest.

Generally speaking these differences 'map onto' differences in GDP/ph. The match is not exact, however, with, for example, parts of Italy with strong GDP/ph – for example Peimonte, Trentino-Alto Adige, and Fruili-Venezia-Gulia – appearing in lower penetration bands. In Austria, the distinction between Salzburg, the NUTS 2 area with the highest GDP outside the capital Vienna, and the rest of Austria could map onto GDP/hd. Further variation within Austria, however, does not. For example, Burgenland which has the lowest level of GDP in Austria, has higher penetration than some other Austrian NUTS 2 regions. In Spain the areas with higher GDP/ph, do have higher fixed telephony penetration rates, but it is Aragon and La Rioja rather than those regions with the highest levels of GDP/per head – Madrid and Navarra – that have the highest levels of penetration.

[7] To quote the EOS Gallup Report (CEC 2000d) section 1.2.1.1 'regional percentages are so numerous that they would have made the maps illegible'.

The EOS report also seeks to show levels of competition for fixed telephony in the regions. To do so the survey featured a question aimed at determining whether households obtained their fixed telephony service exclusively from the existing telecommunications supplier in that country/region, i.e., the incumbent, from traditional suppliers *and* other suppliers or, exclusively from a competitor. As shown in Figure 4.2, again there is a significant 'national effect'. A number of factors are likely to account for this:

- The regulatory environment, both in terms of regulation and enforcement
- The cost of market entry (partly based on the availability of pre-existing networks, for example those belonging to utility companies)
- Levels of competition from alternative technologies, particularly cable

The EU average for households exclusively served by the incumbent was 91 per cent. All bar four of the member states had exclusive incumbent levels above this average. The exceptions to this were (from lowest to highest levels of incumbent inclusive, % in brackets) Sweden (73%), UK (81%), Denmark (86%) and Germany (90%).[8] To represent the regional variations penetration of fixed telephony competitors, the EOS report authors chose to favour the total penetration rate of 'competitors', that is to say: the addition of the percentage of households having as suppliers a 'competitor' only, and the percentage of households having as suppliers both a traditional operator and a competitor.

- Sweden had by far the highest levels of dual provision, with only 73 per cent of households remaining with the incumbent alone. Sweden also has the most regionally uniform penetration of competitors, with the capital region of Stockholm and Vastverige above the norm.

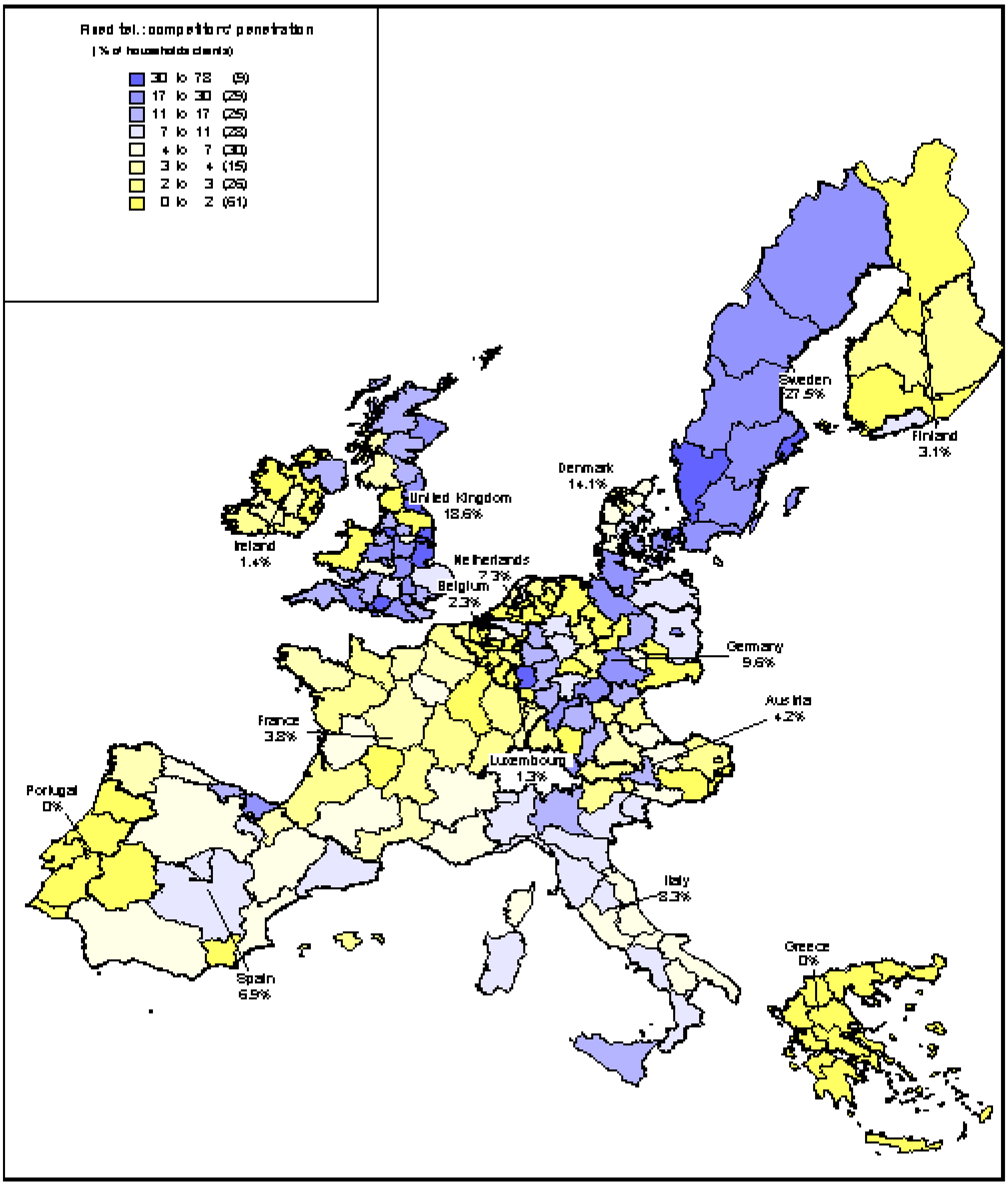
- In the UK the distinction is chiefly an urban-rural one, though some 'deep' rural areas.

[8] This situation is likely to have changed to some extent in most countries, though the incumbent generally remains the core provider of fixed telephony to the home.

- In the case of Denmark competition is concentrated in the south east of country around Copenhagen.

- In Germany, competition appears to be concentrated in urban areas, though NUTS 2 level makes detailed analysis, without background data, problematic. There are concentrations of competition in Schleswig-Holstein, Hamburg and the northern segment of Niedersachsen (around Bremen, but not in the rural west of the Länd), in the Rhineland as far south as Stuttgart and eastern Sachsen-Anhalt. Bayern seems largely to be untouched by competition.

Figure 4.2: Fixed telephone: competitor penetration (% of households)



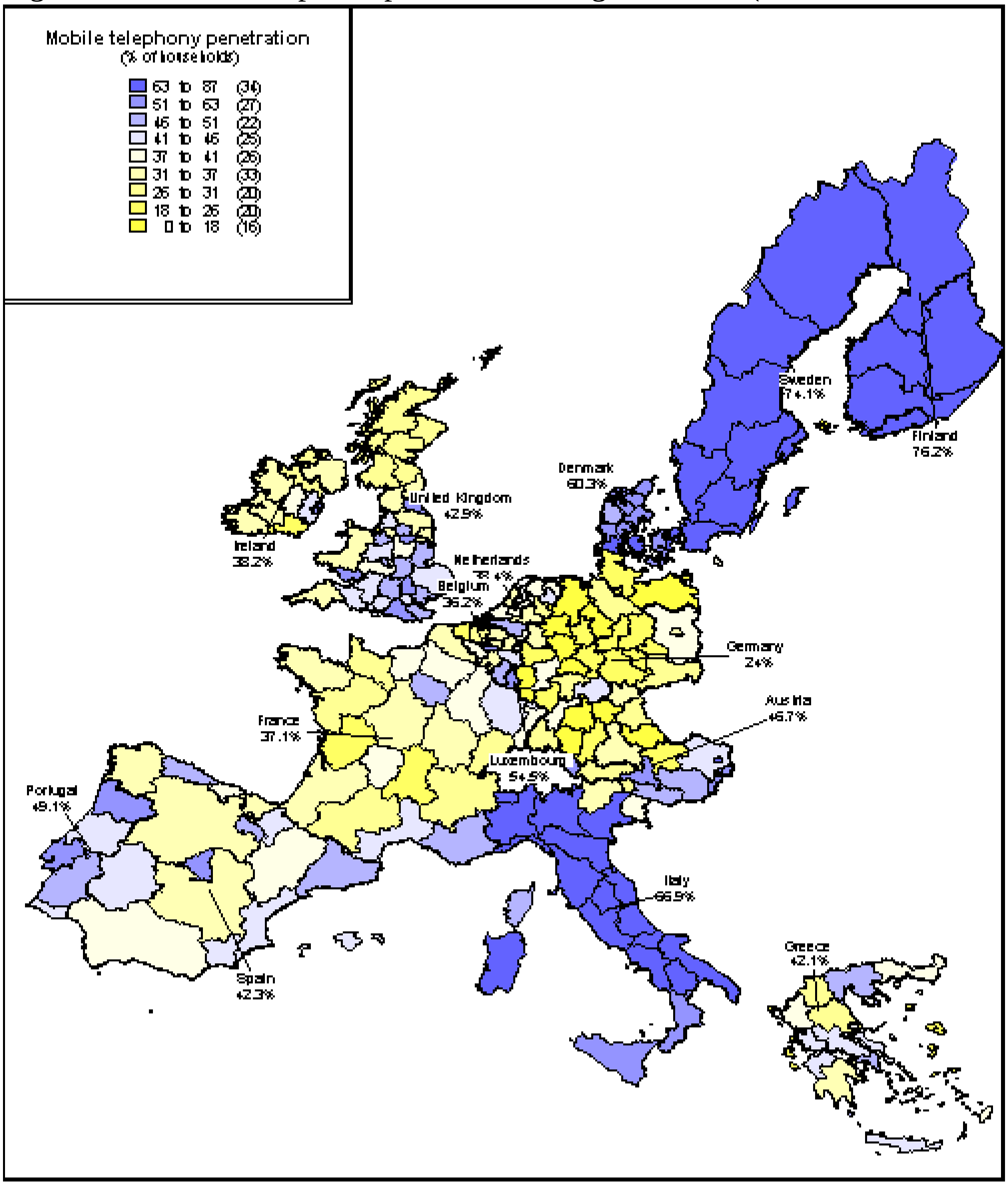
Source: EOS Gallup (CEC 2000d)

Turning to mobile telephony, figure 4.3 depicts the average penetration rates of mobile phones in EU 15 regions. It should be noted that this figure represents a relatively early stage in the roll-out of mobile phones. In some respects the map illustrates different roll-out strategies from country to country. The total picture will clearly have changed since 1999, with much greater levels of penetration and we suspect that there will have been a regional 'catch-up', with a more uniform roll-out across regions. Access to the up-dated DG Infso survey would allow us to determine whether our assumptions are correct. Certainly at the national level, our first interim report pointed to a 'closing of the gap', with high rates of mobile growth. We reproduce as figure 4.4 the map showing cellular subscriber growth rates for the convenience of readers. This map first appeared in from our First Interim Report.[9]

Figure 4.3 demonstrates a clear 'national effect', that is to say there are clear differences between member states, with certain countries leading the way in mobile penetration, notably the northern 'periphery'. All of the regions of Sweden and Finland, (both with national penetration rates of around 75 per cent), appear in the highest band, with penetration levels of over 63 per cent. All of the regions of Italy (except for Sicily and Calabria) also appears in this band. These countries are followed by Denmark and Luxembourg.

[9] See Figure 14 in ESPON 1.2.2 First Interim Report, October 2002

Figure 4.3: Mobile telephone penetration at regional level (% of households – EU 15)



Source: EOS Gallup (CEC 2000d)

There then follows a mid-group which includes the UK and Austria, but also Portugal, Spain and Greece, which suggests that mobile telephony may be presenting opportunities for catch up, as was suggested in respect of candidate and access countries in our first interim report. By contrast France and Belgium and particularly Germany have relatively low levels of penetration rates. With the exception of a few 'hot spots' there is little regional variation within these latter states.

Patterns of regional differentiation are complex[10]. One common pattern is for capital city regions to appear in the highest bands in their respective countries which was not always so with respect to fixed telephony penetration (see for example Madrid and Paris in figure 4.1). This fits expected patterns of early roll-out of new telecommunications technologies.

The Nordic periphery shows little if any regional differentiation. The strong distinctions in Italy are much less clear than in fixed telephony, though as noted above Calabria and Sicily do show lower levels of penetration. By contrast the UK demonstrates a clear 'core-periphery' divide, with high penetration in the south and most of urban England and Wales, but low coverage in northern England and the 'celtic periphery'. Coverage in Austria is more or less uniform apart from in the Tirol area. This is likely to be a function of the landscape rather than GDP/ph.

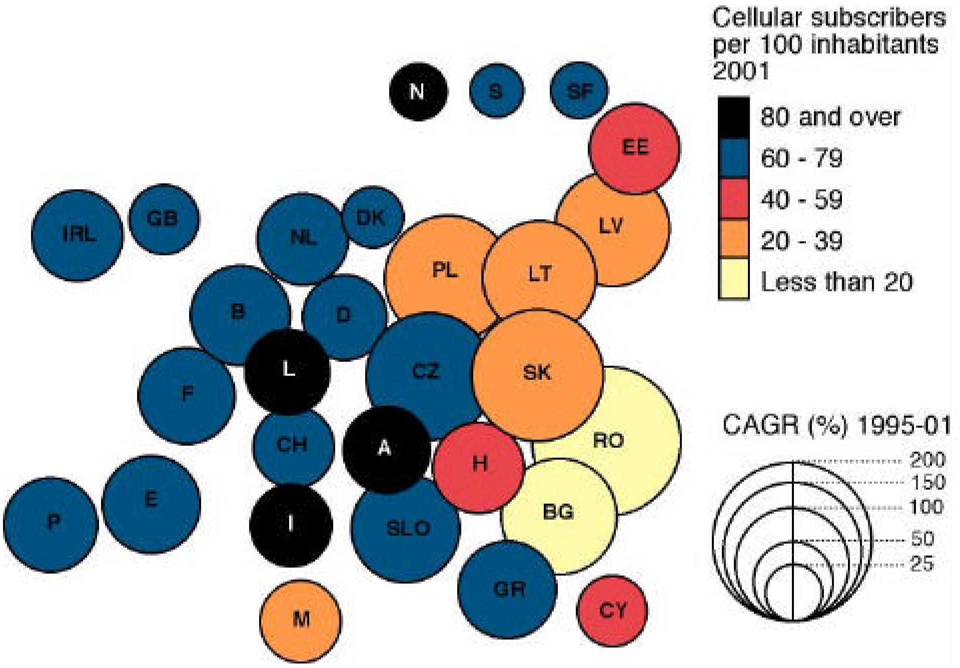
Another interesting point is the proportionately high take up of mobile in some, though not all, regions which are rural and/or less prosperous in the context of their national economies. Languedoc Roussillon in France, Extremadura in Spain and Kentriki in Greece are cases in point. It is also notable that the regions we highlighted in Austria as having relatively low fixed telephony penetration had relatively high take up of mobile in the early years of roll-out.

The regional picture in figure 4.3 is complex and varies across member states. As would be anticipated with a relatively new telecommunications technology the capital city and urban areas tend to attract early investment. There are also signs, in some countries at least, that mobile is being adopted rather quickly in areas which hitherto have had relatively low penetration rates in respect of fixed telephony. Figure 4.2 presents a 'snapshot' only. The picture will undoubtedly have changed since the survey was undertaken in 1999. Figure 4.4 (originally produced as Figure 14 in our FIR) for example shows that there was a large increase in mobile penetration between 1995 and 2001 and that some of the highest rates of growth were in accession and candidate countries. The latest ITU figures confirm that growth is continuing (ITU Yearbook, 2003). Figure 4.4, of course, only reflects the national situation. We need

[10] It should be recalled that figure 2 covers a wider scale than figure 1, so that slighter colour differences cover larger differences.

up-to-date data for the regions. It will also be interesting to see if a similar roll-out pattern emerges in respect of 3G mobile technology, which will permit access to the Internet.

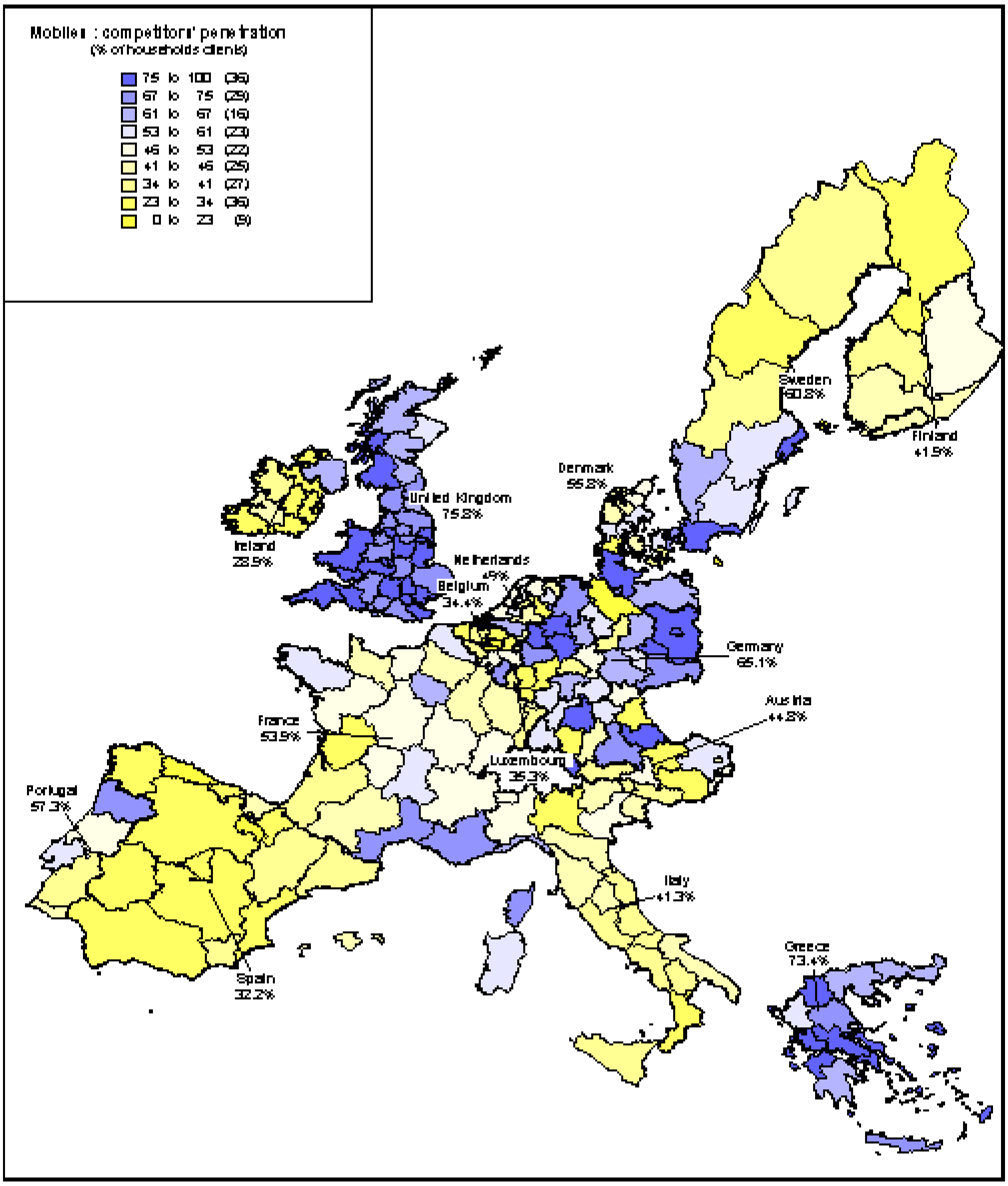
Figure 4.4: Cellular subscribers per 100 inhabitants 2001



Source: Data abstracted from ITU World Telecommunications Indicators 2001, Mapping by CURDS (originally produced as figure 14 in ESPON 1.2.2 FIR)

Competition in mobile telephony is much more pronounced than in fixed telephony in all EU 15 countries, even in 1999, though with significant variation across the Union. Ireland exhibited least competition with only 25 per cent of households using exclusively a competitor to the incumbent. This contrasts with the UK where 70 per cent of households were in that position. Levels of mobile competition are generally low in the Iberian peninsula and in Italy, though are appreciably higher in Greece. It is difficult to discern any link between level of penetration (see figure 4.3) and levels of competition. Regionally, there appears little variation in competition, implying that the competing mobile operators have rolled out networks which cover the national territory (at least at this broad regional scale).

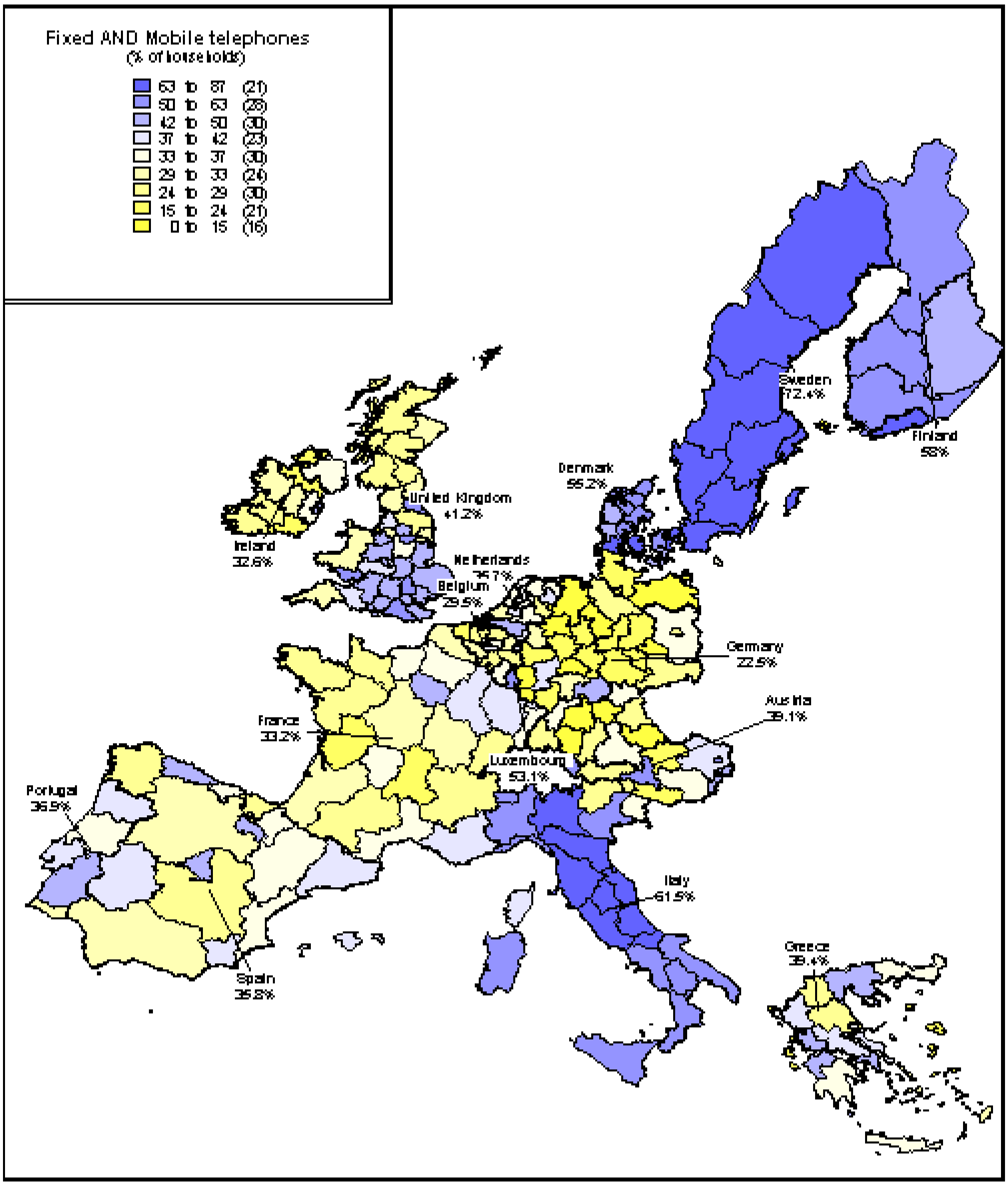
Figure 4.5: Mobile Telephone: competitors penetration (% of households clients)



Source: EOS Gallup (CEC 2000d)

Figure 4.5 shows the proportion of households with both fixed and mobile telephones at regional level. The pattern is only marginally different to figure 4.3, which is not surprising. The highest levels of household uptake of both forms of telephony are found, with Scandinavia countries and in Italy.

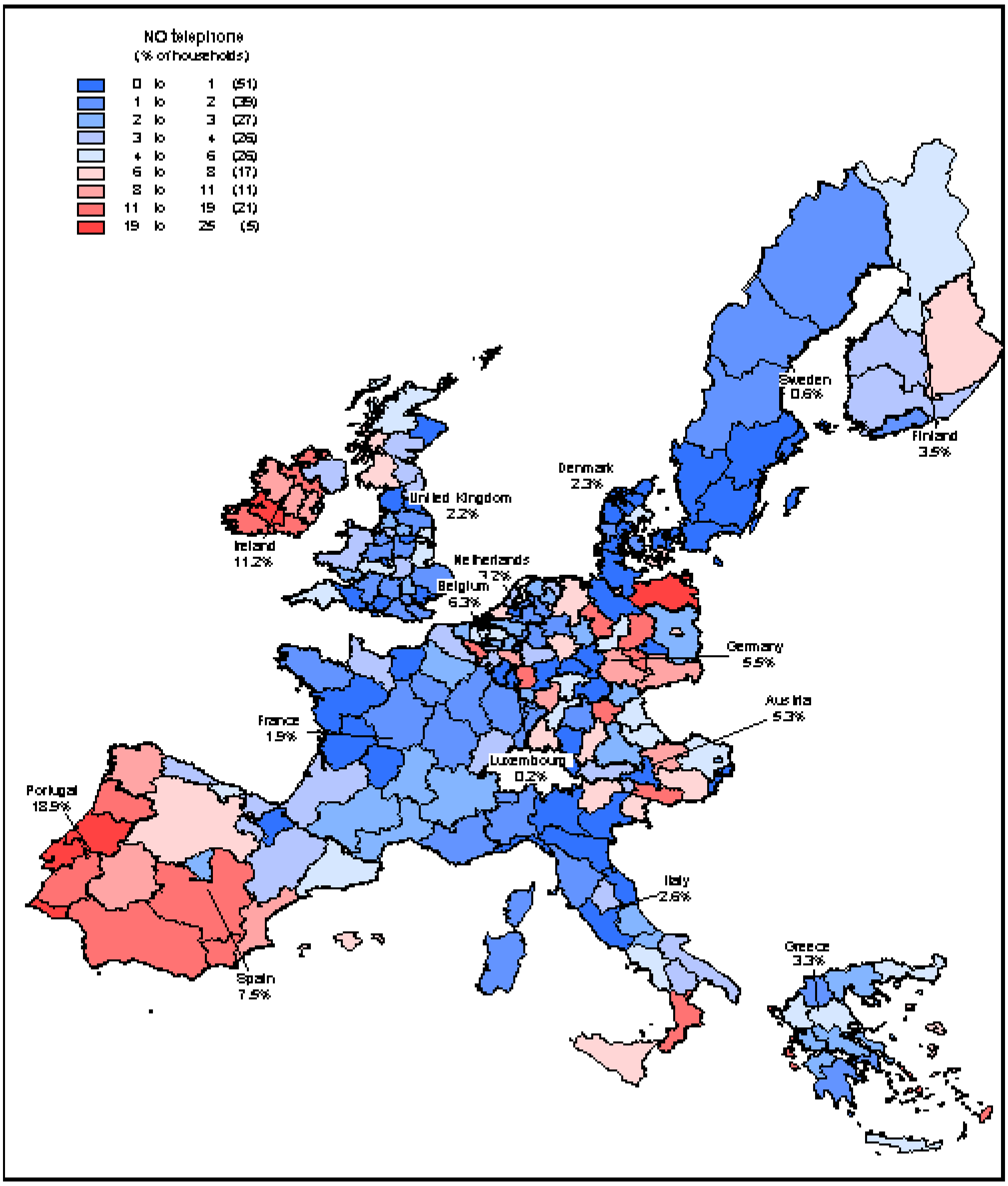
Figure 4.6: Proportion of households with both fixed and mobile telephones at regional level (EU 15)



Source: EOS Gallup (CEC 2000d)

Figure 4.7 visually represents the proportion of households without phones, regardless if they are fixed or mobile. On the whole we are dealing with low number of households here, with only 5 regions having more than 19% of their households not having a telephone. Nevertheless, there are regional differences, with Southern Spain and Portugal, Ireland, and the eastern German Länder showing the main concentrations of non-phone owning households.

Figure 4.7: Proportion of households with no telephone at all (EU 15)



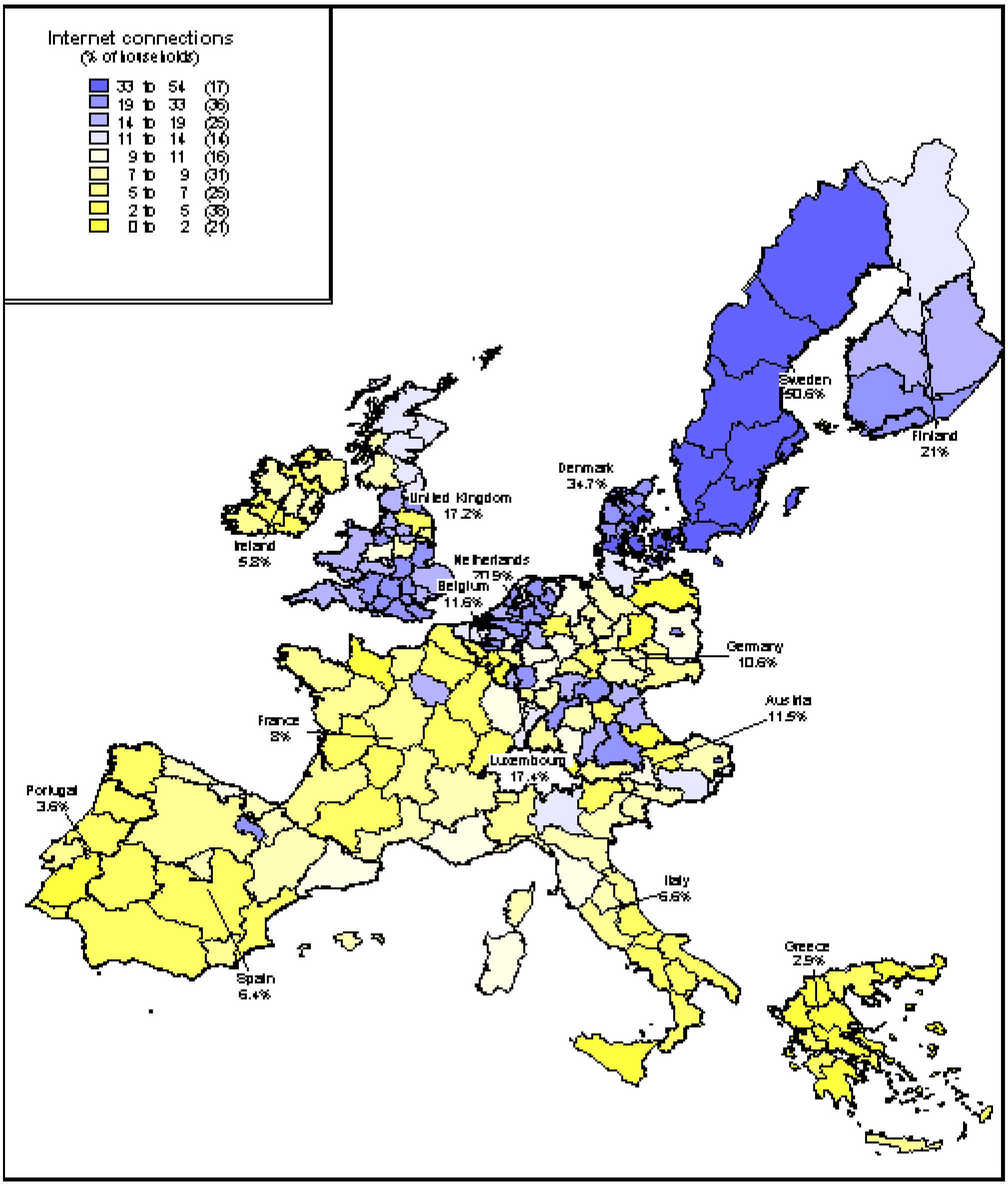
Source: EOS Gallup (CEC 2000d)

Turning to the Internet, figure 4.8 visually represents the average penetration rates of domestic Internet access[11]. As with mobile telephony it should be recalled that this only represents a 'snapshot' of a relatively early stage of consumer up-take of the Internet. Again there is a 'national effect' here with Sweden at the forefront of Internet up-take, followed at a distance by Denmark, Finland, the Netherlands, Luxembourg and the UK. There is a north-south divide within Europe (or perhaps even a north-central-south divide), with all of the southern countries, plus Ireland well behind their northern counterparts. France (where only Paris has levels close to the leading European countries) and Germany have relatively low access levels. In the former case this may result from the success of an earlier 'competing' technology – the Minitel system – which it has been argued delayed the adoption of the Internet in France.

Without access to the background data on which figure 5 is based it is difficult to draw out the regional differences in the countries where access is higher (see footnote 5). Nevertheless, regional differences can be seen in some countries, albeit that they are rather complex. In the UK, for example, the traditional north-south divide can be seen, with higher levels of Internet adoption in the more prosperous South, but there are some areas where high household access to the Internet is hard to account for, rural Wales being a case in point. An interesting concentration of high access occurs in Germany in the 'hi-tech' regions of Baden Wurttemberg and Bayern, with the internal contrast in Germany being between north and south, rather than the more commonly expressed east and west.

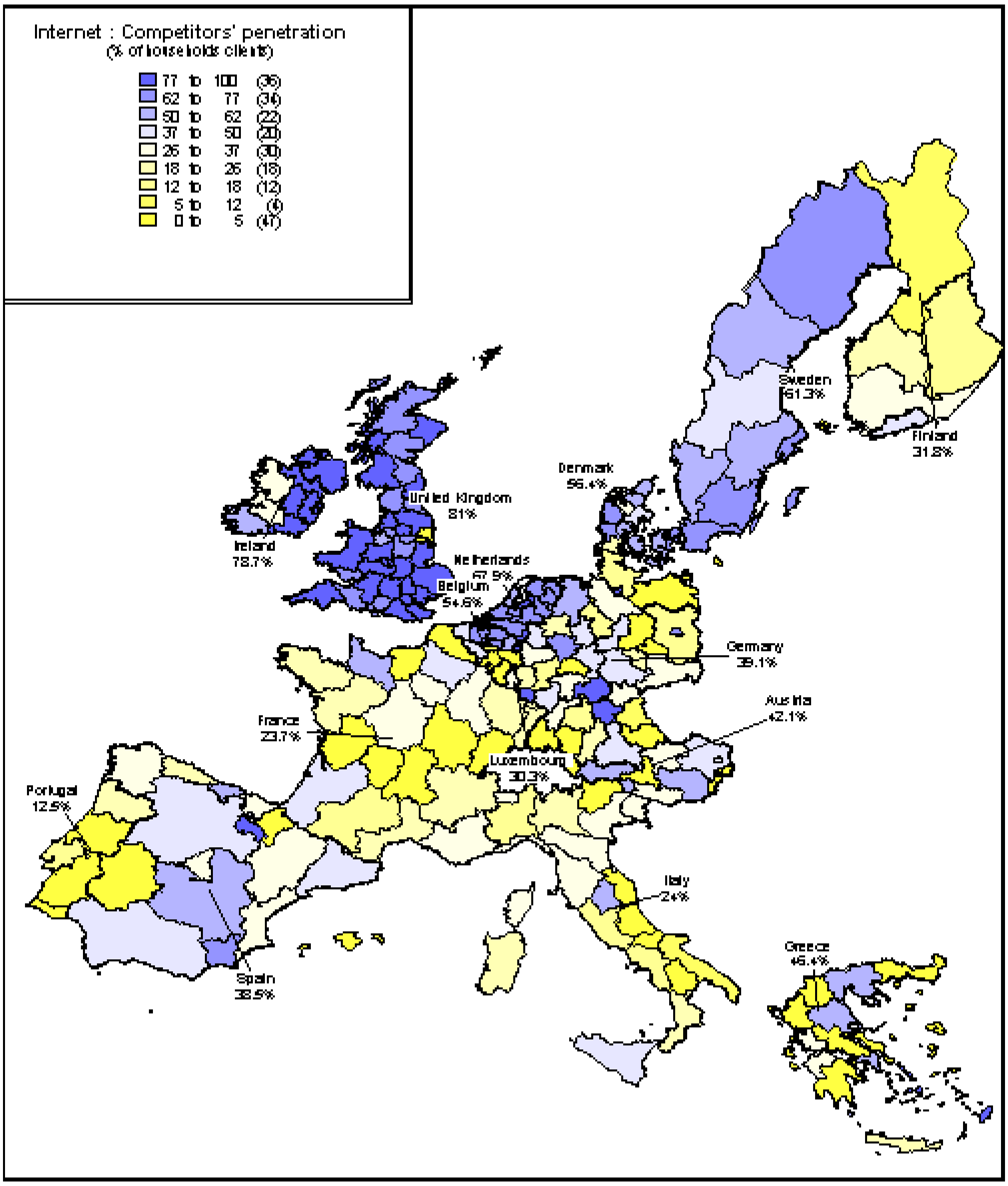
[11] As with all the maps drawn from the EOS Gallup Survey regional variations are expressed by colour gradation. In figure 5 the colours used for regions have spreads that are very different from one another. It can be seen from the legend that the highest category here encompasses a wide range of variation (from 33% to 55%), while the lowest category covers a much more narrow range (from 0% to 2%). The reason is that the authors of the EOS report preferred to highlight the regional differences in terms of low equipment levels (low percentages) rather than in terms of high level of equipment. This potentially dampens the visual impact of regional differences within countries where access is higher.

Figure 4.8: Proportion of households with Internet connections (EU15)



Source: EOS Gallup (CEC 2000d)

Figure 4.9: Internet: Competitors' penetration (% of households)

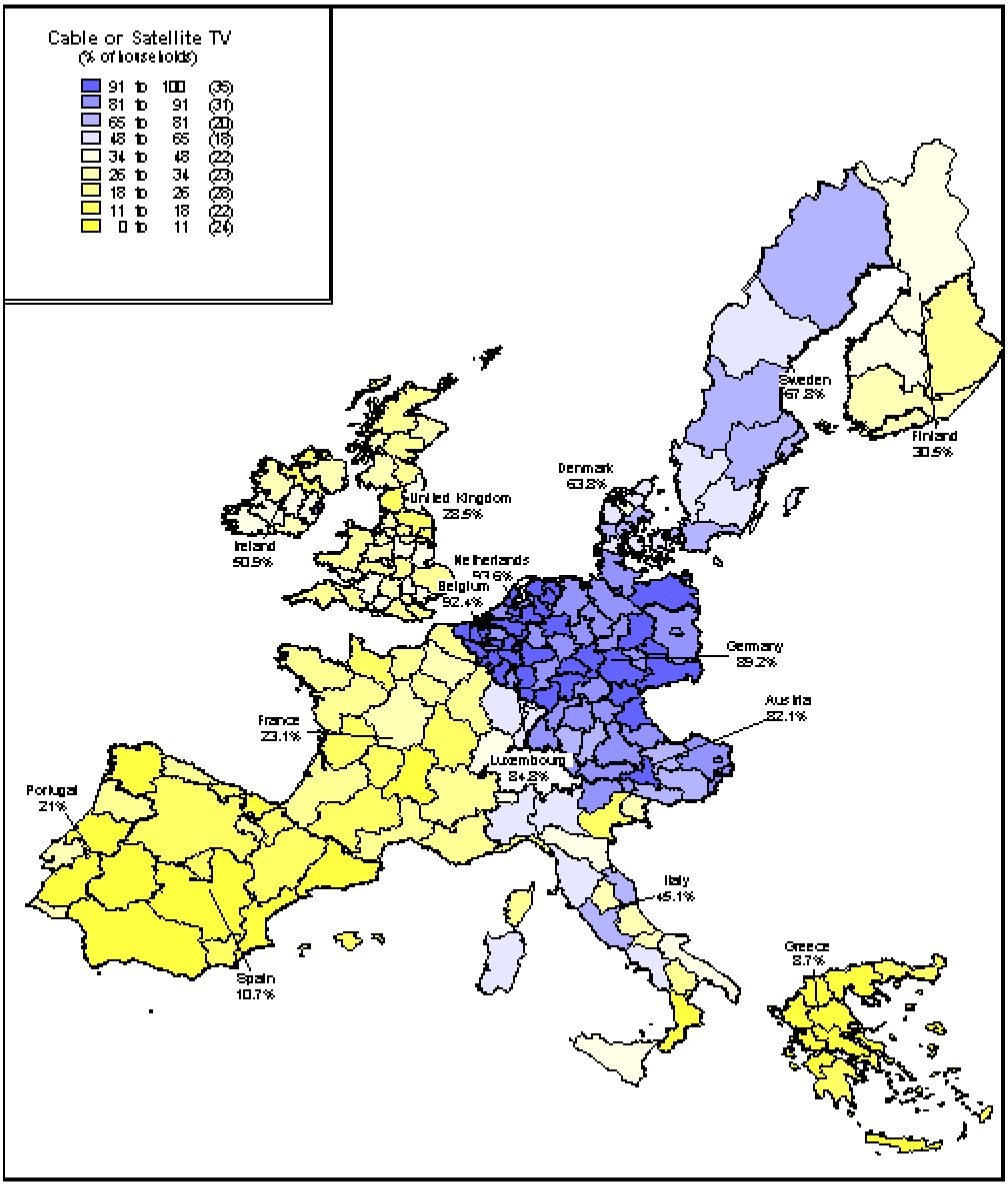


Source: EOS Gallup (CEC 2000d)

Turning to the question of competition in mobile. Again the situation varies considerably across member states, with the UK having the most competitive environment with 81 per cent of households' Internet connections being provided by companies in competition to the main telephony provider. Portugal was the least competitive environment with only 12.5 per cent of households in this position. The authors of the EOS report comment that it would seem that "competitor penetration is often higher when the Internet is well developed in a country, with traditional operators enjoying stronger positions in the less penetrated countries" (EOS Survey, section 5.4.1).

Turning to television, two types of television other than by standard (aerial) broadcasting are considered here – satellite and cable. Each is considered to have potential to provide interactive services which will contribute to the growth in the e-economy. To date, the degree of interaction has tended to be limited.

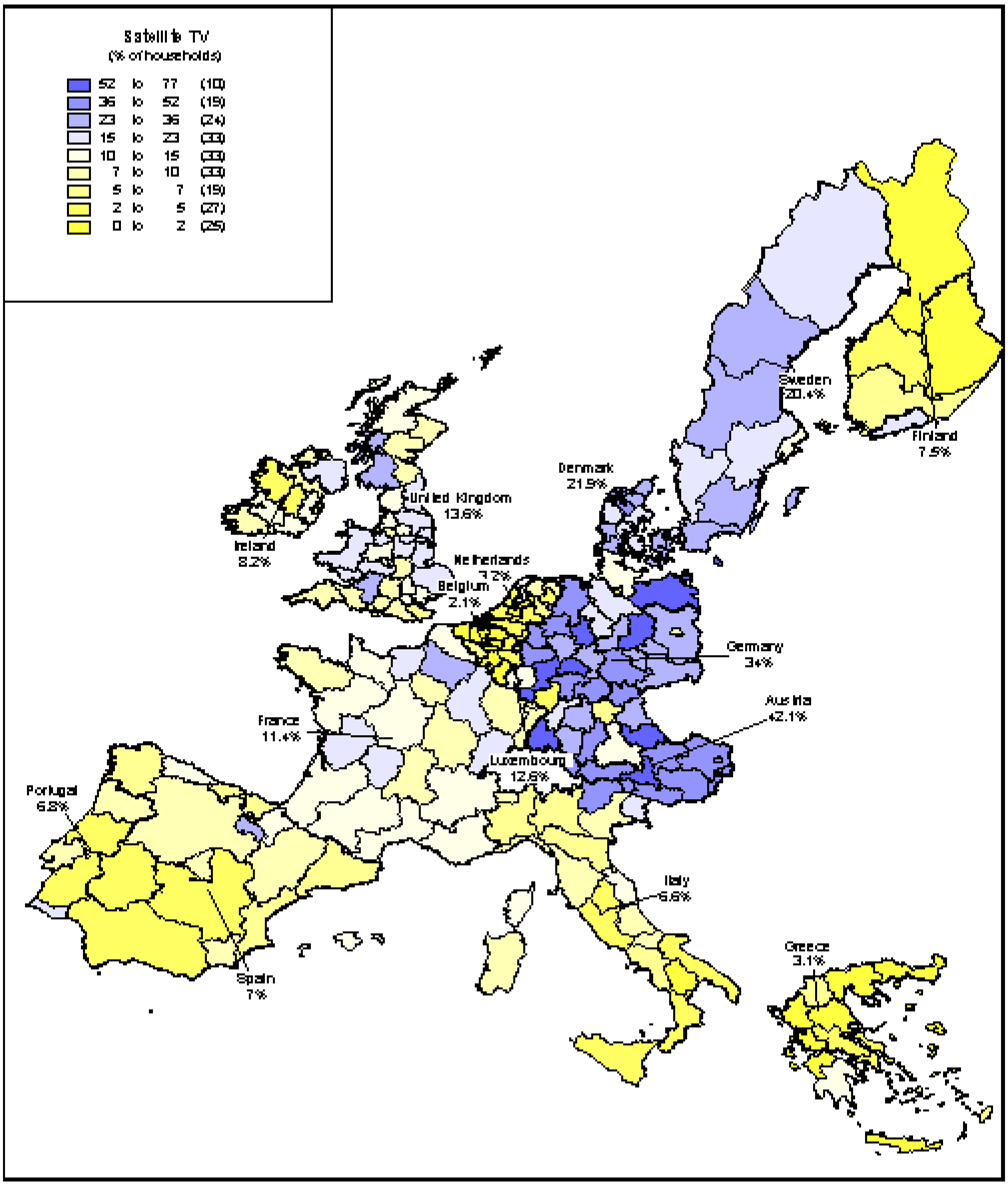
Figure 4.10: Proportion of households with television via cable or satellite



Source: EOS Gallup (CEC 2000d)

Figure 4.10 shows the importance of the 'national effect', with a number of countries having high levels of satellite and/or cable television reception. Germany, Austria and the Benelux countries have by far the highest levels. Sweden, Austria and Italy also have above average levels of penetration.

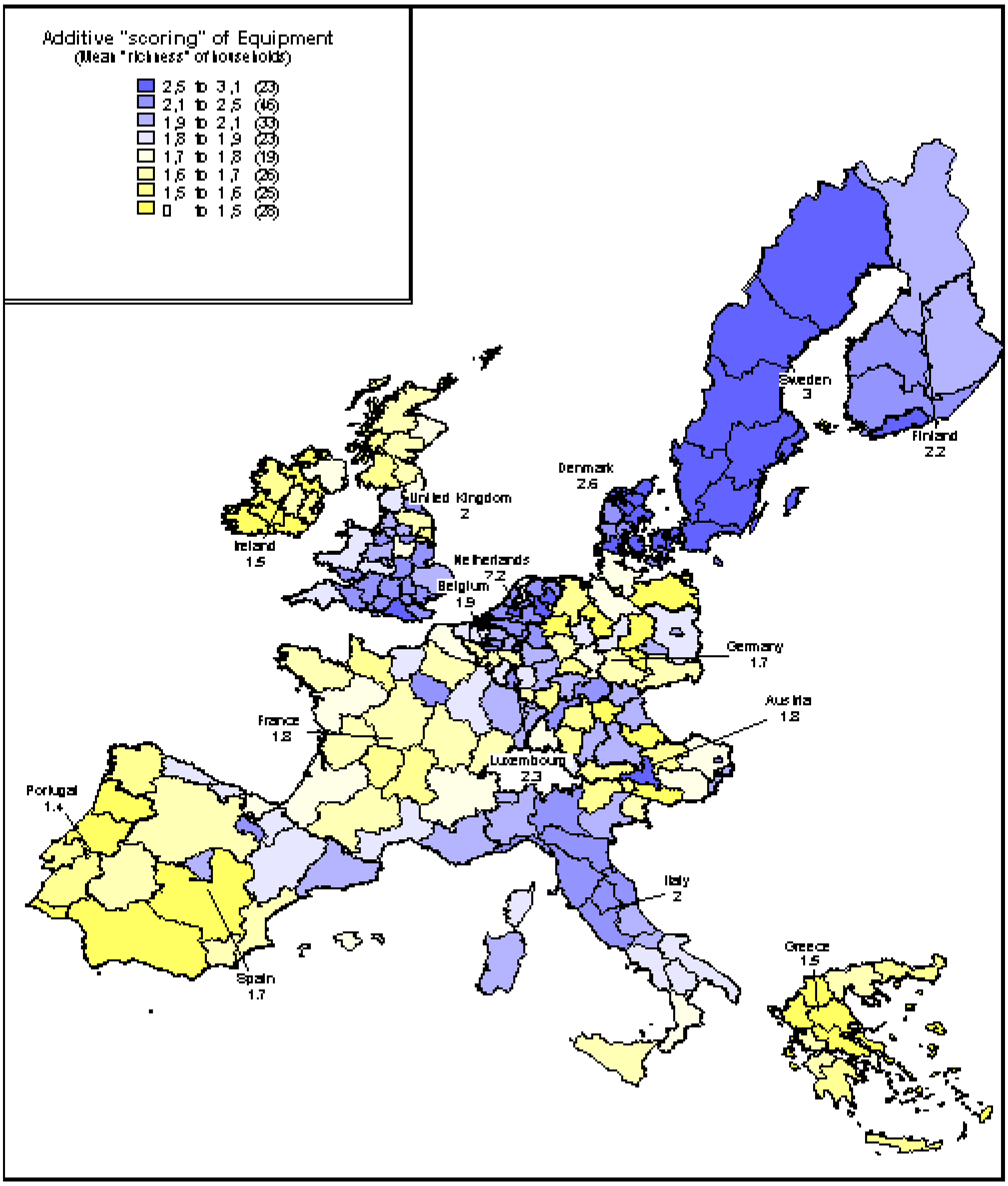
Figure 4.11: Proportion of households with television via satellite (EU15)



Source: EOS Gallup (CEC 2000d)

It is necessary to separate out the two technologies, since technology potentially has a different 'footprint'. Satellite can cover a large area once the expense of launching the satellite has been undertaken. By contrast, the main investment cost for cable operators is in rolling out the cable network. When we separate out the two technologies a slightly different picture emerges. Looking at satellite alone, (Figure 4.11) Belgium and the Netherlands and also Italy no longer feature in the higher bands, as cable is the main technology used in these countries. The UK and France have relatively high levels of satellite penetration, but relatively low penetration rates in cable. Care should be taken when talking about cable technology, as some countries have long established networks of 'old' (and non-interactive) technology. For example, according to figures from the ITU (ITU Yearbook, 2003), cable subscribers in Belgium and the Netherlands in 1991 were around 3.5 million and 5 million respectively. In 2001 the figures stood at 3.8 million and 6.3 million respectively. This contrast with the UK where services have traditionally been aerial based where over the same period subscribers grew from 0.4 to 3.9 million.

Figure 4.12: ICT "Richness" of Households



Source: EOS Gallup (CEC 2000d)

Figure 4.12 represents visually the results of ‘a simple and unpretentious exercise’ in ‘equipment scoring’ undertaken by the authors of the EOS report in an attempt to produce a single index which would act as a ‘practical indicator’ of the ‘general level of domestic equipment’.

To establish the scoring the authors selected the following equipment items and gave each a score of one point, at the household level:

- at least one fixed telephone line, of whatever kind
- at least one ISDN line, or a second standard line
- at least one mobile phone
- at least one PC or equivalent
- at least one Internet access

Cable TV subscription was not included in the scoring because one country to the next has such a different cable network that the authors felt that TV data did not convey a reliable indication of the household equipment level.

One problem with this type of scoring is that countries such as France appear low down on the scale because of particularly low penetration in a single technology (in this case the Internet) and the scoring does not take account of an alternative (albeit now redundant) technology (in this case Minitel).

There are both differences between countries and within countries. Looking at figure 4.12 it would appear that the “20-40-50 Pentagon” capture to some extent the pattern of ICT rich households, as does the ‘blue banana’. However, as always in the spatial patterning of ICTs in Europe, the northern periphery, including Denmark score at least as highly as the traditional European core. Of the southern periphery, Italy as a whole has a relatively high level of household ICT richness, being above that of France and Germany and commensurate with the UK.

At the regional level, there are again significant variations in most countries. Only Sweden appears to have no noticeable (within the limits of our dependence on colour gradation) regional differences.

- In Austria Salzburg and Vienna score highly as does Burgenland, the rest of the country scores relatively lowly.
- In Belgium the divide is between Brussels, followed by the north of the country, and a belt across Wallone which has the lowest score.
- In Denmark the distinction is between Riba Amt and Ringkobing Amt,Vejle Amt and the rest of the country
- In Finland the Helsinki region scores highest, followed by the surrounding relatively urbanised NUTS regions (Etela-Suomi and Vali-Suomi), whilst the less urbanised and less prosperous regions (by GDP/hd) trail.
- As mentioned the relative postion of France viz-a-viz other member states is low, partly at least as a result of the slow take up of the Internet, due in part to the success of the Minitel system. There are again regional differences in France. The Ile-de-France is highest ranked at the centre of a ribbon running from Haute Normandie, through Ile-de-France, Champange-Ardenne and Lorraine and Alsace (the latter both in the second top band) in the north of the country. Provence-Alpes-Cote d'Azur also falls within the second band. Interestingly, Languedoc Rousillon is on a par with the two regions neighbouring Ile-de-France, as is Corsica.
- In Germany the highest scores are in seen in Bayern, southern Hessen and Baden Wurttemberg. The east scores poorly, though Brandenburg and Berlin score reasonably. The north west of the country also scores poorly.
- Greece scores poorly overall, but there is still some regional variation with Attiki (including Athens) having the highest score.
- Ireland scores lowly altogether. It is not possible to see from the map in the EOS report whether Dublin should be included in one of the lower bands.
- In Italy there is also a typical north-south divide, but in the opposite direction from the UK, though there is a tapering effect down the spine of peninsula, with Lombardia south to Lazio showing the highest levels and Calabria and Sicily the lowest. There is some variation in the north of the country also, with

the regions to the east and to the west of Lombardia appearing in the second band. Sardinia falls within the same band.

- Luxembourg is one of the highest scoring countries, but the information we have does not allow any regional analysis.
- The Netherlands has the second highest aggregate score. Together with Sweden it appears most territorially even, with only Amsterdam, Drenthe and Overijssel slightly above the norm.
- Portugal has the lowest score in EU 15. Lisbon and Alentejo appear to score the highest, but the quality of the colour reproduction in EOS report does not allow us to say this with too much confidence.
- There is a regional divide in Spain. Madrid and Catalonia are in the forefront, except for La Rioja (which seems to lead in up-take of all individual technologies). There is also a clear northern bias, with a ribbon from Catalonia to Asturias outpacing other parts of Spain, save Madrid.
- Sweden has the highest overall score in EU 15. The EOS map does not allow us to distinguish between different regions of Sweden and all regions appear to fall within the highest band.
- In the UK there is typical north-south divide, in favour of the south, but also an urban-rural divide, in favour of the urban.

Outside Sweden and Denmark only a handful of NUTS 2 regions fall into the top band. Helsinki in Finland, Hampshire-Isle of Wight in the UK, Salzburg in Austria, and Amsterdam, Drenthe and Overijssel in the Netherlands.

In most cases the capital city region is highly placed relative to the rest of its country.

4.2 Telecommunications and Network Services: Metropolitan, Urban and Rural Divide?

In this section we again draw on the EOS Gallup survey to consider how demand for telecommunications services varies between urban and rural areas. The EOS Gallup survey makes a distinction between Metropolitan, Urban and Rural areas. We also draw on a series of Eurobarometer Flash Surveys to provide some more up-to-date data. This can only be done, however, in respect of the Internet. Several studies have been carried out under the title of "Internet and Public at Large" on behalf of DG Information Society. These studies are carried out by Gallup Europe. They cover:

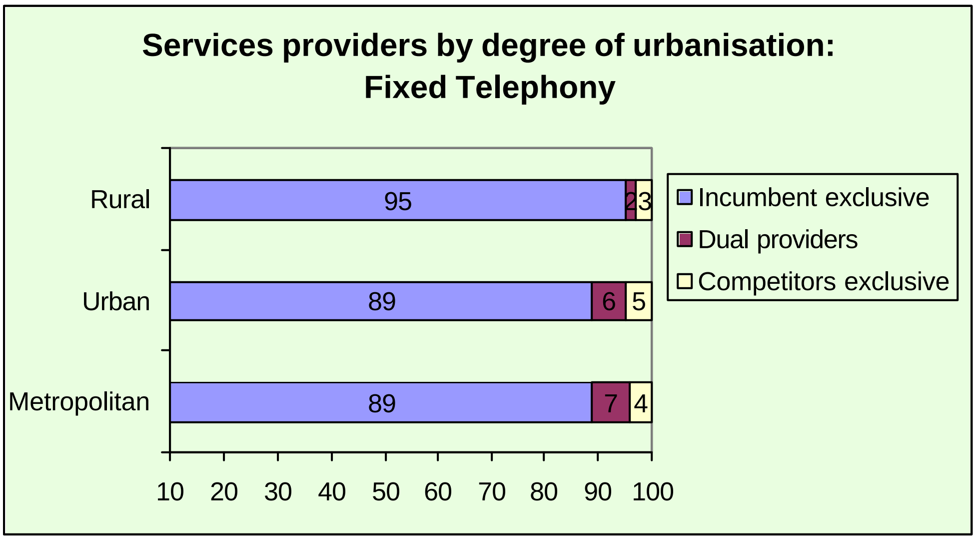
- The penetration and use of Internet by individuals and households
- The purpose of Internet use (e.g., for shopping)
- Internet and security
- Demographic data

Analytical Reports are published, but background tables are also available on request. These tables present answers to survey questions by several demographic categories: sex, age, education and locality type. We are concerned here with levels of use and intensity of use of the Internet by locality type. As in the EOS Gallup 1999 survey, three categories are used to convey locality type – metropolitan, urban and rural. Results are presented only at an aggregate level for EU 15 and not at the national level. Our understanding is that the sample sizes are insufficiently large to allow analysis at the national level. The sample size used in Flash surveys are also insufficiently large to be able to undertake reliable analysis of regional differences. Flash Barometer surveys cover only EU 15.

The latest issue of the "Internet and Public at Large" is Flash 135, published in November 2002. We have obtained the demographic tables and these are used here. We also use Eurobarometer Flash 97 from February 2001 to provide some level of comparison over time. Unfortunately, however, some of the detailed questions in in respect of the issues in which we are interested (or the categories used in cases where multiple answers are possible) differ from one survey to another making comparisons difficult. As is mentioned above, from 2003 onwards benchmarking of Internet penetration and usage will no longer be sourced from the Eurobarometer process (see Chapter 3). Comparisons between results from the EOS Gallup 1999 survey and the Flash surveys should be regarded as indicative rather than precise for a number of reasons, for example, different questions and the sample size differences.

We deal first with telephony and television before turning to the Internet.

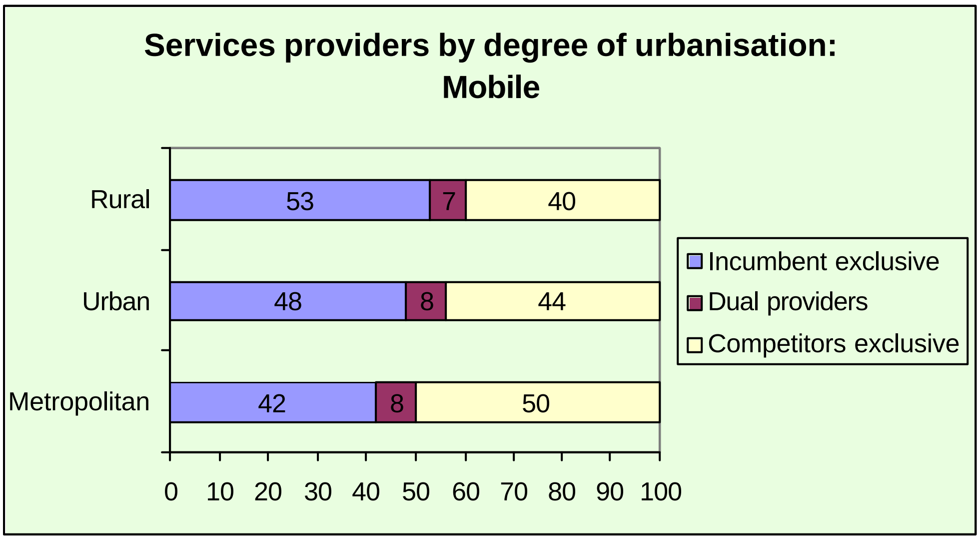
Figure 4.13: Service providers by degree of urbanisation: fixed telephony



Source: EOS Gallup (CEC 2002b)

Figure 4.13 relates to levels of competition in different locality types. It suggests that households in metropolitan and urban areas were more likely to use the services of competitors to the incumbent fixed telecommunication providers, though in all locality types the incumbent is strongly dominant. The authors of the EOS report conclude that "the competitors seem to be carving out their small penetration shares in the more affluent and urbanised categories of the population". This is unsurprising. We would anticipate that as time has passed the difference will be less pronounced. We would still expect differences to be apparent in many countries, as local loop unbundling has been slow to take place and competitors are more likely to target exchanges where rapid returns can be made on investment.

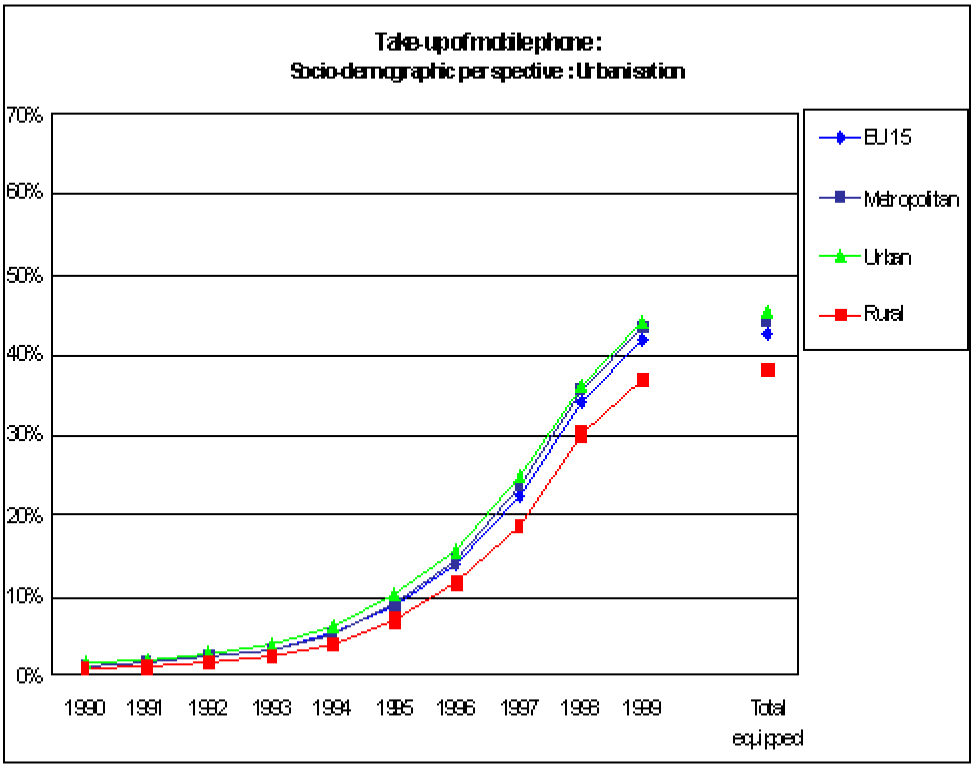
Figure 4.14: Services providers by degree of urbanisation: mobile



Source: EOS Gallup (CEC 2002b)

Figure 4.14 relates to competition in the field of mobile telephony. As was seen above at the regional level (Figure 4.5) competition in mobile telephony was more advanced at the time of the EOS survey than was the case with fixed telephony, though the market was, of course, much smaller. Figure 4.14 suggests that incumbents were fairing better in rural areas than in urban and metropolitan ones. This again suggests that competitors target the most populated areas. Figure 4.15 suggests that there is a lag in the up-take of mobile telephony to rural areas and that this delay is persistent over time. The authors of the EOS report suggest that penetration is growing in an identical manner, but with a slight imbalance to the detriment of rural areas. They suggest that "rural areas behave like towns…some six months later" (ESO Survey, section 3.2.3.3). Notwithstanding this lag the data could be read as suggesting that roll out to rural areas is less problematic than is the case with fixed telephony. As has been suggested elsewhere in this report and in our first interim report this makes mobile telephony appear promising as a technology which will allow a degree of catch up for rural areas.

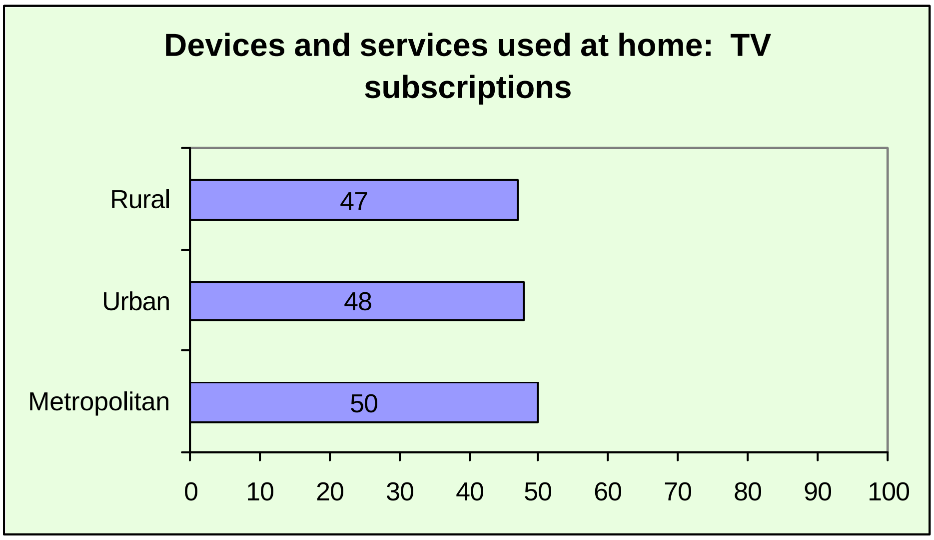
Figure 4.15 Take up of mobile telephony by degree of urbanisaiton



Source: EOS Gallup (CEC 2002b)

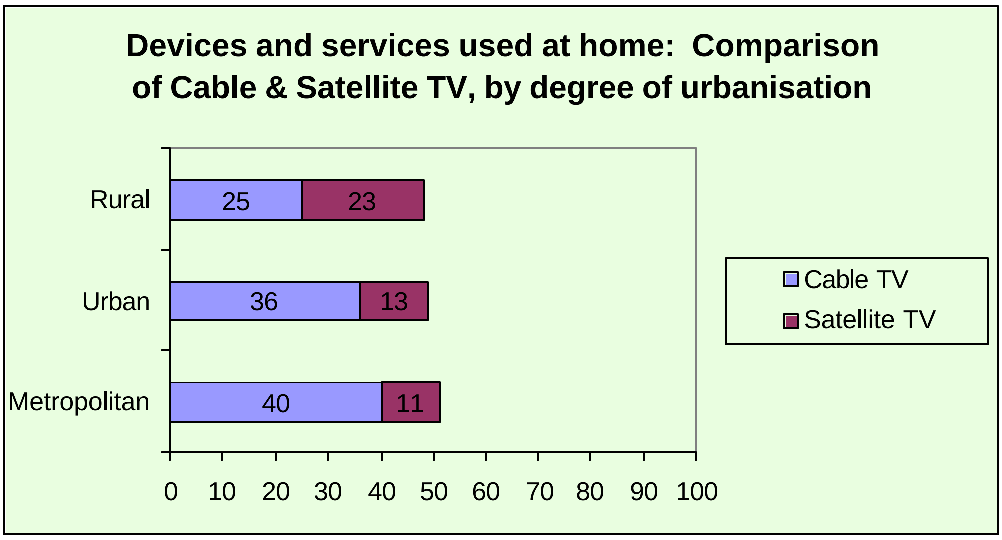
Turning briefly to cable and satellite television, it can be seen from figure 4.4 that there is little difference in up-take between locality type when the technologies are aggregated. If we assume that these technologies may form a platform for introducing interactive services to the general public or consumer then these results would suggest that rural areas are as well placed as urban ones to benefit. When the two technologies – satellite and cable – are disaggregated, however, a different picture emerges, with a clear distinction between metropolitan, urban and rural areas, with the more urbanised areas having greater penetration of cable TV (Figure 4.17). Conversely, rural areas have a rate of Satellite TV up-take which is more than double the rate of metropolitan areas. In the view of many commentators cable is a more likely option than satellite for synchronous interactive exchanges. A note of caution is required, however, in that we do not know what kind of cable technologies are included in the figures reported here. As was pointed out in the section dealing with the regional up-take of telecommunications technologies and services there may be a considerable differences between cable technologies and services from one country to another.

Figure 4.16: Up-take of 'subscription TV' by degree of urbanisation



Source: EOS Gallup (CEC 2002b)

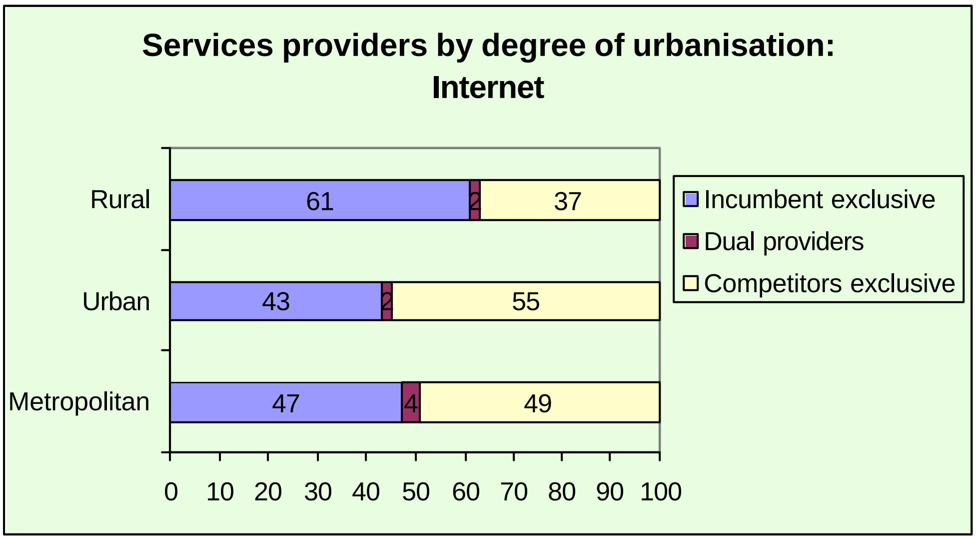
Figure 4.17: Comparison of up-take of Cable and Satellite TV by degree of urbanisation



Source: EOS Gallup (CEC 2002b)

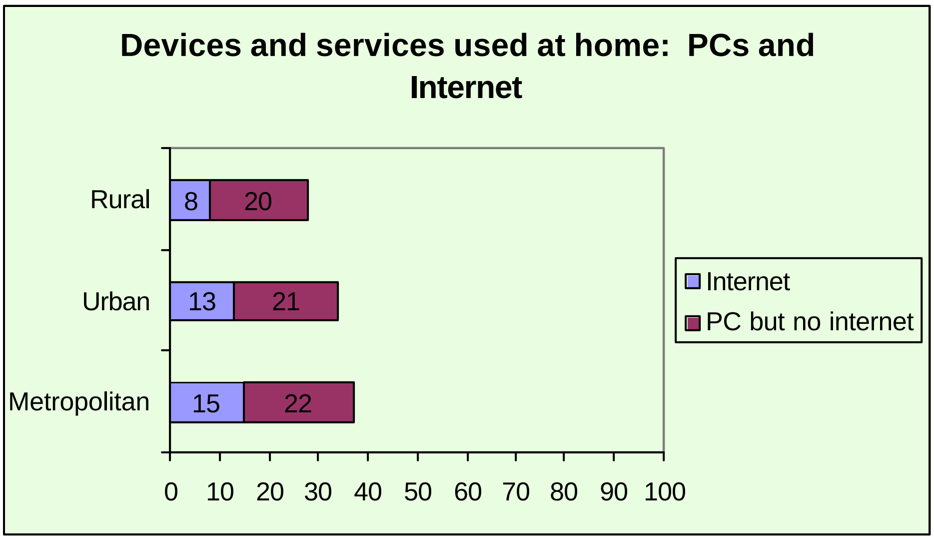
Turning to the Internet, we see clear differences between the urban and rural situation. Firstly, the degree of competition differs between locality types (Figure 4.17). In this case urban areas appear to be most likely to use competitors to the fixed telephony incumbent, 57 per cent using a competitor, followed by metropolitan areas with 53 per cent. In the case of rural households the figure is only 39 per cent.

Figure 4.18: Competition of Internet services by degree of urbanisation



Source: EOS Gallup (CEC 2002b)

Figure 4.19: Up-take of PCs and the Internet at home

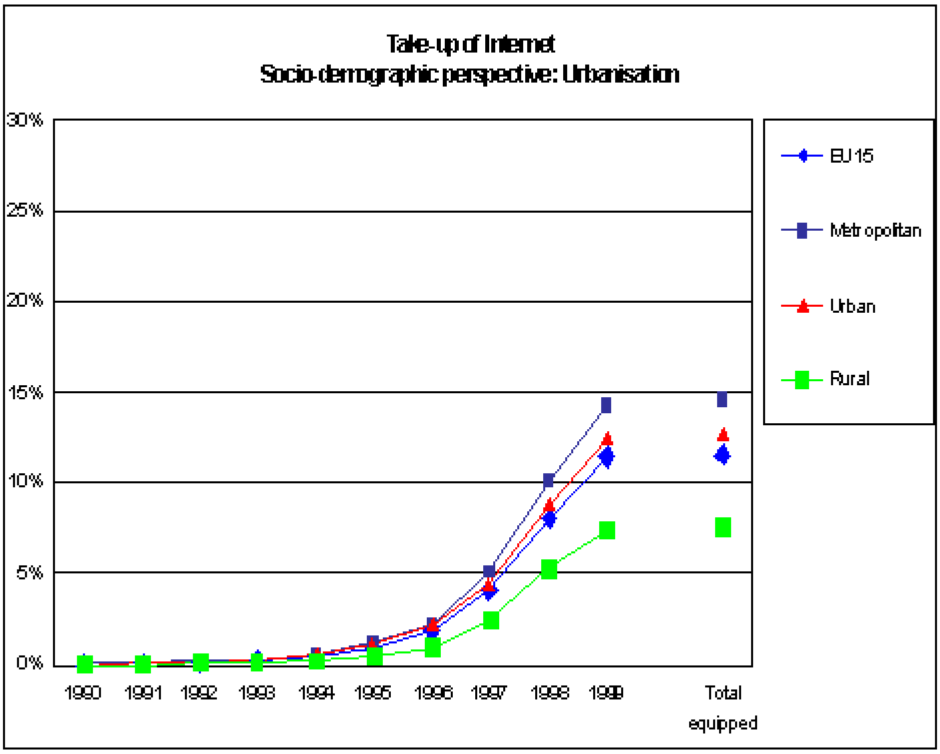


Source: EOS Gallup (CEC 2002b)

Figure 4.19 shows the relative up-take of PCs and the Internet at home across the various locality types. There is a limited difference between the up-take of PCs with no Internet connection. When Internet connections are considered, however, significant differences emerge, with metropolitan households almost twice as likely as rural households to have access to the Internet. Urban households also have relatively high levels of Internet access.

Again, as is suggested by figure 4.20 this difference seems to persist over time, suggesting that in the case of the Internet rural areas are around a year behind urban ones. Indeed, they appear to be falling behind as overall take up increases, with a markedly lower levels of Internet growth in 1999 in rural areas compared with urban and metropolitan areas.

Figure 4.20: Speed of take up of the Internet by degree of urbanisation

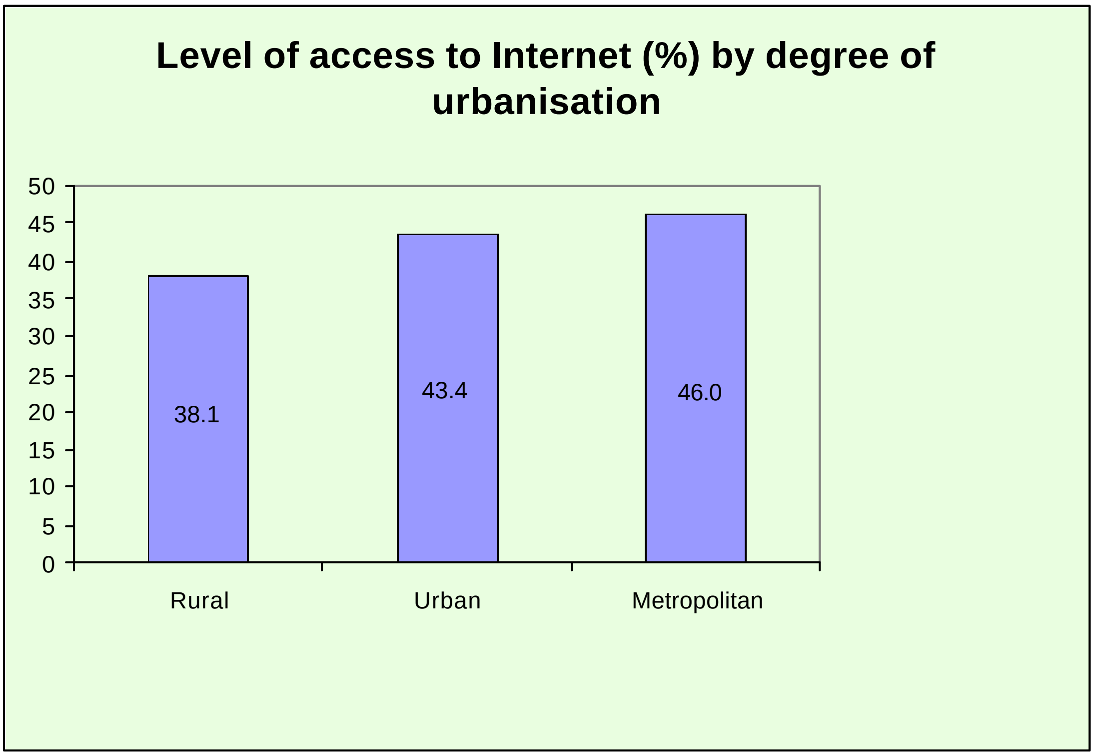


Source: EOS Gallup (CEC 2002b)

Evidence that the differences across locality types are continuing is supported by the findings of the most recent survey by Eurobarometer Flash survey (135) on the Internet and the public at large. Figure 4.20 shows the level of household access to the Internet by degree of urbanisation. It shows that metropolitan households still lead the way, followed by urban areas, with rural areas lagging behind. Further, although care needs to be taken in comparing the two data sets, the evidence suggests the percentage point gap between Internet adoption in metropolitan and rural areas is wider in 2002 than it was in 1999.

The data presented in figure 4.22 illustrate a different phenomenon. The Eurobamoter Flash surveys as respondents how frequently they as individuals (as opposed to their household) use the Internet. Respondents are given a number of options and hey must choose which best characterises their use patterns. Figure 4.22 shows the proportionate growth in those using the Internet most intensively (i.e., people who use the Internet every day or almost every day), according to locality type. The figure is based on the findings of two Eurobarometer surveys[12]. The first published in February 2001, the second in November 2002. It illustrates that metropolitan areas have a higher proportion of intensive users and that the rate of growth is greater in more urbanised areas: metropolitan growth is 5 percentage points, urban 4 percentage points and rural 3 percentage points. As with Internal adoption then, the gap between metropolitan and rural areas appears to be widening over time.

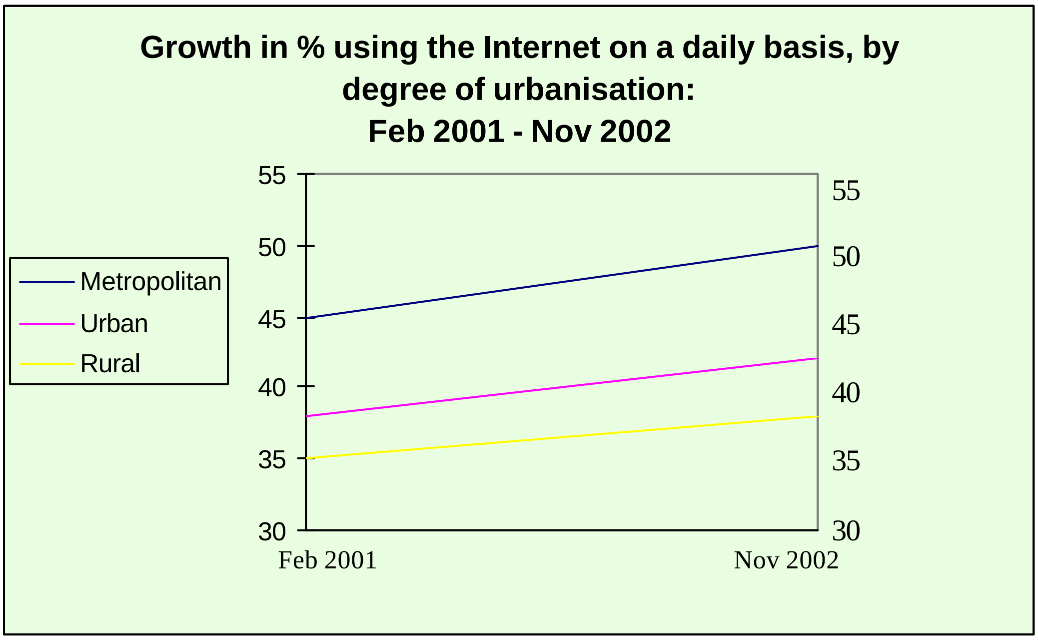
Figure 4.21: Level of household access to Internet by degree of urbanisation



Source: Eurobaromoter Flash 135, November 2002 (Volume B/1)

[12] Care must be taken here as to actual levels of growth as, for reasons which are not explained in the Flash reports, slightly different questions were asked. For the February 2001 report respondents were asked if they used the Internet 'every day'. For the November 2002 respondents were asked if they used the Internet 'every day or nearly'

Figure 4.22: Growth in proportion using the Internet on a daily basis by degree of urbanisation between February 2001 and November 2002



Source: Eurobaromoter Flash 135, November 2002 (Volume B/1)

The following tables also suggest that there is a distinction between how different locality types access the Internet – which kind of connection and what kind of terminal. In each case the data is based on the behaviour of individual respondents rather than households and multiple answers are possible. Table 4.1 suggests that those living in metropolitan areas are most likely to use broadband technologies, ADSL and cable modem, followed by those in urban areas, with those in rural areas least likely. The differences are pronounced in both cases and particularly in relation to ADSL. Interestingly, ISDN is most used in rural areas. The situation regarding mobile wireless is more encouraging for rural areas. Metropolitan areas still lead, but the lead is narrow and rural areas appear more advanced in this respect than urban ones. Again, as suggested previously in this report and in our first interim report, this indicates that mobile telephony may offer some opportunity for rural areas.

Table 4.2 reports on differences in type of terminal used to access the Internet. There are only minor differences, though use of lap-tops is more pronounced as one travels up the urban hierarchy. Interestingly, once again, is the rural lead (albeit slight) in the connection by mobile telephony.

Table 4.1 Type of internet access by degree of urbanisation

	Metropolitan	Urban	Rural
Standard telephone line	63.4%	69.3%	73.9%
ISDN line	17.2%	15.3%	18.7%
ADSL connection	18.6%	12.1%	7.1%
Special modem for TV cable	11.3%	8.9%	6.4%
Mobile/wireless connection	5.8%	4.2%	5.1%
Other	.7%	1.0%	.6%
Dk/n.a.	3.0%	4.0%	3.4%

Source: Eurobarometer Flash 135 (table of results B/1)

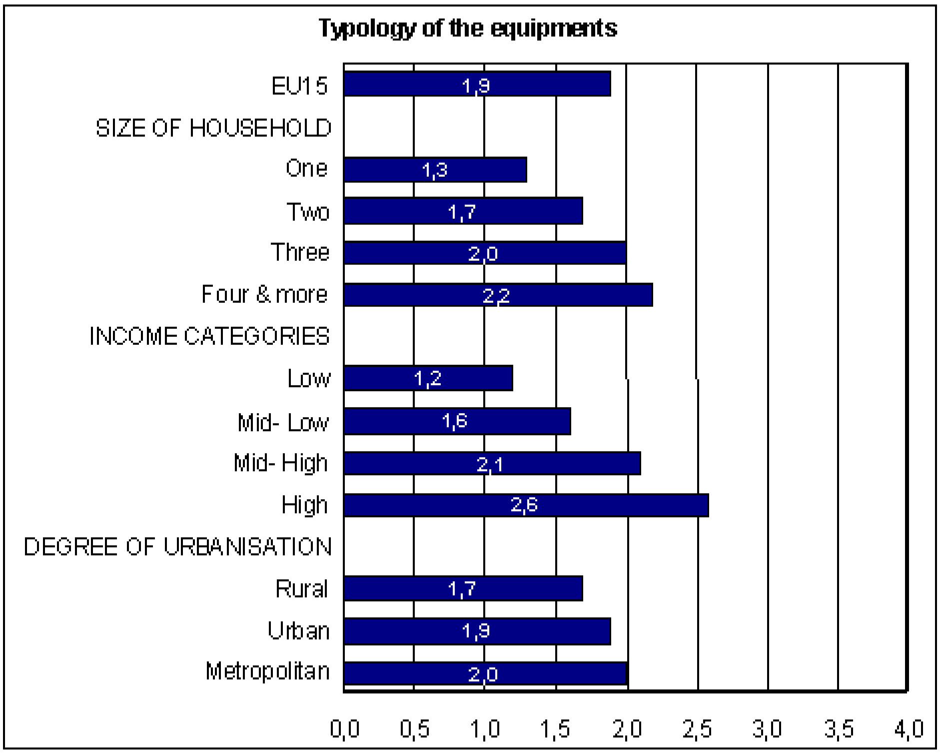
Table 4.2: Type of terminal access to the Internet by degree of urbanisation

	Metropolitan	Urban	Rural
Computer: desktop or laptop	98.1%	98.2%	97.8%
Desktop computer	90.4%	91.9%	93.5%
Laptop computer	17.2%	15.2%	11.2%
TV set-top box (digital TV)	1.9%	3.2%	2.8%
Video game console	1.9%	2.3%	2.2%
Mobile telephone (WAP, GPRS)	5.9%	5.4%	6.1%
Handheld/pocket computer	1.3%	1.1%	.8%
Other	.1%	.1%	.4%
Dk/n.a.	1.1%	.9%	.9%

Source: Eurobarometer Flash 135 (table of results B/1)

For the final graphic in this section we return to the EOS Gallup Report. As a part of the process of exploring differences in up-take of the various technologies, the authors of that report constructed a scoring index of various forms of household equipment (see discussion of Figure 4.12 above for details). As can be seen there is a difference in the scores achieved by households according to locality type, with Metropolitan area having the highest score, followed by urban areas and finally rural areas. This is a useful exercise and it will be interesting to see how the 'scores' change (assuming that the scoring process is carried out) in the follow up report carried out on behalf of DG Information Society. The exercise, of course, disguises to some extent the differential distribution of different technologies. The (admittedly partial) evidence presented in this section suggests that (assuming a weighting of new technologies such as broadband) metropolitan and urban areas will continue to lead and rural areas lag. The advent of broadband and the (growing) differential in access to the Internet may, in fact, widen the gap.

Figure 4.23: “Equipment Scoring Results by Size of Household, Income Categories, and Degree of Urbanisation



Source: EOS Gallup (CEC 2002b)

Chapter 5 – Review of Supply Side Data from a Territorial Perspective

5.1 Introduction – theoretical and technological context

The territorial development of communications infrastructures is far from being a fresh concern. The history of these infrastructures is very much founded on differing approaches and strategies within and between territories. The development of the visual telegraph in post-revolutionary France, for example, was a means of symbolically 'reducing' the size of its territory to facilitate administrative and economic cohesion and control (Hugill, 1999; Mattelart, 1999). The subsequent lengthy periods of hegemonic state monopolies, and their focus on universal service, probably diminished a little the intertwined relationship between telecommunications and territoriality. However, recent changes in the telecommunications market linked to demonopolisation and liberalisation on the one hand, and increasing technological sophistication and product proliferation on the other hand, are once again underlining the need for a territorial basis to telecommunications development. In addition, the 'technological celebration and fetishism' (Kaika and Swyngedouw, 2000) of early telephone use is also reappearing with regard to mobile and broadband technologies, highlighting "a renewed physical, social, political and discursive salience to urban networked infrastructures" (Graham, 2000b, p185). Kaika and Swyngedouw noted how:

> "Because of their significant role in the functioning of the modern capitalist city, networks of technology became *the* embodiment of progress during early modernity… Being excluded from the technological networks symbolised exclusion from the spheres of the powerful. Hence, the connection to the electricity or water networks of the city, or, similarly, the connection of one's home to a network of highways became a symbol of prestige and authority on the one hand and a terrain of controversies and power struggles on the other" (Kaika and Swyngedouw, 2000, p125).

These comments have now become pertinent for the new technological networks being rolled out across territories, and highlight the important social implications of accessibility and unaccessibility for the European territory as a whole.

The territorial dynamics of telecommunications supply at a European level are bound up with a number of important elements and processes from a number of increasingly overlapping or 'telescoped' scales (Offner, 2000; see also Brenner, 1998; 1999). Clearly opposing the cyberspace rhetoric which posits the 'end of geography' or the 'death of cities', these inherent *territorialities* of telecommunications networks include national and supranational regulatory decisions, global-local political economic factors, and availability and accessibility of different technologies (Rutherford, 2003 forthcoming). In the latter case, the European Spatial Development Perspective (ESDP) report has already identified how:

> "Telecommunication networks can play an important role in compensating for disadvantages caused by distance and low density in peripheral regions. The relatively small market volumes in regions with low population density and correspondingly high investment costs for telecommunication infrastructure can thus lead to lower technical standards and high tariffs, which bring competitive disadvantages" (CEC, 1999, p27).

Nevertheless, the ESDP also recognises that achieving parity of access to infrastructure and knowledge will not necessarily come from just deploying new networks, without "accompanying measures in other policy areas" (CEC, 1999, p26). As Manuel Castells has effectively shown, the 'rise of the network society' is characterised not just by an increasingly overwhelming 'space of flows' made up simply of electronic circuits of communications, but instead by a multi-layered 'space of flows' which is necessarily bound up with the traditional territorial dynamics of the 'space of places' (Castells, 1996). Access to the former therefore requires taking the latter into account (for example, by 'other policy measures'). What we are talking about here is 'command over place and space' (Massey, 1993; Swyngedouw, 1993). As Erik Swyngedouw points out:

> "The two-speed and three-speed Europe is not one linked to a geographical core and periphery in terms of their determination to accelerate integration, but is rather an internal differentiation between those who revel in and benefit from greater command over space and those who remained trapped in the doldrums of persistent marginalisation and exclusion" (Swyngedouw, 2000, p73).

This all suggests how, as Mattelart puts it, “networks, embedded as they are in the international division of labour, organise space hierarchically and lead to an ever-widening gap between power centres and peripheral loci” (Mattelart, 2000, p98). Similarly, Veltz (1996) talks about an ‘archipelago economy’, and Petrella of ‘global techno-apartheid’. These notions all portray the same story:

> “The convergence around distinct poles and the organisation of the world economy into networks linking these poles – to the detriment of the areas in between that are less well endowed and therefore more exposed to marginalisation and abandonment – carry a risk of splitting the world economy in two and creating a two-speed social geography” (Mattelart, 2000, p99).

While the move towards liberalisation in most European telecommunications markets has raised technical standards and lowered tariffs, competition has tended to concentrate in the most profitable regions and sectors, leaving many more peripheral regions still facing a (near) monopolistic context rarely conducive to consumer choice and lower costs, and therefore neither to increased technological accessibility. Accessibility becomes, therefore, a key prerequisite to and determinant of the cohesive socio-territorial development of the information society. As Antoine Picon writes, with respect to the intra-urban scale:

> “Time is otherwise taking on a more and more strategic character in the urban economy, an economy in the process of globalisation of which the spatial constraints perceive themselves from now on in terms of accessibility more than distance. The substitution of the notion of accessibility for that of distance puts in crisis crucial distinctions, such as those of centre and periphery. Insufficiently served, some districts of old centres are finding themselves in a more peripheral situation than airport or industrial zones where motorways and rail lines interconnect” (Picon, 1998, p22-23, our translation).

Territorial fragmentation is becoming more and more evident, and seems to be bound up in, and manifests itself in, parallel multiscalar processes. As Picon again suggests:

> "The globalisation of the economy has come to accentuate this fragmentary character by leading spectacular disparities in development to increasingly reduced scales. Linked to the rest of the planet by high-performance information networks, a business centre or an industrial zone can prosper amidst suburbs with problems. The importance taken by the notion of accessibility reinforces this process…Such spatial fragmentation has something paradoxical about it at a time when behaviours and lifestyles are tending to show uniformity. It also constitutes a handicap with regard to the necessity for cities to acquire a bright image in order to attract capital and businesses within a context of widespread economic competition. Never has the global economy been as urban; never has the notion of the city showed itself to be as blurred" (Picon, 1998, p24, our translation).

Within an urban context, there is evidence of a type of core and periphery restructuring – "a reterritorialisation of the urban process in which hinterland organises the centre" (Dear and Flusty, 1998). In urban ICT terms, core and periphery development within core cities was well demonstrated by Longcore and Rees (1996) in a case study of the spatial restructuring of financial institutions in Manhattan in relation to changing technological requirements. Here, the increasing complexity of IT in banking and insurance forced several major firms to relocate from the traditional financial core around Wall Street to more peripheral midtown sites where the buildings had the structures to support the technology and the larger floorspace for the traders. In this way, the urban core and periphery switched round, with Wall Street becoming a 'subdistrict' rather than a core (Longcore and Rees, 1996, p366). We need to investigate whether there is any evidence of similar processes occurring on larger scales in pan-European telecommunications, where network peripheries (for example, in candidate countries) might be influencing network cores.

Another interesting and relevant concept to explore is that of practices of 'spatial selectivity' – "a need to maintain hegemony, suppressing counterhegemonic interests and in the process attempting to gain, through pursuing a particular accumulation strategy, international competitiveness" (Jones, 1997). This is surely a key part of the territoriality of telecommunications networks as deployed by pan-European companies.

Beyond stressing the basic human need for communication, accessibility to infrastructure can be deemed crucial because of the social, economic, political and cultural importance and relevance of the global information and knowledge web that is the Internet. Whilst Internet access can be achieved via a number of different technologies or technical networks (dial-up modem through the basic copper pair, cable, ISDN, DSL, satellite, and, soon, mobile), the backbones supporting this access are deployed terrestrial and subterranean fibre optic cable networks. It has been suggested that the majority of telecommunications traffic now flows over these fibre networks, including the increasing level of digital data traffic which uses Internet protocol (IP) (Malecki, 2003, p2).

In the last few years, extensive fibre backbone telecommunications networks have been rolled out across the globe creating a vast planetary infrastructure web on which the global economy has come to depend almost as much as physical transport networks. Nevertheless, the deployment of these telecommunications networks by large profit-driven operators has inevitably meant that they have focused predominantly on connecting the core 'global integration zones', or 'global cities' (Sassen, 1991; 2000), where their biggest customers (business, government, education establishments) are located (see Rutherford, 2003 forthcoming, for a comparison of Paris and London). As Malecki suggests:

> "In effect, maximization of spatial interaction is implied, with connection of a city being closely related to its market potential or population" (Malecki, 2003, p5).

On a European level, as we shall see, this creates a kind of 'polycentric urban' territoriality of telecommunications focused on the key cities of London, Paris, Frankfurt etc. (see Rutherford, 2003 forthcoming).

Most of these networks tend then to overlap in key urban centres and not to serve more peripheral areas where demand for high bandwidth telecommunications services is considered marginal. Whilst the apparent 'glut' of fibre present in and between large cities, signifying an overabundance of market actors, has been a major factor in the disappearance of some telecommunications companies and the consolidation of others in the last couple of years, it has become clear that multiple networks are crucial to many client companies:

> "The agglomeration is not merely copy-cat behaviour, it provides a crucial degree of redundancy for customers who want more than one connection to ensure that their network is never 'down'" (Malecki, 2003, p6).

The overlapping of these networks in urban centres means that companies must look to serve small niche markets (territorial and / or client) to gain advantage over rivals.

As telecommunications markets have become more liberalised and thus more competitive, data relating to networks – their presence or absence, and their capacity – has become difficult to obtain, as telcos see this information as a commercially valuable resource. In addition, information about traffic flows across telecommunications networks simply does not exist. One of the foremost scholars of the geography of the Internet, for example, has commented that:

> "Unfortunately, there are no reliable data on flows of data traffic throughout the Internet. Unlike voice telephone traffic, for which tariffs are measured in minutes across a fixed path, data packets can take many different paths across packet-switched IP networks" (Malecki, 2003, p7).

Nevertheless, some information does exist on the total capacity of networks connecting individual urban centres, thus "provid[ing] at least a hint of actual flows" (Malecki, 2003, p8). We will discuss and analyse examples of these data resources for pan-European telecommunications infrastructure deployment in the rest of this chapter, which is divided into three main sections. Section 5.2 offers a brief discussion of our methodology in collecting and analysing data on telecommunications networks at a European level, before going on to present and examine a first set of data on the *presence* of these networks in European city regions. Section 5.3 then adopts a two part approach to focusing on the actual connectivity of these networks from a territorial perspective – the first part concentrates on analysing the number of deployed networks which interconnect city regions to each other, while the second part look at the size or capacity of these network interconnections between city regions in terms of bandwidth. Section 5.4 focuses on a territorial perspective on the network roll-out and investment strategies of pan-European telcos looking at individual cases in particular.

5.2 Collecting data on pan-European network coverage

As mentioned in section 5.1, telecommunications data availability can be very restricted. The presence of data resources in the public domain (the Internet and industry reports) is a good starting point, but this must nearly always be supplemented by private resources which have to be purchased. Our first step, then, was to carry out an extensive search for publicly available information about telecommunications networks at the European level, mainly via the Internet. We looked at the websites of major telecommunications companies and industry consultants, regulators and associations. The quality and reliability of the data raised considerably as did its relevance to our study. Nevertheless, from this trawl of websites and reports, an important set of data was uncovered and constructed relating to the territorial roll-out of pan-European networks. The next stage was to decide on a method for charting and mapping this geographical coverage. As outlined in the project proposal, the coverage of each network was examined in relation to a list of over 100 European city regions, in order to provide some standardisation of the data which had been obtained from numerous sources. The varying extent and quality of information increased the importance of this standardisation procedure. The decision to focus initially on a list of city regions, rather than other territorial indicators, is based on the fact that pan-European telecommunications data is presented almost invariably as urban and inter-urban data sets.

Due to the delay in the production of a common objective typology of cities and urban areas for all ESPON projects, we developed our own list of 138 European city regions for the purposes of this part of project 1.2.2 (see annex 4). This list was based primarily on population size (figures from the United Nations report on 'World Urbanization Prospects' and the United Nations Statistics Division – http://unstats.un.org/unsd/citydata/), but also on a concern to ensure full territorial coverage of all countries within the ESPON remit, where this would not have been possible by focusing uniquely on population (Malta and Luxembourg being the major examples). Some concern was expressed over the UN population data, as the figures for some urban areas were considered to be too high, but it is not fully clear where the boundaries were drawn for calculating population. For this reason, we will use the term 'city regions' rather than 'cities'.

Two further data sets were included alongside population size to ensure a representative list of urban areas for the project. First, there is the ranking of some of the city regions in the inventory of world cities developed by the Globalization and World Cities (GaWC) Study Group at Loughborough University (see Taylor, Walker and Beaverstock, 2002). Second, there is the ranking of the top sixty cities in Europe for telecommunications according to Telegeography (see Telegeography website – http://www.telegeography.com).

This list of 138 city regions was inserted into a spreadsheet matrix in order that coverage of numerous pan-European telecommunications networks could be charted against them. This was done following a trawl for the required data on the websites of telecommunications companies with significant market presence across Europe. These companies were chosen based on our own knowledge and experience, plus verification from table of contents lists of pan-European telecommunications companies whose strategies are analysed in relevant consultant reports, and from the websites and annual reports of the companies themselves, which outline where their main markets are located. If a particular city region appeared on a network, a '1' was placed in the matrix in the relevant cell. This built up a complete picture of the urban areas covered by each network and the networks present in each city region. Both fixed incumbent and fixed competitive operators were included in the research, as well as companies from the mobile, ISP, cable and satellite market sectors. In the latter cases, however, due to the types of technological coverage, territorial distribution differences within the urban system are either impossible to determine or generally ubiquitous, so that it is in particular in relation to fixed infrastructures that these differences appear most starkly between European city region. Section 5.2.1 presents some analysis based on this network-presence data from publicly available sources.

Both in order to verify this data and to build on it, two important map resources were purchased from the consultancy firms KMI Research and Telegeography Inc respectively. These were the most useful and extensive resources available within our budget, following an intensive search of consultant websites and contact with representatives of the main consultants to discover what relevant data and reports they had. Other maps and reports did not cover as much of the European territory, focused on narrower sectoral information, or were just too expensive.

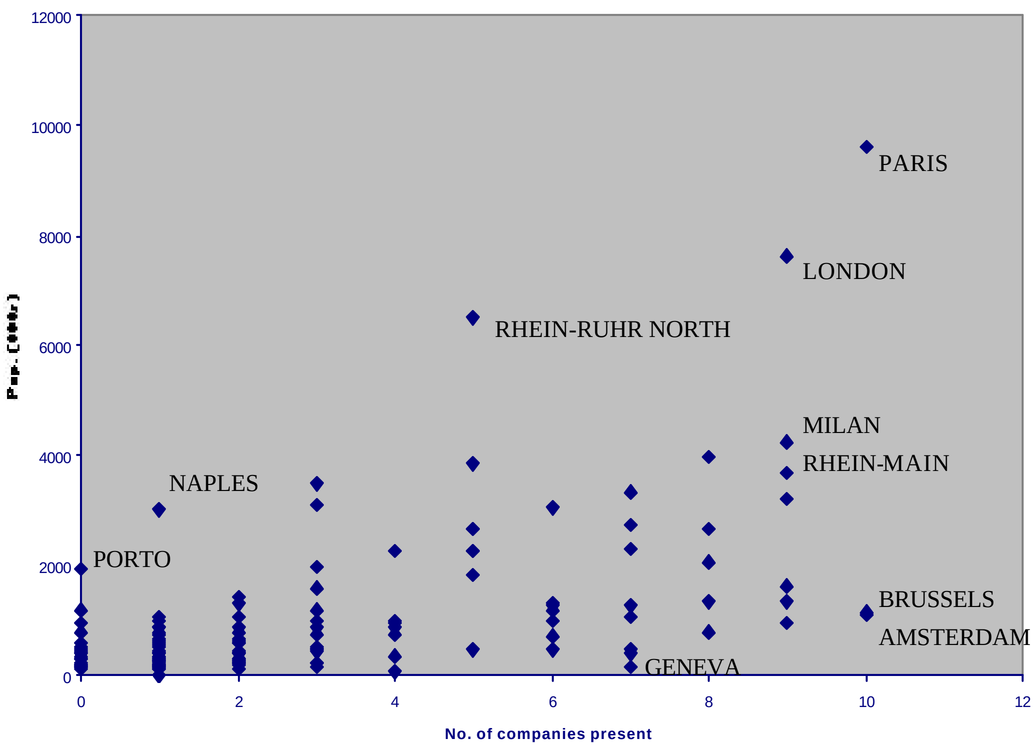
The KMI map shows the roll-out of some 27 pan-European networks across Europe and the cities interconnected by each network. The Telegeography map shows a measure of the total bandwidth capacity deployed via these networks between cities. The analysis of these maps follows in section 5.3 that of the public network presence data. By focusing in turn on network presence, network interconnection and bandwidth capacity, our analysis of these resources builds up, for the first time, a full picture of the territorialities of pan-European telecommunications infrastructures at the European level, regional level within Europe, national level, and intra-national level.

5.2.1 Exploring the relationship between city region population size and presence of networks

In this section, we focus on an analysis of the network-presence data we found for our list of 138 city regions. Uncovering where the key nodes of important pan-European telecommunications infrastructures are, and therefore the number of infrastructures present in each city region, is a crucial first step towards extending our understanding of these infrastructures from a territorial perspective.

Figure 5.1 plots the population of European city regions against how many of ten of the most extensive pan-European company networks are present in them. The ten networks are BT Ignite, T-Systems (Deutsche Telekom), Cable & Wireless, TeliaSonera, Telecom Italia, Colt, WorldCom, Infonet, UPC and Tiscali. The figure illustrates quite well that population size, whilst important, is not the only factor that needs to be taken into account in analysis of the territorialities of telecommunications networks at the European level. We would, for instance, expect that the larger the city region the more pan-European networks would be present, and vice versa. This trend is borne out to some extent, as Paris, the most populous city region, is present on all ten networks, and London, the second largest city region, is present on nine out of ten networks. On the other hand, the majority of city regions which are not on any of the ten networks or only on one of them have the smallest populations (less than 1 million). Nevertheless, the figure shows that there are a number of 'outliers', or deviations from the norm. For example, Brussels and Amsterdam have relatively small populations of just over 1 million, yet they are to be found on all ten pan-European telecommunications networks considered, and Geneva is present on 7 networks despite having a population of less than 200,000 people. At the other end of the scale, for a population of over six and a half million, we might have expected the Rhein-Ruhr North region to be on more than 5 networks. Likewise, Naples has a population of three million, but is only on 1 network, while Porto with a population of close to two million is not on any of the networks.

Figure 5.1 Comparing population of European city regions with the number of main pan-European telecommunications networks present

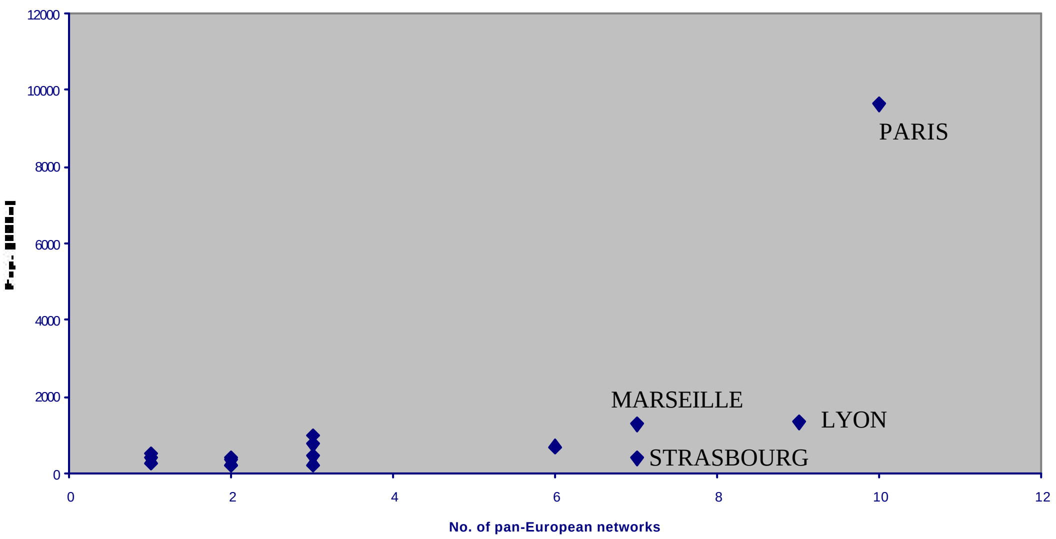


Source: Data from company websites, plotted by CURDS

Figures 5.2 to 5.5 use the same data on the urban presence of 10 pan-European telecommunications networks, but plot the data for city regions in individual countries, with the aim of beginning to demonstrate sub-national territorial differentiation in telecommunications infrastructures.

Figure 5.2 illustrates the primacy of Paris in the French urban system in terms of population size. Despite this, however, other city regions are not too far behind for telecommunications infrastructure provision. Lyon is present on 9 of the 10 pan-European networks, and Marseille and Strasbourg on 7. The latter is remarkable because of its relatively small population (under 400,000), suggesting that its role as a political and economic centre attracts network providers. Many of the smaller French city regions appear on very few of our networks, however, and with the exception of St. Etienne and Dijon, these tend to be located around the coastal and border areas of France, which suggests that there is something of a telecommunications 'desert' in the more rural heart of the country.

Figure 5.2 Comparing population of French city regions with the number of main pan-European telecommunications networks present

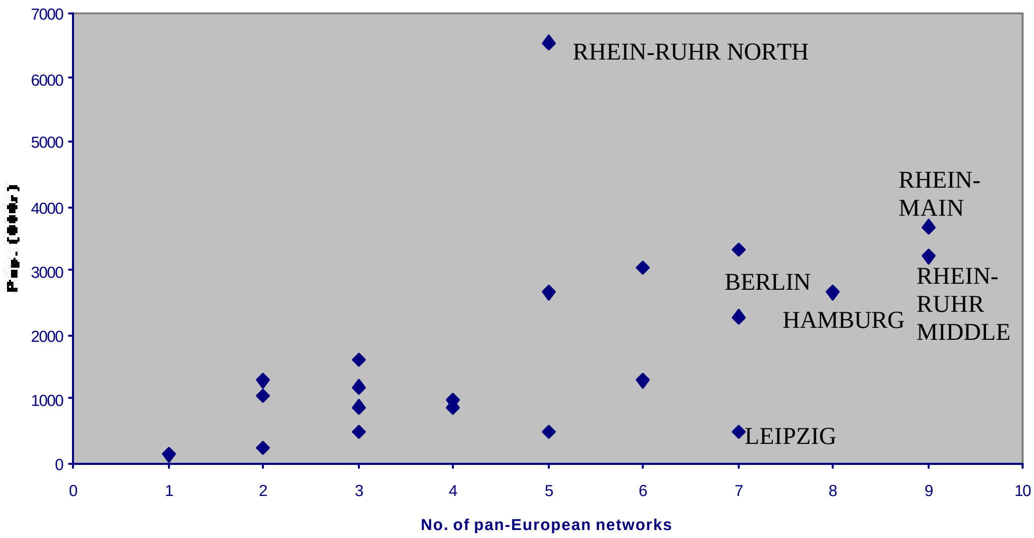


Source: Data from company websites, plotted by CURDS

Figure 5.3 illustrates a more balanced situation among German urban areas than in France. The most populous city region, Rhein-Ruhr North (Duisberg-Essen-Bochum-

Dortmund), is far from being one of the leading city regions in Germany for the number of pan-European networks present, although the leading city regions in this regard do have significant populations, with the exception of Leipzig (7 out of 10 networks for a population of just under 500,000). The German capital Berlin, with a much greater population, is present on the same number of networks as Leipzig, suggesting that its capital city functions do not greatly attract more network deployment. The relative importance of Berlin and Leipzig, however, does show that there is an eastern German concentration of infrastructure, offering some territorial balance to the otherwise north western German focus of pan-European networks.

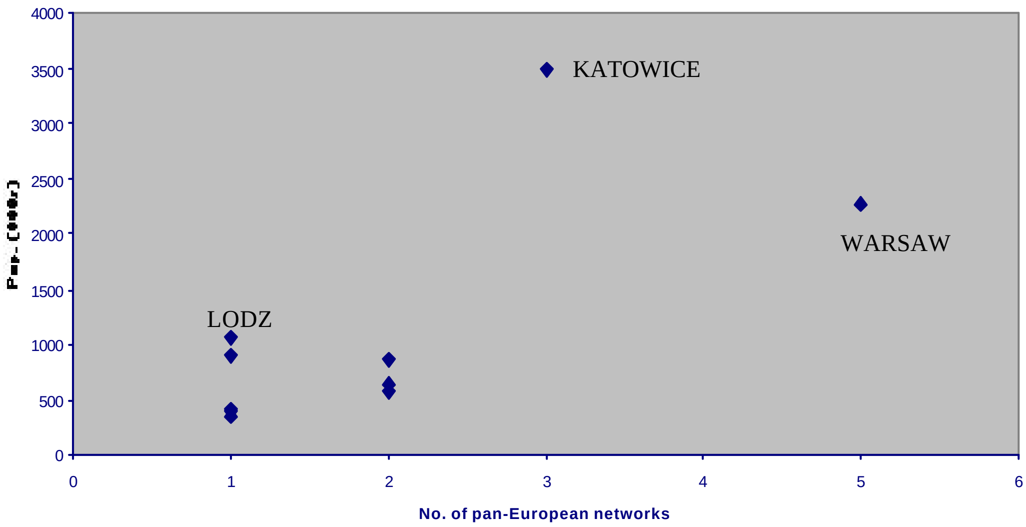
Figure 5.3 Comparing population of German city regions with the number of main pan-European telecommunications networks present



Source: Data from company websites, plotted by CURDS

Figure 5.4 illustrates the situation in Poland, which concerns slightly fewer pan-European networks than France and Germany. Here, the capital Warsaw, despite its smaller population than Katowice, dominates to a large extent, suggesting, in contrast to Germany, that its functions as the Polish capital do play a part in attracting network deployment. Otherwise, we can note that there are a number of city regions clustered in the figure, with populations between around 300,000 and just over one million, and presence on only 1 or 2 of the ten pan-European networks considered. In geographical terms, however, these city regions are quite well distributed across the Polish territory, underlining that there is some fairly ubiquitous access to these networks in Poland.

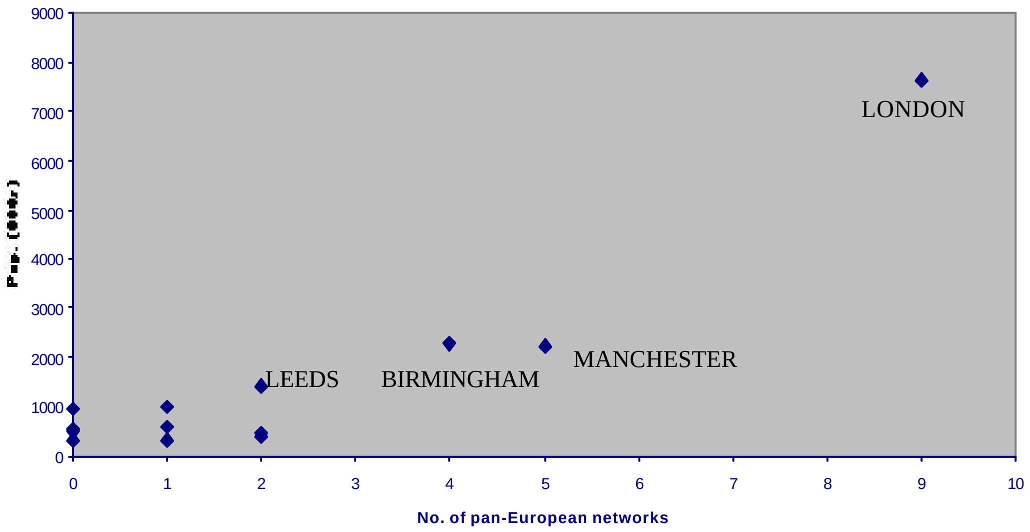
Figure 5.4 Comparing population of Polish city regions with the number of main pan-European telecommunications networks present



Source: Data from company websites, plotted by CURDS

Figure 5.5 illustrates the absolute primacy of London among UK city regions for population and pan-European network concentration. The next largest UK city regions, Manchester and Birmingham, are present only on around half the networks that London is. Other city regions show even more limited network presence with 4 of the 13 UK city regions on our list unconnected to all ten pan-European networks featured.

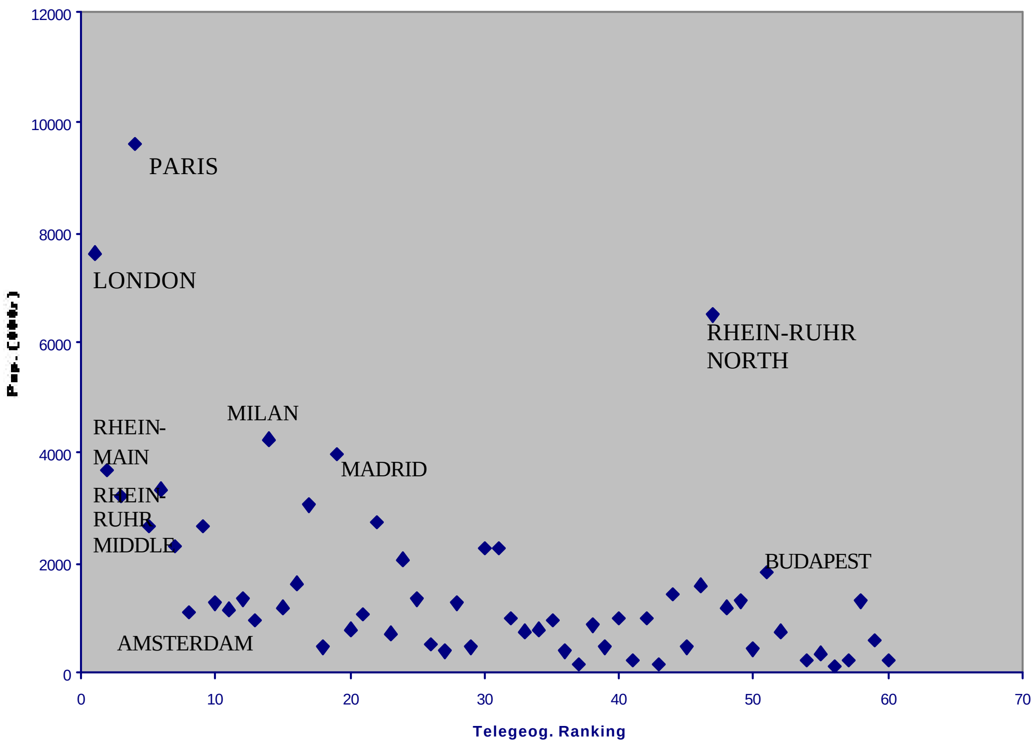
Figure 5.5 Comparing population of UK city regions with the number of main pan-European telecommunications networks present



Source: Data from company websites, plotted by CURDS

Figure 5.6, which compares city region populations with the ranking of each city region for telecommunications allotted by the consultancy Telegeography, shows much the same general pattern and trends as figure 5.1. The third most populous European city region, Rhein-Ruhr North, again stands out with its relatively lowly ranking of 47 for telecommunications availability and quality. Milan and Madrid, with populations around the 4 million mark, fail to make the top ten telecommunications city regions as well. On the other hand, Amsterdam (8^{th}), Brussels (11^{th}) and Hannover (10^{th}), with populations of just over 1 million, are considered to be among the top European cities for telecommunications. The highest ranked city regions (London, Frankfurt, Dusseldorf, Paris) can be viewed, then, as 'global integration zones', where the density of telecommunications infrastructure facilitates their position as places where the European economy meets global networks of exchange and control.

Figure 5.6 Comparing population of European city regions with the ranking of the top 60 cities for telecommunications by Telegeography Inc.



Source: Data from Telegeography Inc. website (http://www.telegeography.com), plotted by CURDS

5.3 Analysing pan-European network coverage from a territorial perspective

5.3.1 The territoriality of inter-urban network connections

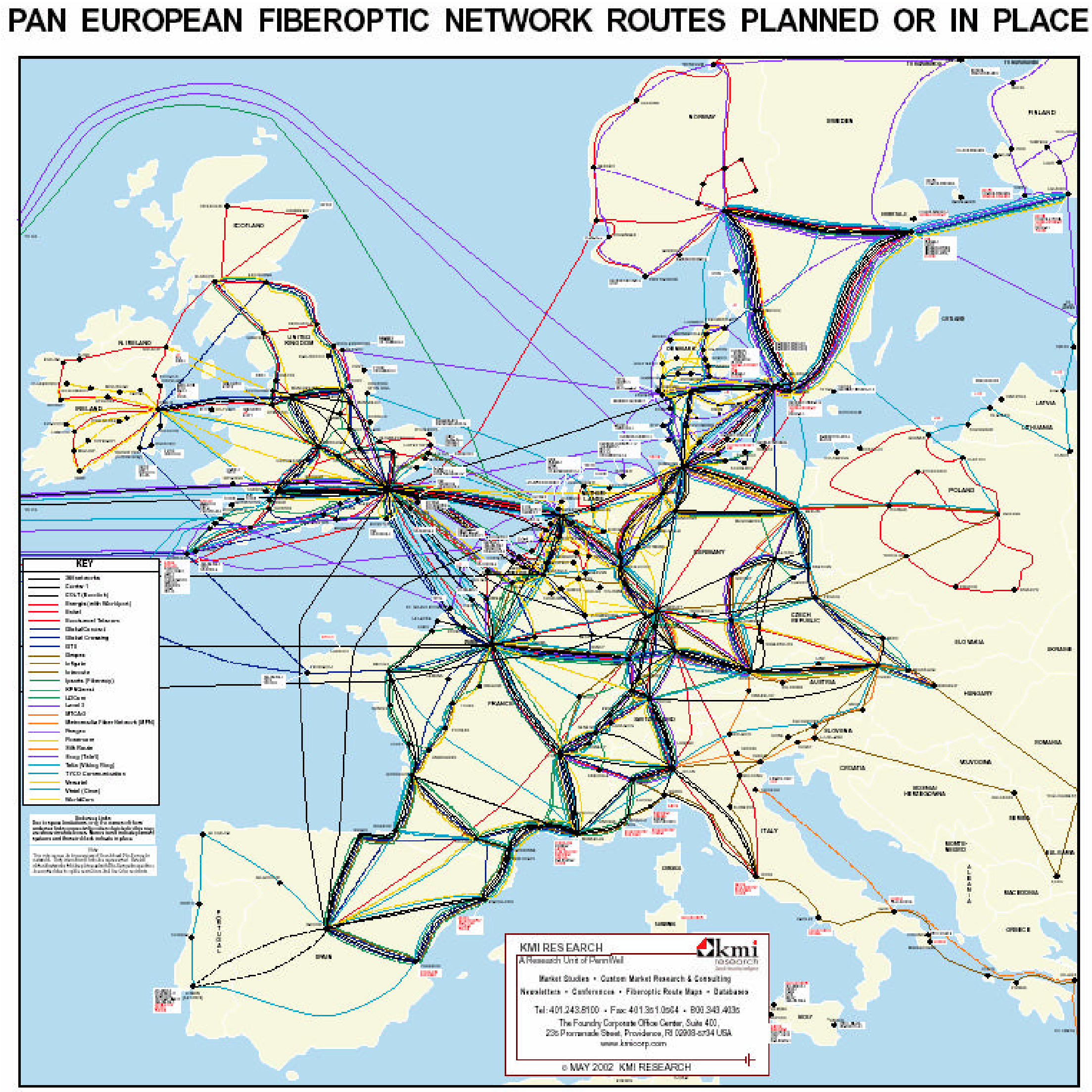
As described in section 5.2 above, following an extensive search process, we selected two sources from which to draw upon to deepen our analysis of pan-European network coverage from a territorial perspective. In this section, then, we take a two part approach to the territorial connectivity of these networks – part 5.3.1 concentrates on analysing the number of deployed networks which interconnect city regions to each other, while part 5.3.2 looks at the size or capacity of these network interconnections between city regions in terms of bandwidth.

The first source was a map of 'Pan European Fiberoptic Network Routes Planned Or In Place' from the telecommunications consultancy KMI Research (see figure 5.7). This shows the full extent of the deployed infrastructures of 27 alternative or competitive (ie non-incumbent) pan-European telecommunications companies across most of the ESPON territory. Patrick Fay of KMI Research explained how the inclusion of networks in the map is decided upon:

> "KMI's definition of pan-European network includes those service providers that installed their own fiberoptic cable in more than one European country. For example, KMI did not classify Energis as a pan-European operator until it acquired EnerTel from Worldport in November 1999. Subsequent to that purchase Energis went on to acquire carrier24 in Germany, and also leased fibers from the Polish railway. Since that time, Energis itself was acquired, as I'm sure you're aware, and has downsized its continental network. EuroTunnel also was included even though its network only extends from France to the U.K.
>
> Some portions of network deployments for many operators include/d leased fibers that use an approximately 20-year indefeasible right of use (IRU.) Global Crossing and KPNQwest leased fibers from Telia, Vattenfall or other providers in Sweden to extend their network footprint. In this instance, KMI does not classify Vattenfall or any other domestic service provider as a pan-European network operator even though some of its fibers are leased to pan-European operators" (Personal communication from Patrick Fay, 21 March 2003).

The map is undoubtedly one of the most detailed available at a European level, and allows us to build on, and fill in the gaps from, the analysis of territorial perspectives on pan-European telecommunications infrastructures of the previous section. The only limitation would appear to be that some of the more recent changes in the telecommunications sector across Europe, particularly the disappearance of some companies and the withdrawal of others from certain markets, are not reflected in the map. For example, our own research shows that Interoute is no longer operating at all, and Energis and Carrier 1 have cut back on their territorial strategies to focus on their traditional markets. Nevertheless, the map illustrates the intended territorial roll-out strategies adopted by major telcos under strong market conditions, i.e., when the market is 'working'.

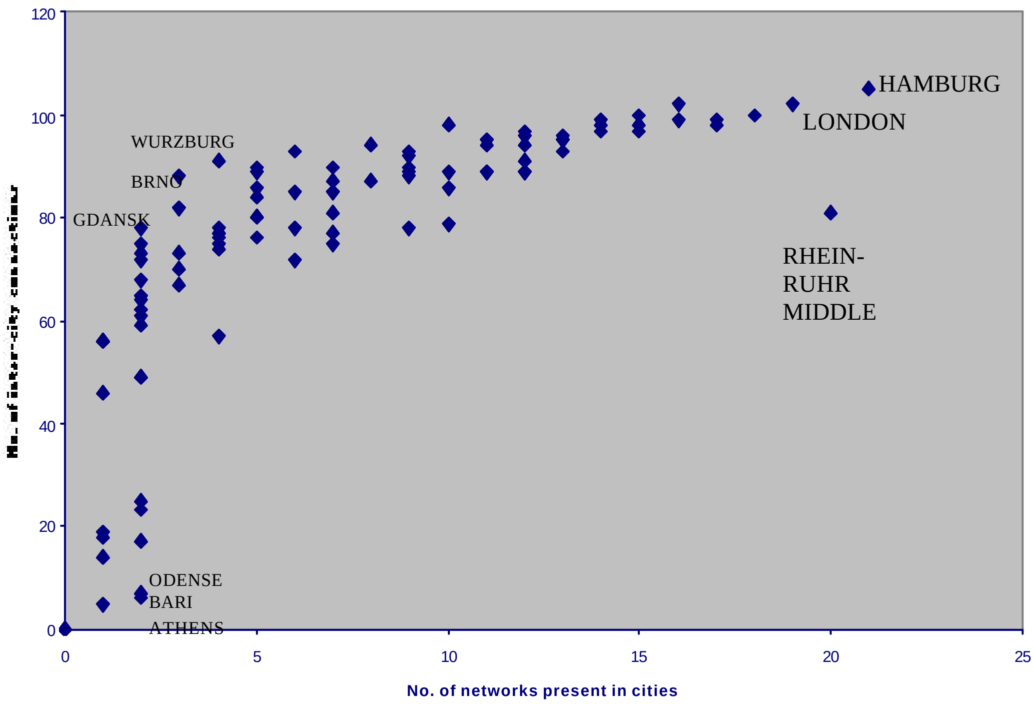
Figure 5.7 The KMI Research map of pan-European telecommunications networks



Map source: www.kmiresearch.com, based on publicly available information or information shared with KMI as of Q3 2001

Figure 5.8 plots the number of pan-European telecommunications networks present in the city regions on our list (see annex 4) against the number of other places which a particular city region is connected to via those networks. As we would expect, the basic pattern is one generally characterised by the more networks present in a city region, the more connections to other places that city region will have. However, the gradient of the plotted points on the graph does not rise very steeply as we move along the 'x' axis, which suggests that the city regions which are on relatively few networks remain very well connected to other places and that the city regions which are on the most networks are not as well connected as might have been expected. In turn, this suggests firstly that there are a small number of very extensive pan-European networks which inter-link a large number of city regions. This would explain how Gdansk has 79 connections to other city regions by being on only 2 of the 27 networks, and Brno has 89 connections from only 3 networks. Both these city regions are on the networks of Energis and Telia, and Brno is also on that of Carrier 1. Secondly, we can also suggest that beyond this small number of extensive networks, there is a larger number of networks which are either somewhat less extensive or simply replicate the routes followed by other networks. This would explain why being on the majority of the 27 networks featured on the KMI map does not lead to a city region having many more inter-city connections. For example, while Hamburg and London appear on six or seven times more networks than Brno, they are linked to less than 20 extra city regions. In conclusion then, the density of networks in a city region does not necessarily appear to closely correlate to significantly greater territorial connectivity on a wider scale. The differences between city region must therefore emerge in the quality and quantity of network connections between the same places, ie the number of networks offering the same route and the amount of overall bandwidth present on that route. These issues will be the focus of the next section.

Figure 5.8 Comparing the number of pan-European networks present in city regions with the number of inter-city connections from city regions



Source: Data from KMI Research map, plotted by CURDS

Table 5.1 shows the inter-city connections with the most number of networks passing along them. We can observe that all the connections take place in a very concentrated core area which extends no further south than Frankfurt. The predominance of large north western German city regions here stands out, although the fact that Dusseldorf appears more frequently on these links than Frankfurt is quite surprising.

Table 5.1 Inter-city connections with most networks along them

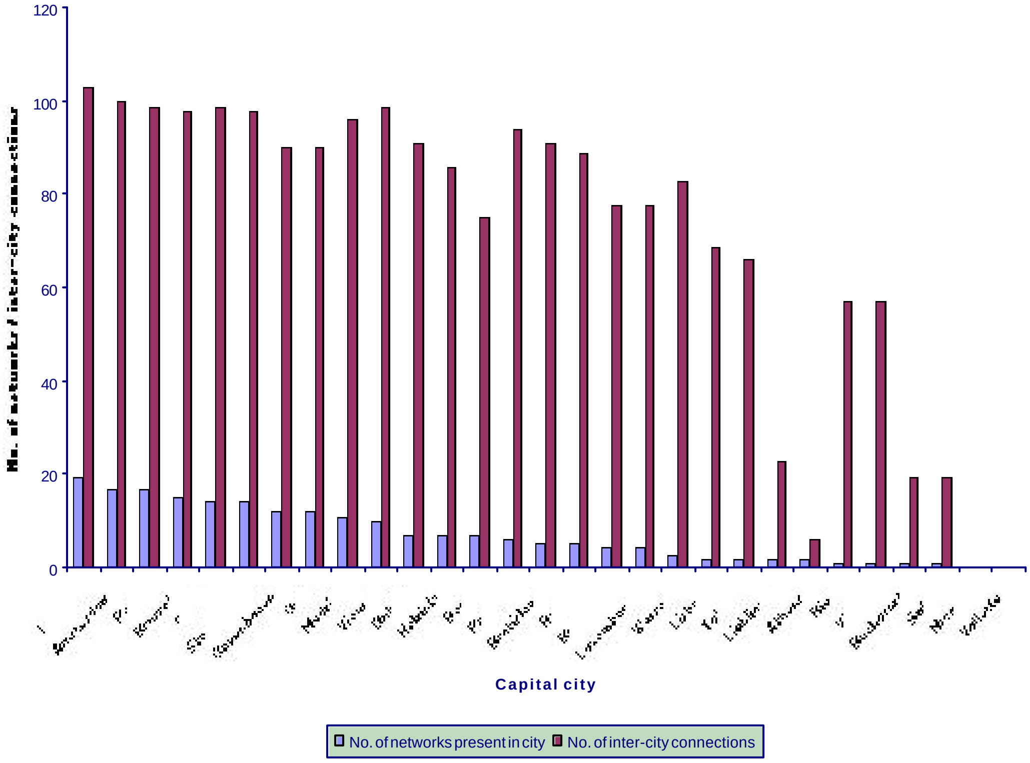
Link	**No. of networks on link**
Hamburg-Dusseldorf	17
Amsterdam-Hamburg	16
Amsterdam-London	16
Amsterdam-	16

Dusseldorf	
Hamburg-London	16
Hamburg-Dortmund	16
London-Paris	16
Amsterdam-Paris	15
Bremen-Hamburg	15
Brussels-Paris	15
Bremen-Dusseldorf	15
London-Dusseldorf	15
Paris-Dusseldorf	15
Frankfurt-Dusseldorf	15
Dusseldorf-Dortmund	15

Source: KMI Research map

Figure 5.9 illustrates the capital city territoriality of pan-European telecommunications networks. The number of networks present in each of the 29 ESPON country capitals and the number of other places these networks link the capitals to are both shown. There are at least two interesting and intertwined territorial perspectives at play here – a centre-periphery perspective at a European scale, and a capital-provincial perspective on a national level. In the first instance, the broad pattern shown in figure 5.9 is one of 'central' or core capital cities on a European level (London, Amsterdam, Paris, Brussels, Berlin) having more networks present and more inter-city connections than more peripheral capitals (Athens, Riga, Bucharest). The main exceptions to this trend are Luxembourg and Rome, which can perhaps be explained respectively by the smaller size of Luxembourg on a national level and the relative peripherality of Rome on a European level compared to Milan, which is more of a focus within Italy for telecommunications investment. In the second instance, we can highlight the greater importance of national capitals which dominate their respective telecommunications markets (London, Paris, Brussels) compared to those capitals which are either not the most important city in their country for telecommunications (Bern, Rome) or are part of a relatively balanced national urban system in which no city really dominates (Berlin).

Figure 5.9 The number of pan-European networks and inter-city connections of capital cities



Source: Data from KMI Research map, plotted by CURDS

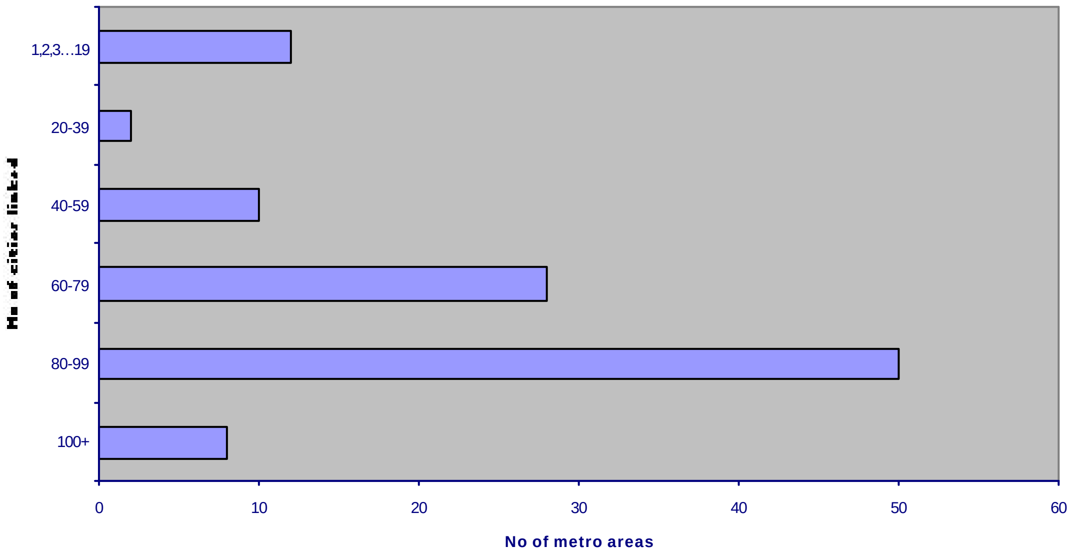
Table 5.2 Eight city regions are linked to over 100 other places

City regions	No. of network links to other city regions
Hamburg	106
London Rhein-Ruhr North (Essen-Dortmund)	103
Rhein-Ruhr Middle (Dusseldorf) Bremen	101
Amsterdam Rhein-Main (Frankfurt) Lyon	100

Source: KMI Research map

The above table lists those city regions with 100 or more network connections to other places according to the KMI pan-European networks map. We can briefly note here the absolute dominance of 'core' city regions, and within this, in particular of the major north western German city regions. In addition, the fact that Lyon is more linked than Paris (albeit very marginally) is remarkable, suggesting the importance of its location linking major Swiss and Italian cities with those of northern Europe.

Figure 5.10 The number of other city regions linked to main European city regions



Source: Data from KMI Research map, plotted by CURDS

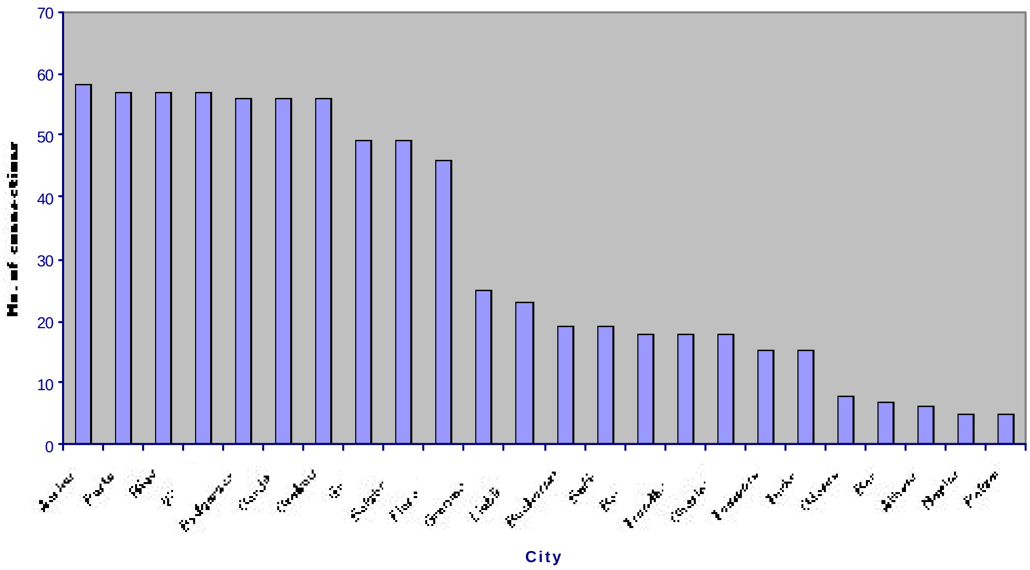
Figure 5.10 illustrates how many European city regions are connected to many other city regions via the pan-European networks featured on the KMI map. We might have expected few city regions to be linked to many other city regions in a clearer core – periphery pattern, but here there is not much of a core – periphery pattern, but a set of European city regions which are generally very highly interconnected between themselves.

Different territorial peripheralities in telecommunications network provision:

The 'core' city regions of Europe tend to exhibit an almost homogeneous pattern of territorial connectivity, with some of them exceeding 100 network connections to other places, and nearly all the other city regions having more than 90 links. There are a few exceptions – Karlsruhe in Germany has 6 networks passing through it, yet only 72 links to other city regions, which actually makes it less linked than Cork in southern Ireland (74 connections via 2 networks). This is all the more surprising given that Karlsruhe is located in the middle of a telecommunications-intensive 'diamond' between Frankfurt, Strasbourg, Zurich and Stuttgart.

The overall situation is much different though when we analyse our data for more peripheral city regions (figure 5.11). For example, a Greek or southern Italian city present on 1 or 2 networks is thus only linked to 5-7 other places, eg Athens, Patrai, Naples and Bari. Meanwhile, however, cities in the Baltic region like Riga and Vilnius are also only present on 1 network, but that network connects them to 57 other places. At the same time, the Polish city regions of Gdansk, Poznan and Warsaw are more connected to other places via 2-3 networks than the locationally less peripheral Leipzig in eastern Germany is via 9 networks. We must clearly, therefore, distinguish both between telecommunications networks in terms of connectivity and territorial extensiveness (in the first case, the Grapes and Silk Route networks serving Greece and southern Italy are very limited in extent compared to the Telia network serving the Baltic), and between peripheral regions across Europe in terms of access to telecommunications infrastructure as there is evidently more than one form of peripherality in European telecommunications territoriality.

Figure 5.11 The city regions with fewest connections to other city regions

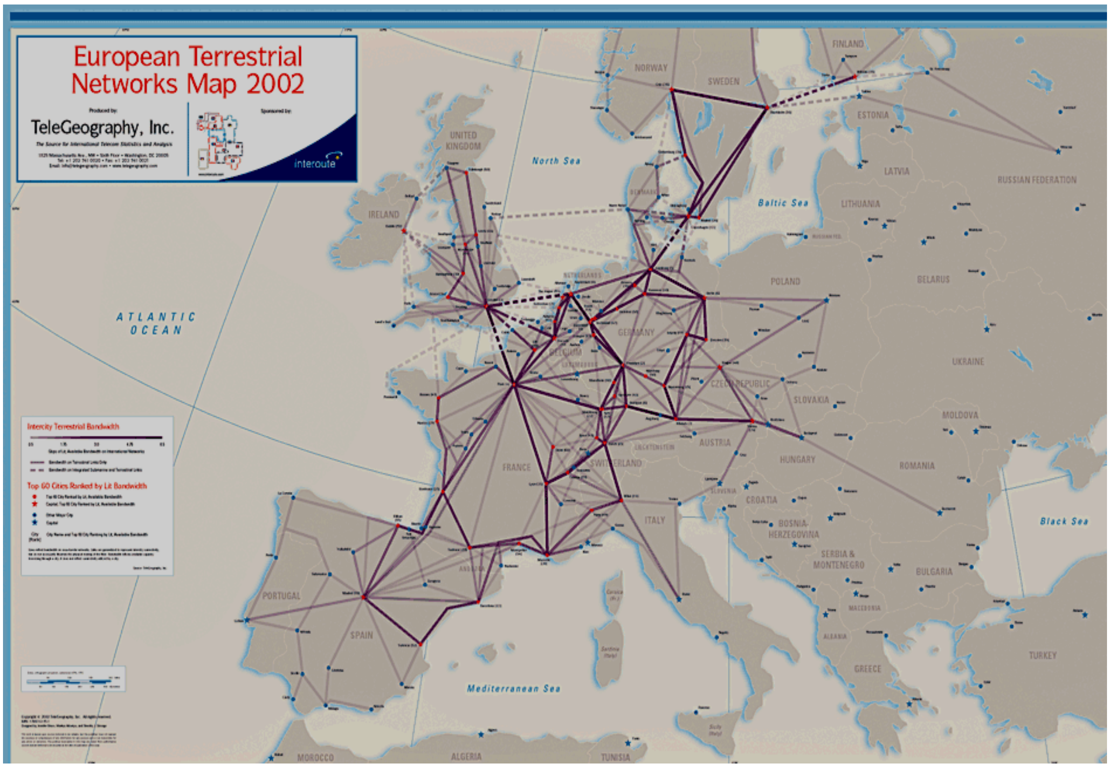


Source: Data from KMI Research map, plotted by CURDS

5.3.2 The territoriality of inter-urban bandwidth capacity

In this second part of section 5.3, we now turn to look at one of the key maps produced by the consultancy Telegeography Inc. Analysis of this map allows us to explore a different territorial perspective to pan-European telecommunications to the investigation of inter-urban network connections in the previous section based on the KMI map. The European terrestrial networks map (figure 5.12) shows measures of total inter-urban bandwidth, thus illustrating how much capacity has been deployed through all the networks present on routes between city regions, irrespective of the actual number of networks. This indicates where the most important connections are, and also which territories are only served by minor connections.

Figure 5.12 European terrestrial networks in 2002



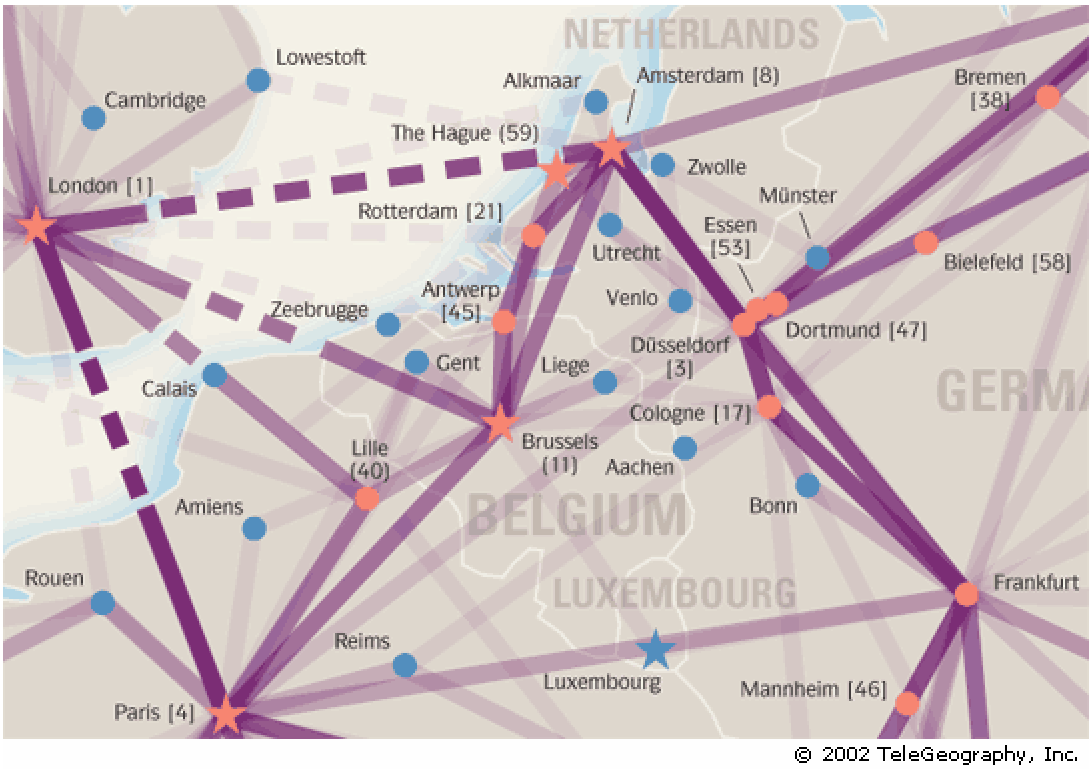
Source: Telegeography Inc. website – http://www.telegeography.com

The Telegeography map of intercity bandwidth connections (see figure 5.12) mainly confirms the general trends in the development of telecommunications infrastructure at the European level. These trends include:

- The predominance of the core area of the EU (the pentagon) as a cluster of bandwidth connections / communication corridors (see figure 5.13 below).
- The most important connections (in terms of bandwidth) are to be found between the major urban (and business) centres of Europe, thus telecommunications can be viewed as largely respecting the traditional European urban hierarchy.
- Both the number of intercity bandwidth connections and the bandwidth capacity of connections (and therefore overall telecommunications accessibility) diminish gradually with distance from the core area.
- Peripheral (and / or rural) areas of the ESPON territory have therefore relatively reduced accessibility to these intercity bandwidth connections (Internet backbone networks).

- The largest national urban centres concentrate the most intercity bandwidth at the European level (eg London, Paris, Madrid).

Figure 5.13 European terrestrial networks in 2002 – 'core' area detail



Source: Telegeography Inc. website – http://www.telegeography.com

Nevertheless, it is possible to identify some points of interest which suggest a certain element of divergence from the above trends:

- The emerging importance of urban centres outside the core area of the EU for attracting bandwidth connections (eg Prague, Toulouse, Leipzig, and, to a slightly lesser extent, Dublin, Oslo). Whilst not yet suggesting any "shake-up in the urban hierarchy" (Malecki, 2002), these city regions might have the potential to become viewed as both 'new network cities' which surpass some traditionally larger city regions (Townsend, 2001; Malecki, 2002), and a crucial part of a more polycentric European urban system.
- Some of these emerging urban centres may be viewed as 'gateway cities' for telecommunications bandwidth connections, in the way in which they act as

links between the core area and more peripheral areas, eg Copenhagen for Scandinavia, Berlin for Poland, Vienna and Prague for south eastern Europe.

- Smaller urban centres are increasingly connected to the largest European city regions, which offers access to large capacity global bandwidth connections.
- Some important urban centres in the core area have relatively limited bandwidth connections for various reasons (eg Rhein-Ruhr North, Rome).
- Unlike the UK, France, Spain or Italy, Germany has numerous urban centres with important intercity bandwidth connections (Frankfurt, Dusseldorf, Cologne, Hamburg, Berlin…), rather than one major centre at which bandwidth concentrates. The urban bandwidth hierarchy for these German centres does not strictly respect the national hierarchy either (eg the most populous urban region Rhein-Ruhr North has only 1 link to other city regions; Leipzig has twice as many links as the much larger Rhein-Neckar urban region).

Table 5.3 Eleven city regions are linked to over 10 other places

City regions	**No. of bandwidth links to other city regions**
London	25
Paris	22
Rhein-Main (Frankfurt)	15
Madrid	14
Rhein-Ruhr Middle (Dusseldorf) Strasbourg	13
Milan Brussels Amsterdam Zurich	12
Lyon	11

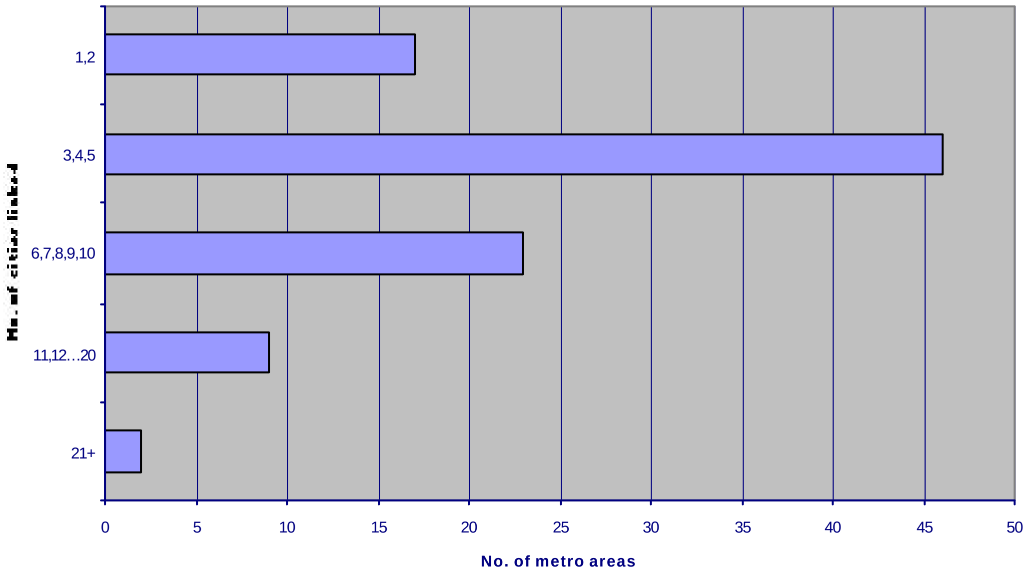
Source: Telegeography Inc. map

Table 5.4 23 Second-Tier Hubs (6-10 city links)

City regions	No. of bandwidth links to other city regions
Rhein-Ruhr South (Bonn-Cologne) Hamburg Copenhagen	10
Berlin Stuttgart Munich Vienna Marseille Hannover Prague	9
Toulouse Leipzig Geneva	8
Barcelona Birmingham Manchester Stockholm Nuremberg Dublin Karlsruhe Oslo Bordeaux Basel	6

Source: Telegeography Inc. map

Figure 5.14 The number of other city regions linked to main European city regions



Source: Data from Telegeography Inc. map, plotted by CURDS

Figure 5.14 shows that, as Malecki (2002) illustrated for the USA, 'few cities are connected to many other cities'. As we saw in table 5.3, only London and Paris connect to more than 21 other places. The slight surprise of this graph is that it shows that there are many more city regions which connect to 3-5 places than city regions which only connect to 1-2 places, whereas we would have expected the opposite finding if the general inverse relationship between number of places linked to and the number of city regions concerned had been respected. This suggests that European city regions are relatively well interconnected in terms of bandwidth links, which is borne out by the Telegeography map where we can see that it only really certain peripheral city regions which are only connected to 1-2 places (Bucharest, Porto, Bergen).

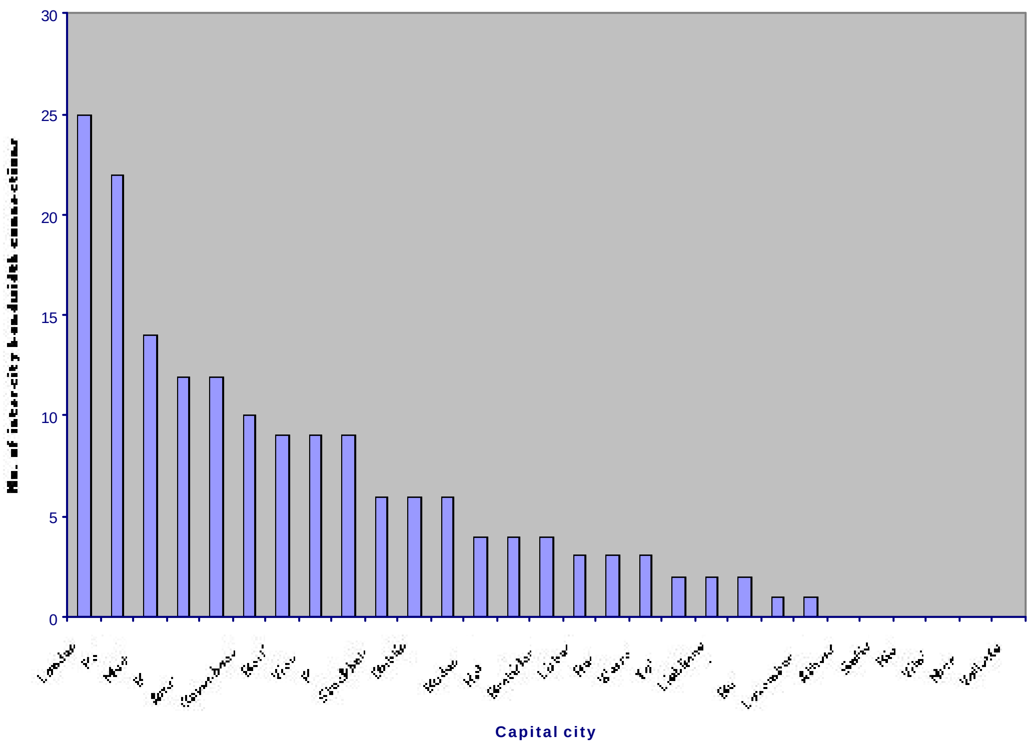
Table 5.5 Major bandwidth routes (4.75-6.5 Gbps)

London-Paris
London-Amsterdam
Frankfurt-Dusseldorf
Frankfurt-Bonn/Cologne
Frankfurt-Mannheim
Dusseldorf-Bonn/Cologne
Dusseldorf-Hamburg
Dusseldorf-Amsterdam
Hamburg-Berlin
Stuttgart-Munich
Hamburg-Copenhagen
Lyon-Marseille

Source: Telegeography Inc. map

Table 5.5 shows the main inter-city bandwidth connections in Europe. This indicates the total size or capacity of all the networks that have been deployed by telcos between city regions. They tend to generally confirm the pattern observed earlier in table 5.1, which showed the number of network connections between city regions. We can note immediately an overwhelming 'core' area dominance, with concentrations between the key business centres. Within this, the major trend is a German dominance with no fewer than 7 intra-German routes among the densest in Europe for bandwidth links. Given this, these inter-city connections tend to be short haul routes as well, as telcos are evidently keen to maximise bandwidth between important, fairly proximate city regions, rather than deploy it along longer routes at greater cost and which might risk remaining under-used. Comparing table 5.5 with table 5.1 suggests that there is a strong correlation between the number of networks and the amount of bandwidth on inter-city routes. Table 5.5 differs slightly as it includes more varied routes extending into eastern and southern Germany, Denmark and the south of France, whereas the routes with the most network connections according to KMI were more highly concentrated in the core area of Europe.

Figure 5.15 The number of inter-city bandwidth connections of capital cities



Source: Data from Telegeography Inc. map, plotted by CURDS

Internet exchange point locations

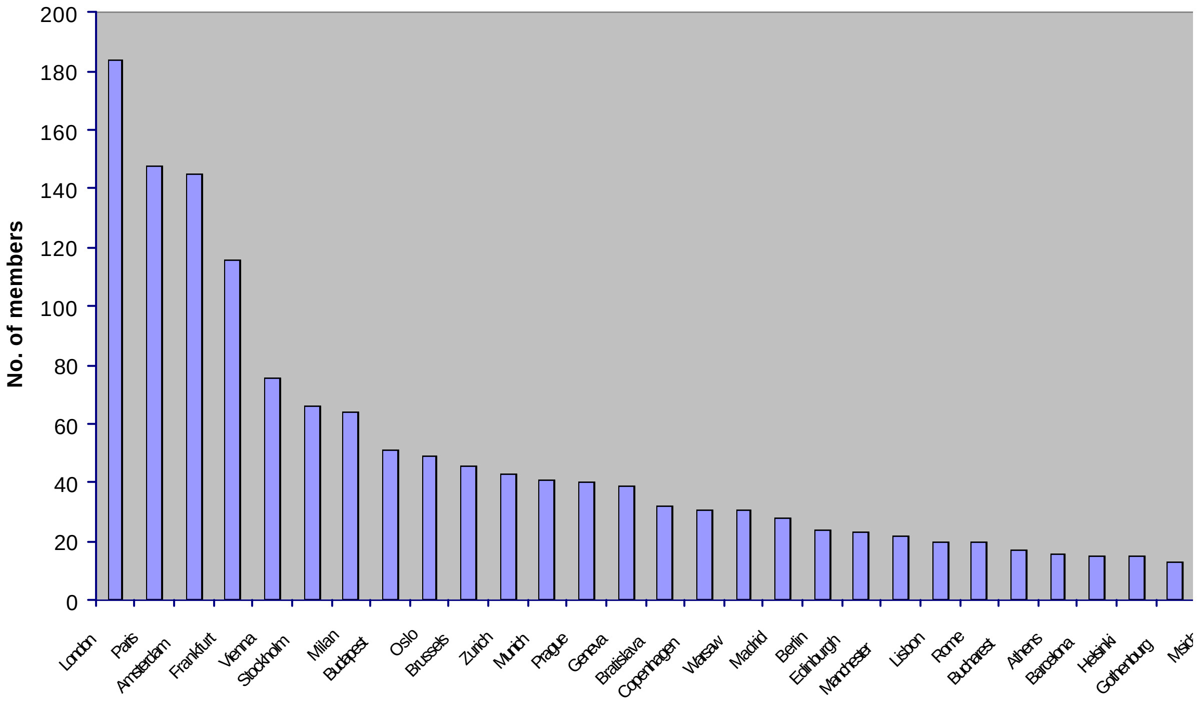
Internet exchange points "are services created to facilitate on-site interconnection between independent or third-party Internet networks [or] neutral meeting grounds for traffic exchange" (Telegeography website – http://www.telegeography.com). They are, therefore, a crucial element in the global Internet infrastructure, as they permit communications to pass between different backbone networks. Consequently, the locations of these points in Europe help us to uncover the territorial dynamics of Internet backbone networks. In particular, it allows us to assess which European city regions are 'accessible' and 'central' for network interconnection, and are therefore well served by these networks, at least potentially offering good infrastructural access to Internet communications.

On the whole, figure 5.16 supports the evidence which we presented in section 5.2 regarding the primary importance of city regions such as London, Paris, Frankfurt and Amsterdam for pan-European telecommunications networks. These city regions also have the largest numbers of Internet exchange point members, which is clearly a related development, as many of these members are likely to be providers or users of the pan-European networks.

In addition, however, we can note the presence of certain city regions in figure 5.16 which seem to be more important as Internet exchange points than the data presented in section 5.2 on pan-European networks might have led us to believe. This may be the case for the capitals of candidate countries such as Budapest, Prague, Bratislava and Warsaw, which are apparently more important exchange points than the likes of Madrid, Berlin, Barcelona or Helsinki. The need of telecommunications and IT companies for network interconnection locations in eastern Europe appears to be growing. These eastern European Internet ‘centres’ may be viewed as crucial ‘regional integration zones’, allowing the more peripheral cities and regions of eastern Europe to develop links to the key ‘global integration zones’ of western Europe.

On a national territorial level, we can again distinguish between countries such as France and the UK where Internet exchange points are mainly clustered in the capital city, and Germany where several city regions have exchange point locations. In the former case, Paris and London points act as interconnection locations for the majority of Internet traffic, whereas in the latter case, backbone networks and their traffic are transferred on a more spatially diffuse level throughout Germany.

Figure 5.16 The number of Internet exchange point members in European city regions



Source: Data from Telegeography Inc. website (http://www.telegeography.com), plotted by CURDS

5.4 Analysis of individual pan-European provider strategies

Identifying the key pan-European players

Undertaking the analytical exercises described in sections 5.2 and 5.3 of plotting the nodes of numerous important pan-European telecommunications networks against a list of 138 city regions allowed us to see which are the most extensive networks on a European level. This, combined with a study of consultant websites and reports, permitted us to construct a list of the main pan-European telecommunications providers, whose network deployment and overall strategies would be worth further analysis as the third part of our investigation into the territorial development and trends of telecommunications across Europe. Table 5.6 lists these providers and the number of ESPON countries in which each has operations or interests.

Table 5.6 18 principal pan-European telecommunications companies and their national market focus

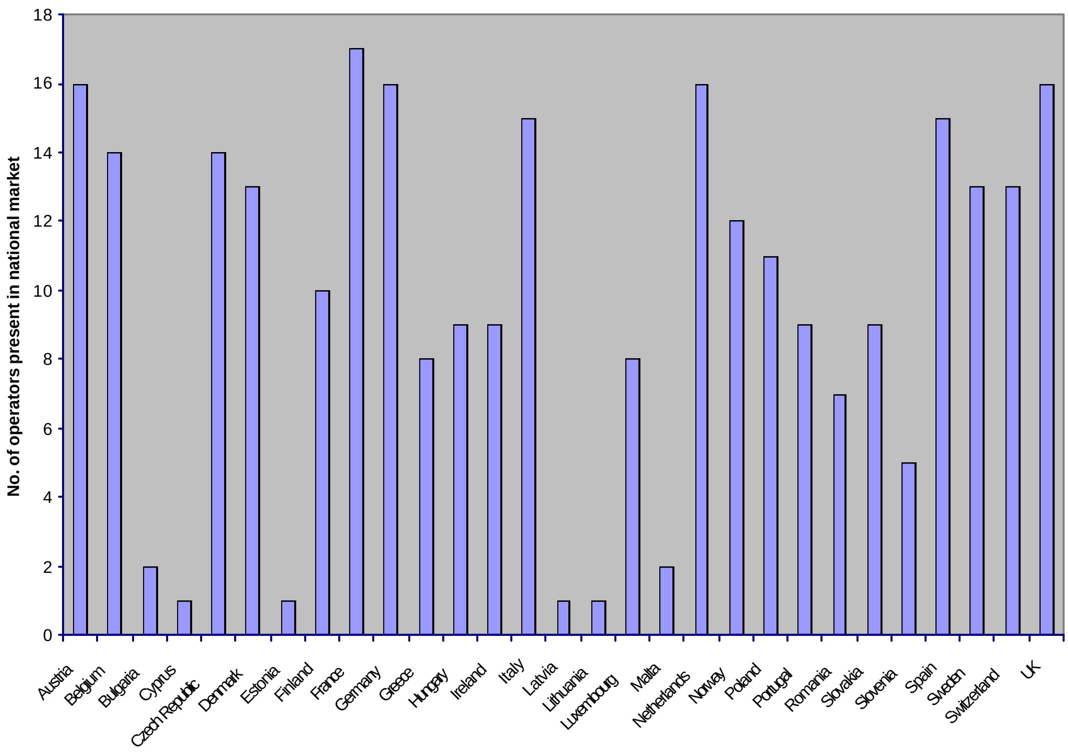
Company	Type	No. of ESPON countries in network
BT Ignite	Fixed (established)	22
Cable & Wireless	Fixed (established)	21
Equant (France Télécom)	Fixed (established)	23
T-Systems (Deutsche Telekom)	Fixed (established)	23
Telecom Italia	Fixed (established)	9
Telefonica	Fixed (established)	16
KPN	Fixed (established)	9
TeliaSonera	Fixed (established)	23
Colt	Fixed (entrant)	14
WorldCom	Fixed (entrant)	16
AT&T	Fixed (entrant)	24
Infonet	Fixed (entrant)	20
Tiscali	Fixed (entrant) / ISP	13
Vodafone	Mobile	17
Orange	Mobile	6
T-Mobile	Mobile	6
TIM	Mobile	8
UPC	Cable	13

Source: Data from company websites

Figure 5.17 illustrates how many of these 18 key pan-European telecommunications providers are present in each of the 29 ESPON countries. Even a fairly simple chart such as this reveals some elements of important territorial differentiation in supply of, and potential access to, telecommunications networks deployed at a European level. Although this chart shows *national* presence and absence of providers, there are clearly similar territorial implications within countries from these patterns of presence and absence of major European telecommunications companies. For example, *regional* and *local* access to backbone networks is likely to be severely limited within those countries where very few providers are present, illustrating again that the territorialities of telecommunications infrastructures are inherently bound up with multiple parallel scalar dynamics.

The countries with only 1 or 2 of the 18 operators present tend to be among the most peripheral of the ESPON territory (Bulgaria, Cyprus, Estonia, Latvia. Lithuania, Malta), while the countries in the core area of Europe are served by the majority of these providers (France, Germany, Netherlands, UK…). Beyond these observations, it is interesting to note that some countries to the east of the core area are surprisingly well served by pan-European network providers, eg Austria (16 providers) and the Czech Republic (14), and to a slightly lesser extent, Poland (12) and Slovakia (10), and this could be seen to constitute a new territorial corridor of telecommunications development and investment. It represents perhaps a search for new national and sectoral markets on the part of the providers to supplement their operations in western Europe, although whether this trend might extend into further more peripheral regions in the near future remains to be seen.

Figure 5.17 Pan-European operator presence in ESPON countries



Source: Data from company websites, plotted by CURDS

The territorialities of their networks and strategies

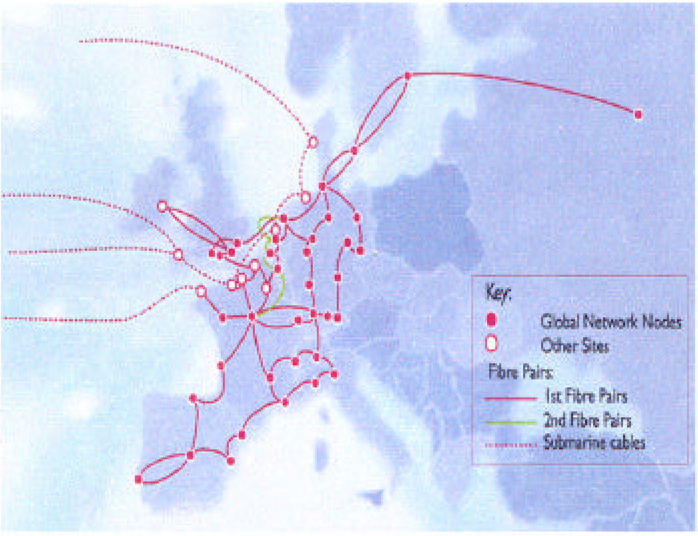
The similarities and differences in the networks and strategies of these pan-European telecommunications companies from a territorial perspective can best be explored initially by taking examples of two major pan-European telcos to illustrate that, as implied by the KMI consultancy at the beginning of section 5.3.1, even within the concept of 'pan-European', there exist strategic differences which are founded on territoriality.

1. Territorially extensive pan-European telecommunications strategies – the case of Cable & Wireless

Cable & Wireless is one of the oldest and most widespread telecommunications companies in the world. Having originated in the United Kingdom, and gradually moved its operations out into the markets of Commonwealth countries, it is now present virtually across the globe through two divisions, Cable & Wireless Global and Cable & Wireless Regional. The latter focuses on 33 countries including those in the Caribbean, the Middle East and South East Asia, but it is the former which concentrates a majority of the operations as it focuses on offering data and voice services within the key US, Japanese and European markets.

Cable & Wireless has extensive operations in Europe, with a presence in 21 countries in the ESPON territory (see figures 5.18-5.21).

Figure 5.18 The pan-European network of Cable & Wireless



Source: Cable & Wireless website – http://www.cw.com

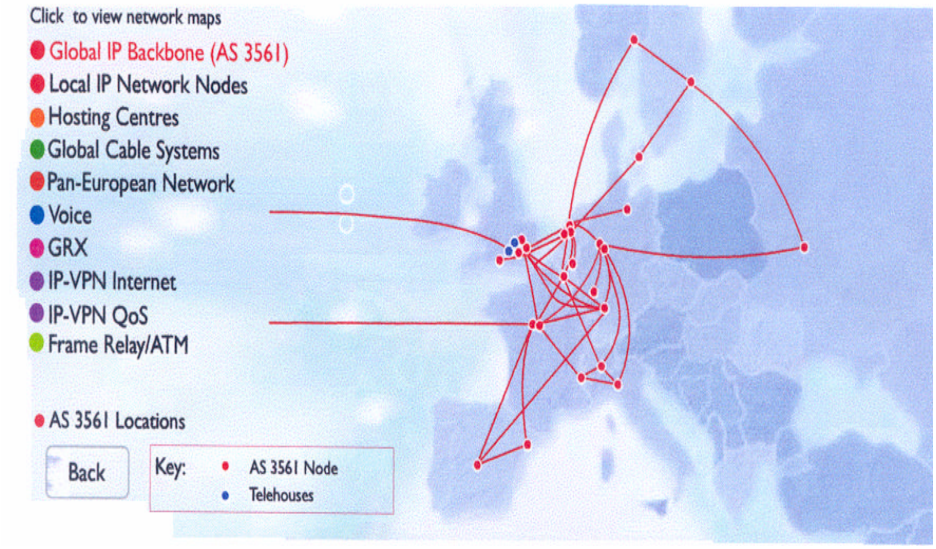
Table 5.7 C&W's 'polycentric' network 'cores' (global nodes / gateway cities to the rest of the world)

City	Locations	Connections
Paris	2	8+1
London	3	6+4+2
Milan	1	2
Madrid	1	3
Frankfurt	2	10+1
Barcelona	1	2
Stuttgart	1	1
Hamburg	1	1
Munich	1	2
Stockholm	1	4
Copenhagen	1	2
Brussels	1	4
Amsterdam	2	11+1
Rotterdam	1	1
Zurich	1	4
Oslo	1	2
Antwerp	1	1
Geneva	1	2

Source: Data from Cable & Wireless website – http://www.cw.com

In addition to these 'core' global nodes, Cable & Wireless also has 160 network 'peripheries' (local nodes / gateway cities to regional and local markets).

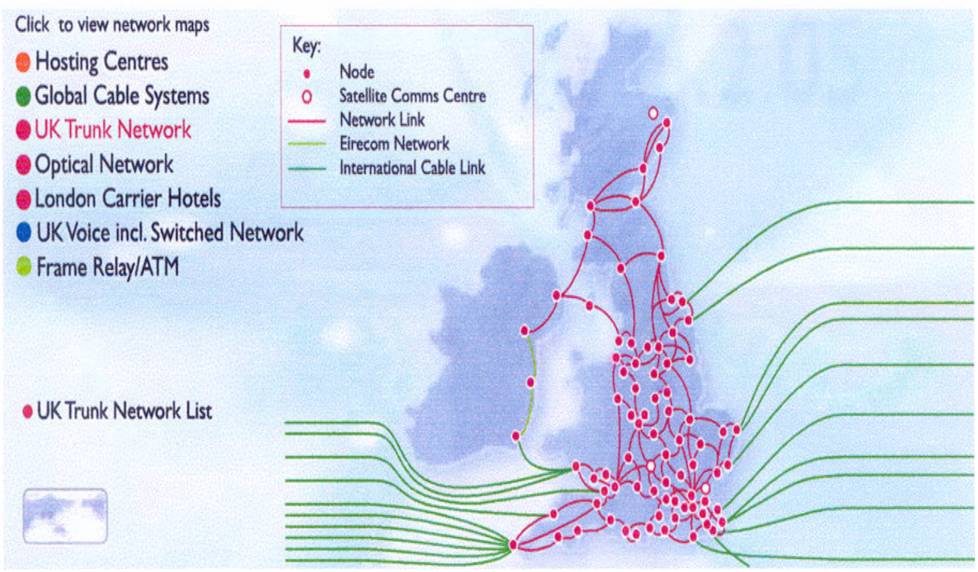
Figure 5.19 The European IP backbone of Cable & Wireless



Source: Cable & Wireless website – http://www.cw.com

Looking at the various maps of the different technological networks of Cable & Wireless across Europe, we remark firstly a broad focus on the 'core' area of Europe (table 5.7), with network extensions or axes to important 'semi-peripheral' city regions such as Madrid, Oslo and Stockholm (see figures 5.18 and 5.19). The relative density of nodes on the maps of their UK trunk and optical networks (with the exceptions of peripheral regions such as northern Scotland, Wales and parts of northern England) shows that the UK has very much been the territorial foundation and precursor to their overall pan-European strategy (figure 5.20).

Figure 5.20 The UK trunk and optical networks of Cable & Wireless



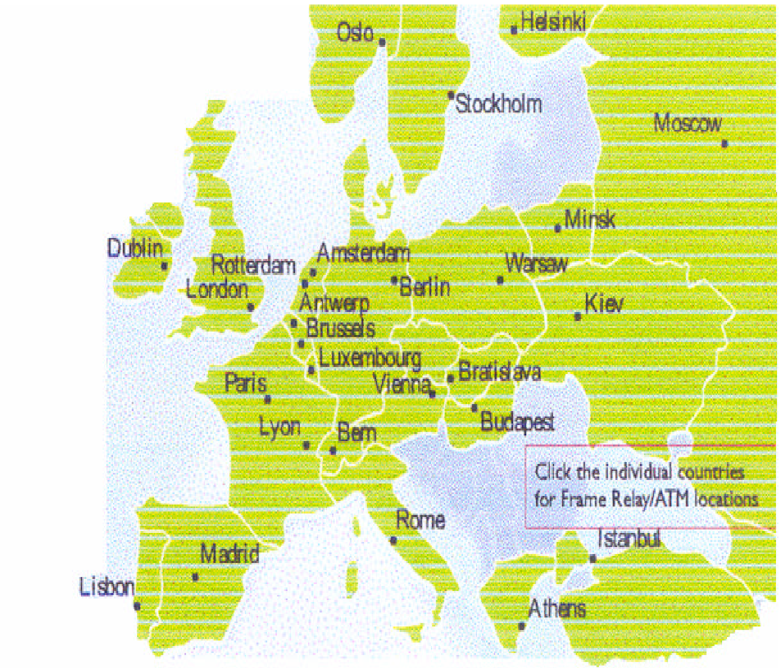
Source: Cable & Wireless website – http://www.cw.com

There is in these maps a fine illustration of the territorial advantage that western Europe and its Atlantic coast areas hold for direct accessibility to trans-Atlantic cables and therefore to US networks. The more peripheral regions of eastern Europe are, in contrast, somewhat disadvantaged by the distance over which pan-European telecommunications companies such as Cable & Wireless have to roll out their cables from these coastal landing points, which becomes an important factor in network provision for these regions.

There is generally limited network provision extending into eastern Europe, and it is notable that whilst their Pan-European Network has not (yet?) expanded to key city regions such as Prague or Budapest (unlike some of their competitors), despite a concentration of global network nodes in Germany and Austria, it has extended from Helsinki into Russia and to Moscow in particular. This is the one of the few examples we have found of Helsinki becoming a 'gateway city' for telecommunications infrastructure deployment towards the east of Finland.

It is curious that Eastern Europe is covered more by the GRX, IP-VPN and Frame Relay / ATM (see figure 5.21) advanced data telecommunications networks of Cable & Wireless than apparently by standard voice and IP networks.

Figure 5.21 Frame Relay / ATM availability across Europe from Cable & Wireless



Source: Cable & Wireless website – http://www.cw.com

2. European telecommunications strategies focused on a regional block – the case of Sonera

Sonera is the Finnish incumbent telecommunications operator, which was privatised and changed its name from Telecom Finland in 1998. Since the beginning of 2003, Sonera has merged its business with Telia, the Swedish operator, to create TeliaSonera, which is now the leading telecommunications group in the Nordic and Baltic region. However, the company continues to operate as Sonera in Finland. The strategy of Sonera in recent years, and probable future strategy of TeliaSonera, is a good illustration of a territorially focused pan-European operation, compared to the more extensive pan-European strategies of companies such as Cable & Wireless.[13] In this way, 'pan-European' does not necessarily have to be equated to territorial extensiveness.

[13] Other 'territorially focused' networks include the Mediterranean roll-out of the Grapes and Silk Route infrastructures between Italy and Greece, and the northern Europe roll-out of the network of GlobalConnect which deploys a 'ring' from Hamburg through Denmark up to Gothenburg.

Executive Vice President Jaakko Nevanlinna and Vice President Tuomo Kokkila of Sonera explain the traditional *regional* focus of their strategy in an uncertain market (Sonera website – http://www.sonera.com):

> JN: “Throughout the 1990’s, the need for network capacity grew tremendously. Many operators saw this as a great opportunity and built or bought new networks locally, regionally and across the globe. Many also established large, heavily manned offices to support their global presence. Needless to say, they made huge investments. As all the new capacity became available, the competition grew fierce and prices crashed. Many operators that went global were suddenly faced with fewer customers, staggering interest payments and impossible business plans.”

Sonera were able to avoid this position due to the nature of their territorial focus:

> JN: “Our fixed network focus has all along been limited to the Baltic Sea region, extended by Russia. In this region, we have our own backbone network. However, even though we have global services and global customers, we have never built global networks. We operate on the principle of partnerships. Rather than trying to conquer large or incumbent operators, we work with them. To do this, we use the concept of network-to-network interconnection, or NNI. In Germany, we have a point of interconnection in Hamburg. When a partner operator in Germany wants a connection to Finland, we interconnect them in Hamburg to Sonera’s network and route their traffic from there. The partner accepts that we are able to guarantee good service in our area, so they see no need to build their own network here. Conversely, if a Finnish customer wants a connection to Germany we interconnect them, again in Hamburg, with a partner’s network. In simple terms, the NNI concept is just an extension of our domestic network.”

Extent of telecommunications infrastructure is not the limit, then, on the territorial operations of a pan-European company, or on the territorial accessibility of customers to the networks and services of the company. Indeed, interconnection agreements between operators are absolutely crucial to the territorial accessibility of telecommunications across Europe, and cities which act as interconnection points therefore become key ‘gateway cities’ for companies to a ‘virtual’ territorial expansion of their service availability:

> TK: “We have an infrastructure of our own in the extended Baltic region. Elsewhere, we work with operator partners using the NNI concept. This keeps us small and agile and allows us to react quickly to market changes. Our key interconnection points are in Hamburg, Frankfurt and London, with one more opening soon in New York. Our headquarters and international sales functions are in Finland. In addition, we find it essential to have local representation in our key sales areas. We therefore have subsidiary companies in Russia, Sweden, Germany, the UK and the USA. These are basically sales offices which serve and stay in close contact with our customers – operators, service providers, Internet service providers, and selected corporate customers which operate as service providers. On the operator front, we are one of the first to focus on both fixed and mobile operator customers.”

Developing a successful and efficient investment and deployment strategy also relies on identifying the technological platforms and infrastructures on which the market will come to focus:

> TK: “In the future, the mobile sector is expected to show the biggest growth. We sell traffic, network capacity and IP products. The telecoms world is moving towards IP, meaning that eventually nearly all traffic will be based on the Internet Protocol. In the IP world, fixed and mobile services will be integrated in one backbone network.”

Sonera seems to be a good example of an important European telecommunications company which has founded its strategy on a focused and traditional territorial market, which can be ‘virtually’ extended by agreements and partnerships with other operators rather than infrastructure build-out. The recent merger with Telia will presumably extend their potential pan-European territorial market access even further (see figure 5.22), although the operations of Sonera itself are to remain focused on the domestic Finnish market.

Figure 5.22 The pan-European network of TeliaSonera

Source: TeliaSonera website – http://www.telia.com

3. Examples of the networks of other pan-European providers

BT Ignite

The UK incumbent has a POP (point of presence) in 60 of the 138 city regions in our list and Metropolitan Area Networks (MANs) in 25 city regions. The extent of their 57,000 kilometre pan-European fibre optic network (figure 5.23) appears quite similar to that of Cable & Wireless, with extra extensions into eastern Europe to Warsaw (from Berlin and Prague), Bucharest (from Budapest) and Ljubljana (from Vienna).

Figure 5.23 The pan-European network of BT Ignite

Source: BT Ignite website – http://www.btignite.com

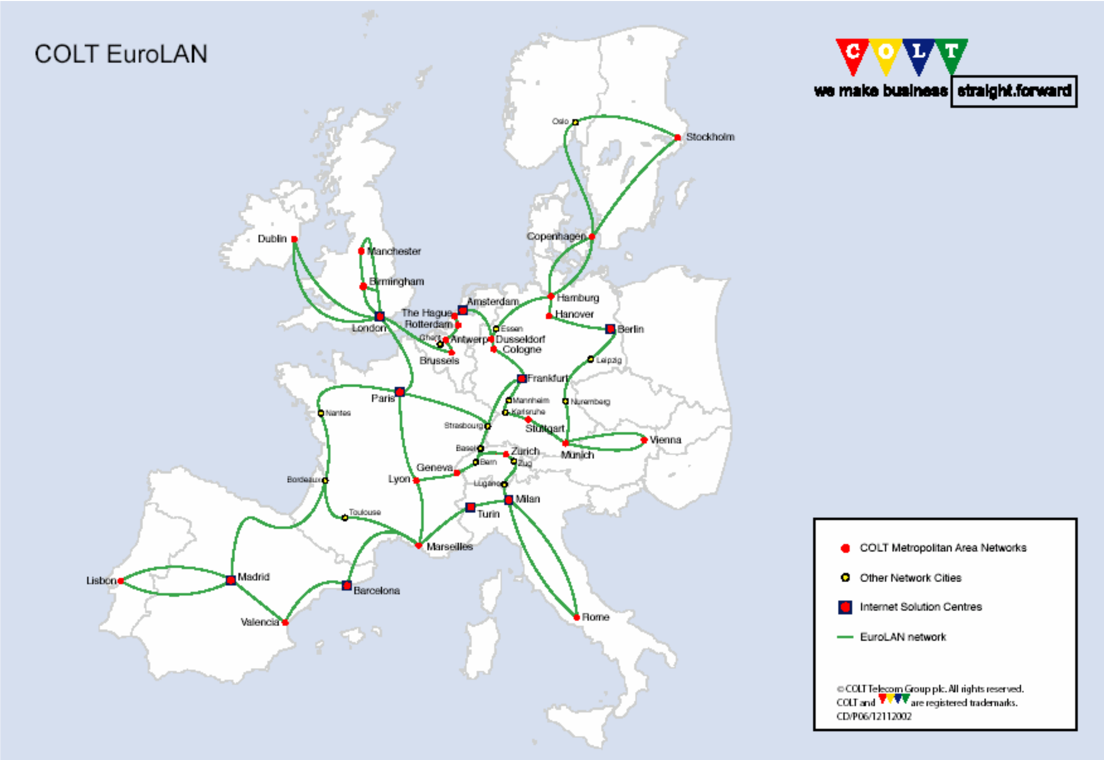
Ignite has particularly extensive networks throughout Ireland, Belgium, the Netherlands, Germany and Spain, but surprisingly limited network penetration into Italy. The Yankee Group consultancy summarises, nevertheless, how BT Ignite has:

> "a solid European in-country network presence… support[ing] its target customers – multisite corporations and governments. BT retains a leading position in the key UK market. With its leading market share in the local access market, BT has built a solid customer base. This market represents about 75 percent of BT Ignite's annual revenue. The company can leverage this position to penetrate continental Europe" (Yankee Group, 2003 – http://www.yankeegroup.com/public/products/research_note.jsp?ID=9624).

Colt

Having originated in a very small territorial market (Colt – City of London Telecommunications) in the early 1990s, Colt has since been one of the key 'internal' (from within Europe) new entrants on to the pan-European market with its 'hub and spoke' EuroLAN infrastructure. It has MANs or POPs in over 40 city regions, and concentrates on serving these city regions via small network 'rings' which loop between two or more city regions. At the edges of the network, these rings are smaller than at the core, eg Madrid-Lisbon, Milan-Rome, Munich-Vienna. The core ring runs between London-Paris-Strasbourg-Frankfurt-Amsterdam-Brussels-London, but what is interesting from figure 5.24, and compared to other companies, is the lack of direct link between Paris-Frankfurt, Paris-Brussels, or indeed London-Frankfurt.

Figure 5.24 The pan-European network of Colt



Source: Colt website – http://www.colt.net

WorldCom

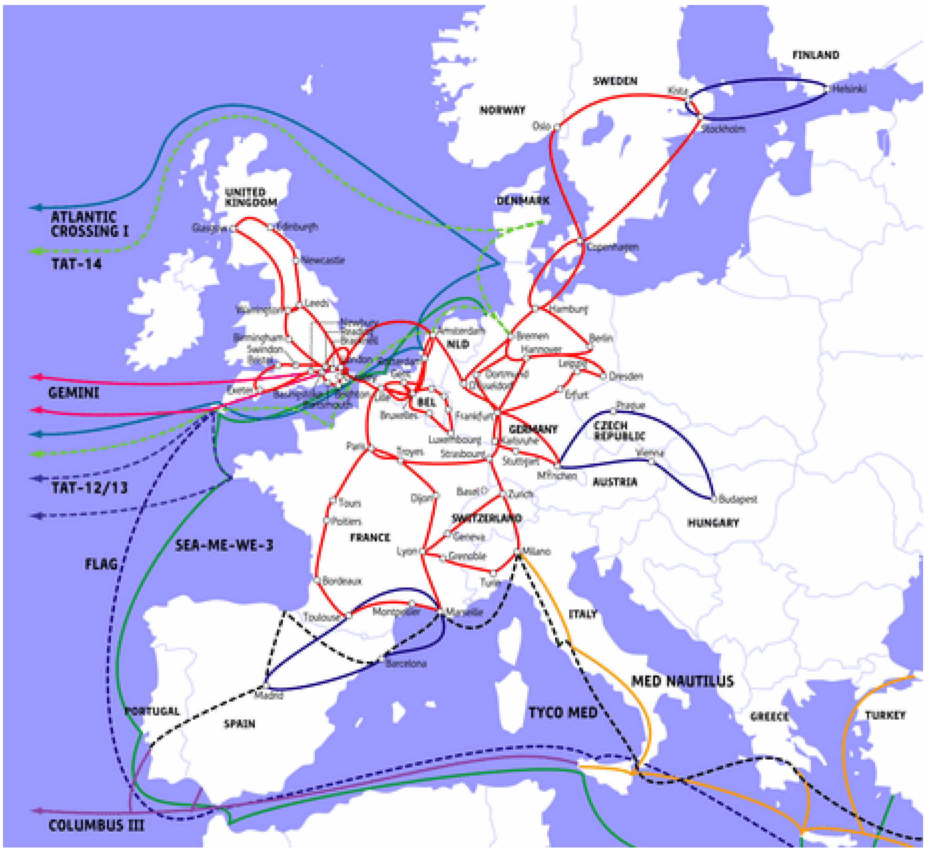
The US telecommunications company WorldCom has been one of the key 'external' (from outside Europe) new entrants on to the pan-European market, despite recent difficulties, which saw it forced to apply for Chapter 11 protection in the United States following a financial accounting scandal. Despite this, it is held that its European operations have been virtually untouched by these problems.

42 of our 138 city regions are present on its international network, but figures 5.25 and 5.26 illustrate the 'core' focus of this presence. Extensions of its operational network into Scandinavia and Scotland are rare excursions into more peripheral regions, although WorldCom also offers managed end-to-end capacity between Stockholm and Helsinki, and in a ring from Munich-Vienna-Budapest-Prague-Munich.

Like our discussions of Cable & Wireless earlier, figure 5.25 also demonstrates the important locational advantage of good access to subterranean cable systems, in particular those crossing the Atlantic to New York and Washington, which offers part of the explanation at least for the predominant position held by London in pan-European telecommunications (the Gemini cables, for example, run straight into London from New York).

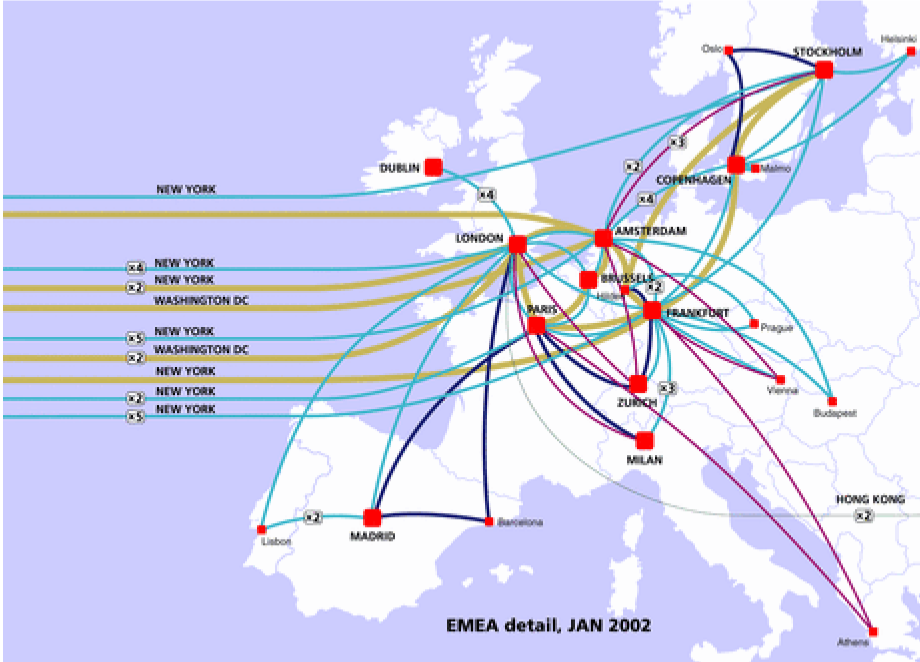
The WorldCom IP network (figure 5.26) also offers an interesting single network perspective on the Telegeography bandwidth map we analysed earlier. The largest bandwidth connections (2.5 Gbps) are again present between key city regions such as London-Paris, London-Amsterdam, and Paris-Frankfurt, but here, WorldCom has more significant links to and within Scandinavia (Brussels-Stockholm, Frankfurt-Copenhagen, Copenhagen-Stockholm). In contrast, bandwidth connections to more peripheral city regions such as Lisbon, Athens, Budapest and Prague are of relatively small capacity (155 Mbps or less), suggesting some degree of ‘friction of distance’.

Figure 5.25 The intra-continental presence of WorldCom’s network



Source: WorldCom website – http://www.worldcom.com

Figure 5.26 The pan-European IP network of WorldCom



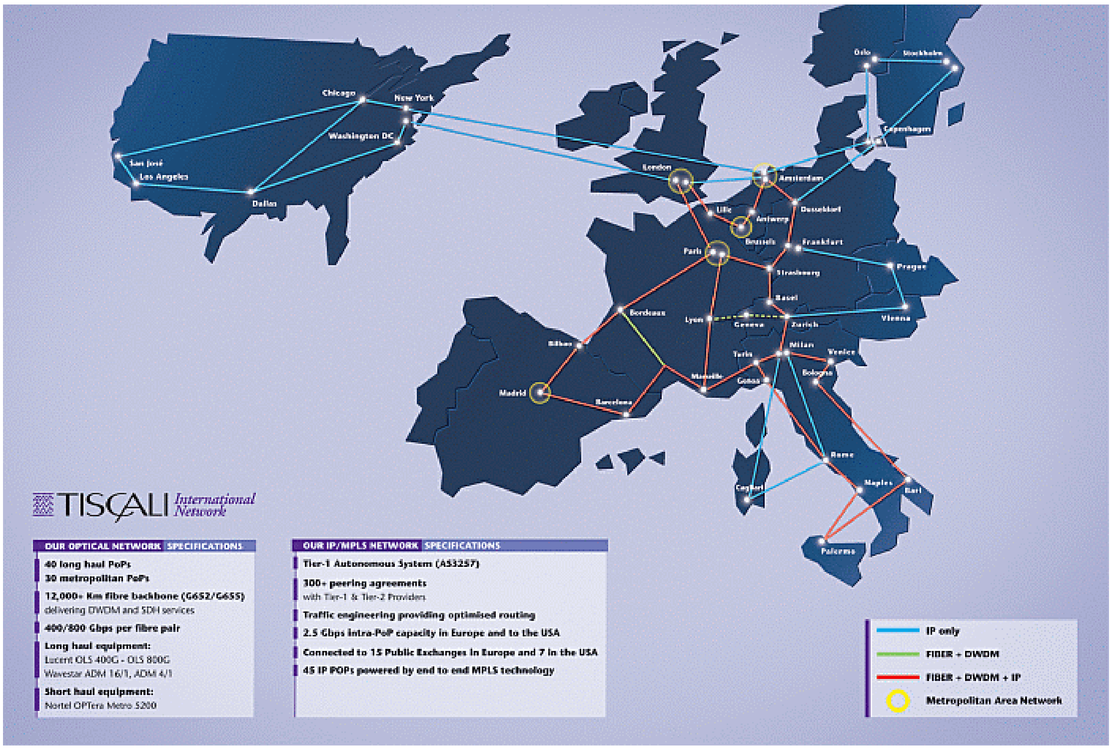
Source: WorldCom website - http://www.worldcom.com

Tiscali

Tiscali has built itself up from being a domestic Internet Service Provider in the Italian market to being a pan-European (present in 13 of the 29 ESPON countries) Internet Service Provider and telecommunications operator in a short space of time. It purchased the backbone network of NETs in order to give itself the means for this territorial expansion.

Figure 5.27 highlights the main strands of this strategic expansion. Its densest infrastructural capability (fibre, Dense Wavelength Division Multiplexing and Internet Protocol) is concentrated on linking 'core' city regions plus its traditional domestic market in Italy. Where Tiscali has chosen to expand into Scandinavia (to Copenhagen, Oslo and Stockholm) and central and eastern Europe (to Vienna and Prague), it has only deployed its IP network infrastructure.

Figure 5.27 The pan-European network of Tiscali



Source: Tiscali website – http://www.tiscali.com

5.5 Future supply side research

We have presented in this chapter a detailed territorial analysis on the results of the data collected on the supply of telecommunications networks and services at a European level. These results have begun to draw out and highlight some of the key territorial dynamics of and implications from the deployment of telecommunications infrastructure across Europe, notably beyond a simple core and periphery form of analysis. It is nevertheless envisaged that this research will be built on the later stages of the project. It is hoped that the data uncovered so far will be supplemented by interviews with telecoms, both national and pan-european.

It is also intended to carry our further statistical analysis, mapping and modelling of our existing telecommunications network data to highlight pertinent territorial perspectives. It is envisaged that this will add an additional analytical layer to our existing analysis. Such statistical analysis and modelling of telecommunications data has been very rarely undertaken, so we would envisage offering a fresh and innovative perspective on telecommunications territoriality to complement our other results and analyses.

5.6 Conclusion

Much of the evidence in this chapter from our research into the supply side of telecommunications networks at a European level confirms the view of the European Spatial Development Perspective on the importance of the concept of 'polycentricity' in the future. The broad 'hub and spoke' geographies of telecommunications infrastructure deployment have a crucial 'polycentric' component, yet this requires further elaboration because both the concept itself and the process of telecommunications deployment across Europe have particularly complex implications for territorial development and cohesion.

In the first case, Peter Hall has written about how "it is necessary to realise that the central word, *polycentric*, needs to be carefully defined: it has a different significance at different spatial scales and in different geographical contexts" (Hall, 2001, p9). At a European level, this would mean promoting 'sub-global' cities such as Brussels and Frankfurt rather than 'global' cities like London. Other activities could be diffused down to 'regional capitals' such as Copenhagen, Rome and Madrid, "each commanding a significant sector of the European territory" (Hall, 2001, p9). Further down the scale, polycentricity can also refer to the changing roles of large cities vis-à-vis smaller cities within their hinterlands, as around London, and then in more peripheral regions, the key might be to promote the development of 'regional capitals' of between 200,000 and 500,000 people or 'county towns' with populations of 50,000-200,000 (Hall, 2001, p9-10). In this way, the concept of 'polycentricity' becomes a pertinent illustration of the way in which territoriality has become more and more bound up in parallel and intertwined spatial scales, rather than the traditional distinct hierarchy of scales that we are used to.

We can suggest that this vision of a parallel and intertwined scalar polycentricity finds a very good illustration in the deployment of telecommunications infrastructures across Europe. Our analysis of the KMI and Telegeography maps in this chapter began to draw out some of the different territorial dynamics and implications across different spatial scales as Hall suggests above. It is clear, for example, that while pan-European telecommunications companies have traditionally viewed the 'global' cities of London and Paris as a crucial territorial foundation to their overall pan-European strategies, other cities and network links have almost become as important – the 'sub-global' centres of Hamburg, Dusseldorf and Amsterdam are more or less the equals of London and Paris in terms of network presence, and according to the Telegeography map, routes such as London-Amsterdam and Dusseldorf-Hamburg have similar bandwidth provision (4.75-6.5 Gbps) to London-Paris.

Looking at our research, it is possible to identify a number of 'regional capitals' in terms of telecommunications network provision. Madrid, Copenhagen and Vienna, for example, could all be said to be the leading urban centres for telecommunications in part of the European territory (Iberian peninsula, Scandinavian gateway, central Europe and eastern European gateway respectively).

The development of a polycentric form of telecommunications territoriality at lower levels based around the 'spheres of influence' of large cities may be seen to be of two types. Firstly, the national territorial dominance of cities such as London and Paris has been such that telecommunications network deployment in the UK and France has been very much organised in relation to these cities. There is some limited evidence so far of national territorial polycentricity in telecommunications here – Birmingham, Manchester and Bristol are all increasingly important centres for telecommunications concentration, although still in the shadow of the capital, while Lyon, Strasbourg and Bordeaux have all profited from their 'gateway' locations (towards Italy and Switzerland, Germany, and Spain respectively) to improve their network presence and connectivities. Secondly, on a finer scale, smaller cities within the wider hinterlands of these key cities can be seen to have been able to participate in telecommunications network deployment, eg Reims and Rouen in the Bassin Parisien, and Reading and Cambridge around London, albeit largely through profiting from their proximate links to the capital city.

In countries without a real single dominant and influential large city such as Germany, a more tangible polycentric form of telecommunications territoriality has been able to develop. For example, many of the most important direct bandwidth connections in Europe are between German cities according to the Telegeography map, and there are no less than six German city regions with more than 15 alternative networks present according to the KMI map (Hamburg, Rhein-Ruhr North, Rhein-Ruhr Middle, Bremen, Rhein-Main, and Munich). Both the overall centrality of these city regions and their particular 'gateway' locations (eg Hamburg and Bremen link towards Scandinavia, Munich towards eastern Europe, the Rhein-Ruhr cities towards France and the Benelux) are principal reasons for the promotion of this polycentricity.

Within this enlarged territorial notion of differing 'polycentricities', the concepts of 'development corridors' and 'gateway cities', also discussed in the ESDP, would appear to offer some resonance as possible means to promote polycentric forms of telecommunications territoriality throughout Europe.

Peter Hall talks about 'development corridors' from a public transport perspective, suggesting the need for decentralised 'clusters of urban developments' around train stations and motorway interchanges at quite a fine spatial scale (Hall, 2001, p9). A telecommunications perspective on 'development corridors' may equally take a smaller territorial approach, focusing on groups of (broadband enabled) local exchanges and network interconnection points as potential decentralised 'cluster zones', where access to infrastructures and services can be facilitated, but wider scale 'development corridors' related to current and future pan-European telecommunications network deployment could well be a more preliminary approach given the inherent 'territorial corridor' nature of this deployment generally.

A brief look at the KMI and Telegeography maps, plus the maps of individual pan-European telecommunications companies, suggests a broad pattern of connected 'corridors' and 'rings' across Europe along which networks are deployed. These are, then, already the main telecommunications 'development corridors and rings' on a European scale. However, many of the networks deployed along these corridors are meant purely to connect the two urban centres at either end without offering any kind of connection to the intermediate territory, thus they are characterised by a so-called 'tunnel effect', which is rarely beneficial for territorial cohesion. The largest inter-city bandwidth connections will always be routed directly between key cities such as London and Paris, Paris and Frankfurt etc to serve as efficiently as possible the most profitable customers of telecommunications companies located in those cities. The parallel is often drawn here with the high-speed train, by explaining how if a high-speed train starts to stop at all the intermediate points on its route, it stops being a high-speed train. Beyond these ‘fat pipe’ routes however, the KMI map, for one, illustrates quite clearly that many pan-European networks are deployed to serve not only the key cities but those smaller cities which are located along their routes, thus reducing the ‘tunnel effect’ of their deployment strategies. This pattern can also be seen from our analysis of the number of connections to other places which each city has via pan-European networks, where we saw that despite quite large variations in the numbers of networks present in cities, there was not really a similarly large variation in the number of inter-city connections, therefore the likes of Brno and Gdansk were still connected to a large number of other European cities in spite of being on very few networks. There appears, therefore, to be some potential for conceptualising and taking into account in policy development the ways in which European cities, and perhaps more peripheral cities in particular, are benefitting from being located along telecommunications network ‘development corridors and rings’. Being connected via these corridors and rings to many other places is a significant factor which could promote a more ‘polycentric’ telecommunications territoriality in the future.

‘Gateway cities’ would also appear to be a key concept for discussion of forms of ‘polycentric’ telecommunications territoriality. In the same way as the ‘polycentricity’ concept itself, ‘gateway city’ must have ‘different significance at different spatial scales and in different geographical contexts’. London and Paris may be viewed as networked cities which are on one level ‘gateways’ to the global ‘space of flows’. Equally, and at the same time, by being the primary focus of important bandwidth connections to the UK and France, they are the national ‘gateways’ for pan-European networks to reach other cities in their respective countries. They are also gateways to their own urban hinterlands and the further development of connectivity of smaller cities within these hinterlands.

However, the major meaning of ‘gateway cities’ would appear to be at a regional European level, where certain cities concentrate networks and bandwidth connections which ‘pass through’ them or are re-routed from them to significant sectors of the European territory. Copenhagen does this for many of the pan-European networks which come from Germany and are destined for Scandinavia. Vienna has good network presence and quite large bandwidth connections because it acts as a ‘gateway’ between the core area of western Europe and the relatively new telecommunications markets of eastern Europe. Southern French cities such as Bordeaux and Montpellier must be passed through for those pan-European networks which have been deployed in Spain and Portugal. This trend has already had important polycentricity implications because all these ‘gateway cities’ have become more crucial to the overall functioning and roll-out of pan-European telecommunications infrastructure than they would have been previously.

Chapter 6 Preliminary Policy Recommendations

6.1 Introduction

ESPON 1.2.2 focuses on telecommunications networks and services and it is this which we address in terms of preliminary policy recommendations. It is worth reiterating (as we pointed out in our first interim report), however, that infrastructure questions should be addressed in tandem with other questions including demand stimulation, content provision, education and training, e-government and so on, as, indeed, is the case in the eEurope Action Plan 2005. The territorial focus of ESPON 1.2.2 is regional and we concentrate on policies relating to the regions, though, of course, these policies may be designed and articulated at the European, national, regional or even local levels.

Our line of thinking, in respect of policy, has not changed radically since the first interim report and so readers are referred to the chapter 7 of that report – Preliminary Policy Directions. In the first section we build on some elements from the first report, focusing on the need for public intervention around *broadband* infrastructure.

The other sections of this chapter focus on the need for the regional question to become more central to the eEurope Action Plan process and the need for a more territorially focused approach to benchmarking indicators, data and statistics.

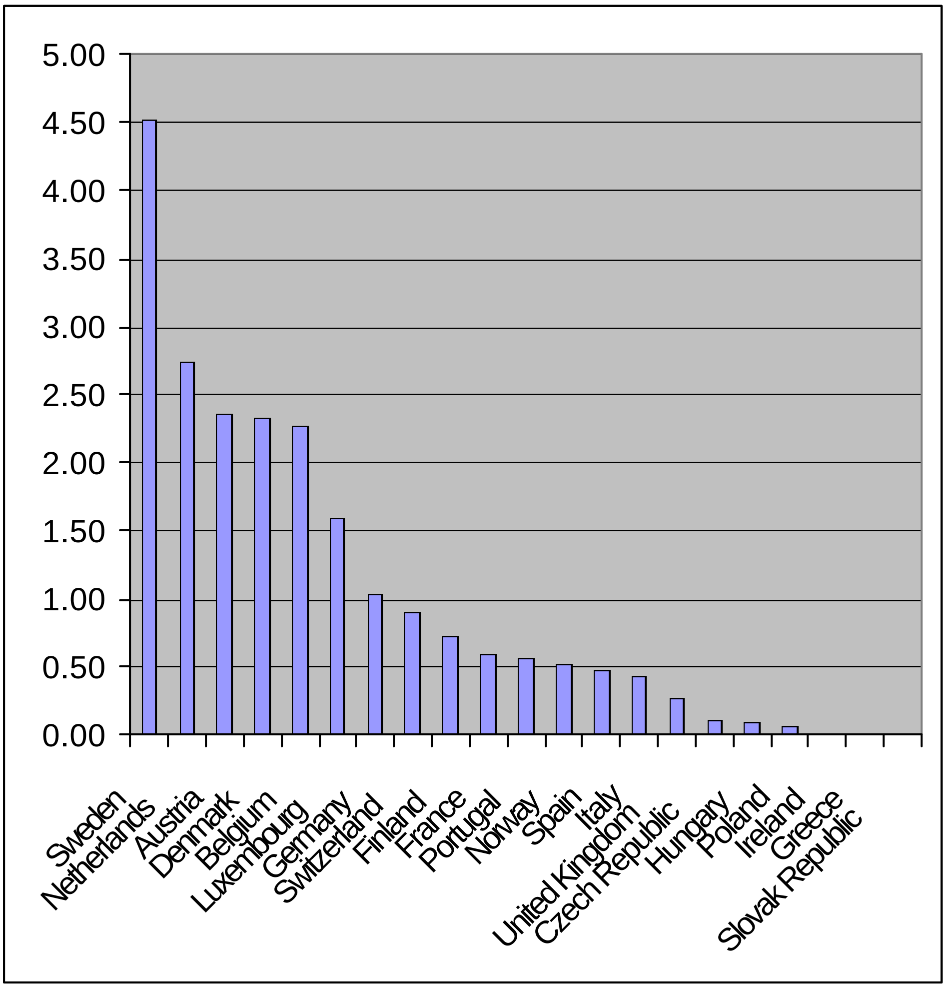
6.2 Public intervention to ensure more territorially even access to advanced technologies

This section concentrates on broadband technologies. Broadband has been identified as a key technology (or set of technologies) in facilitating the growth of the Information Society. It is worth drawing attention here to the concept of "broadband for all" which brings together the idea of providing broadband services in a cost effective way for both households and firms, irrespective of location (urban/rural, profitable/non-profitable areas) and social class. From a regional perspective, it is generally accepted within the ICT-interested regional policy community that broadband technologies are a necessary (though not sufficient) condition for economic, social and community development in the construction of eRegions. For example, there is a belief that broadband will become an essential tool of knowledge-based enterprises. Such enterprises will not be established in, or be able to survive in, locations where (cheap) broadband access is not available. The importance of Broadband is recognised in the eEurope Action Plan, 2005, specifically mentioning potential territorial disparities.

On the regulatory front, at the European level, however, the potential importance of broadband as a development tool has not been taken into account. The dominant political belief with respect to TN&S developments is that deregulation and full competition will maximise social benefits. The current dominant regulatory paradigm is based on this belief, though several regulators have been criticised for doing insufficient to ensure competition. The current regulatory system also largely ignores territorial differences. Although the Universal Service Directive (USD) makes it clear that Internet access is a basic service, broadband access (or even ISDN access) is not. The USD of course represents a minimum requirement for EU members and there is some scope for individual regulatory regimes to specify other requirements so long as they do not distort competition.

Our first interim report pointed to (see figure 19 in SIR for detailed commentary) clear territorial differences in broadband penetration across Europe. We re-present that figure below (figure 6.1) for the convenience of the reader. The figure shows significant territorial differences. Patterns are not clear cut, but by and large there is a north-south and west-east disparity in favour of the north and west. We will explore these differences further in WP3, subject to data availability.

Figure 6.1: Broadband Penetration per 100 inhabitants (2001)

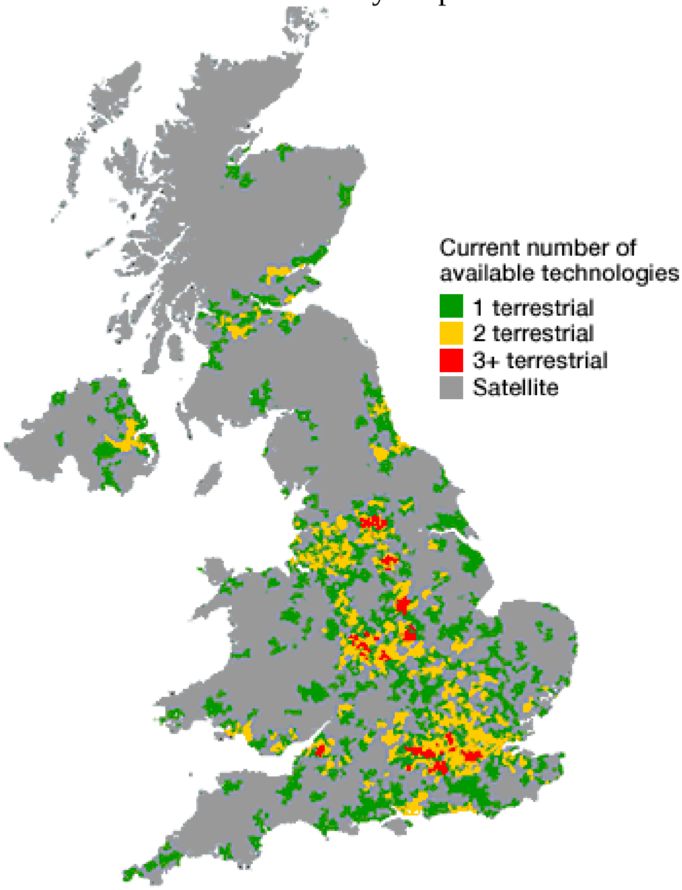


Source: OECD, 2001

We have only been able to present limited data on the regional or local territoriality of Broadband in this report as we have found virtually no comparable data on the matter collected at the European level. The little data we have found, however, supports the view that there are territorial differences in penetration, notably between metropolitan, urban and rural areas (see table 4.1) It is particularly unfortunate that the results of the DG Information Society commissioned follow up to the EOS Gallup survey are not yet available, as we believe that this does cover broadband technology penetration from a regional and urban-rural perspectives.

Some of the early results from our national studies under WP3 support the view that there are territorial differences, with a clear urban-rural divide. We, briefly, present three examples, here, in order to support the view, expressed below, that some form of public sector intervention is likely to be required in order to reduce territorial disparities. These maps are presented for *illustrative* purposes. Further analysis of these and other maps will appear in our third interim report.

Figure 6.2 Broadband Availability Map in the UK

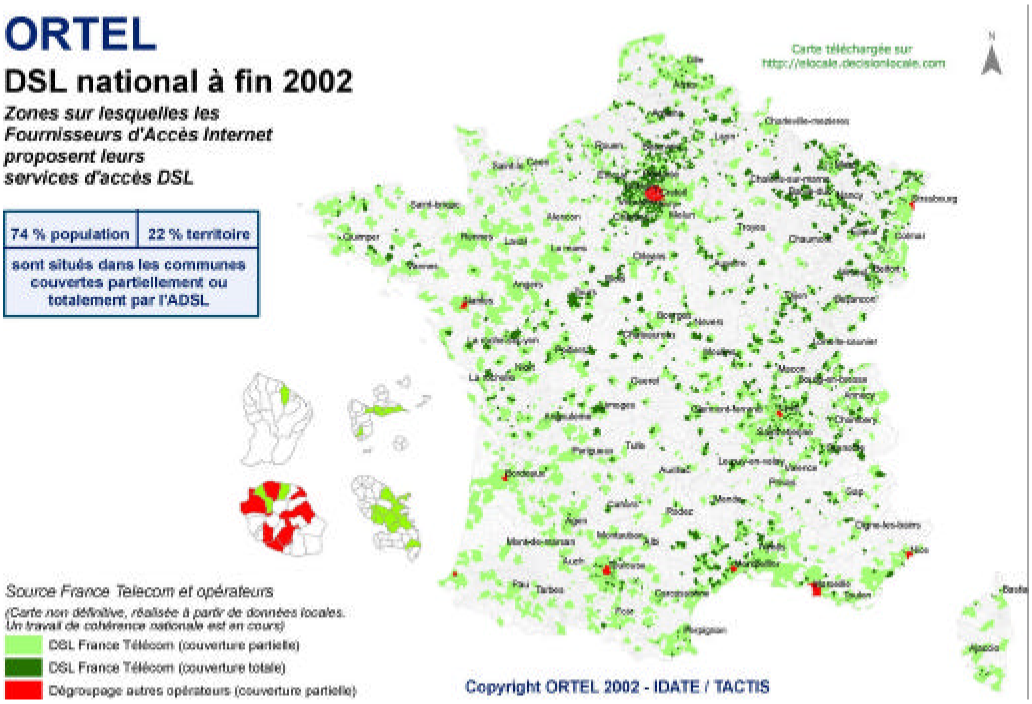


Source: UK Online Annual Report, based on Analysis survey of telecommunications companies

Figure 6.2 shows the pattern of broadband *availability* (though not take up) in the UK. Green represent DSL availability, yellow represents cable and red represents fixed wireless services (Satellite can, in practice, be ignored, at least for the present). All technologies are concentrated in urban areas. Where broadband is present in towns located in rural areas there is generally only one broadband option (DSL). Cable tends to be even more concentrated in urban areas. Deep rural areas have limited coverage. Fixed wireless access is even more an urban phenomenon, notwithstanding its potential for rural coverage.

Figure 6.3 shows a similar situation in France, but relates only to DSL. The map shows a complex picture, but in essence it shows that it is the more urban areas which are best covered. For example, competition between providers (represented by red patches) is present only in urban areas.

Figure 6.3: DSL availability in France



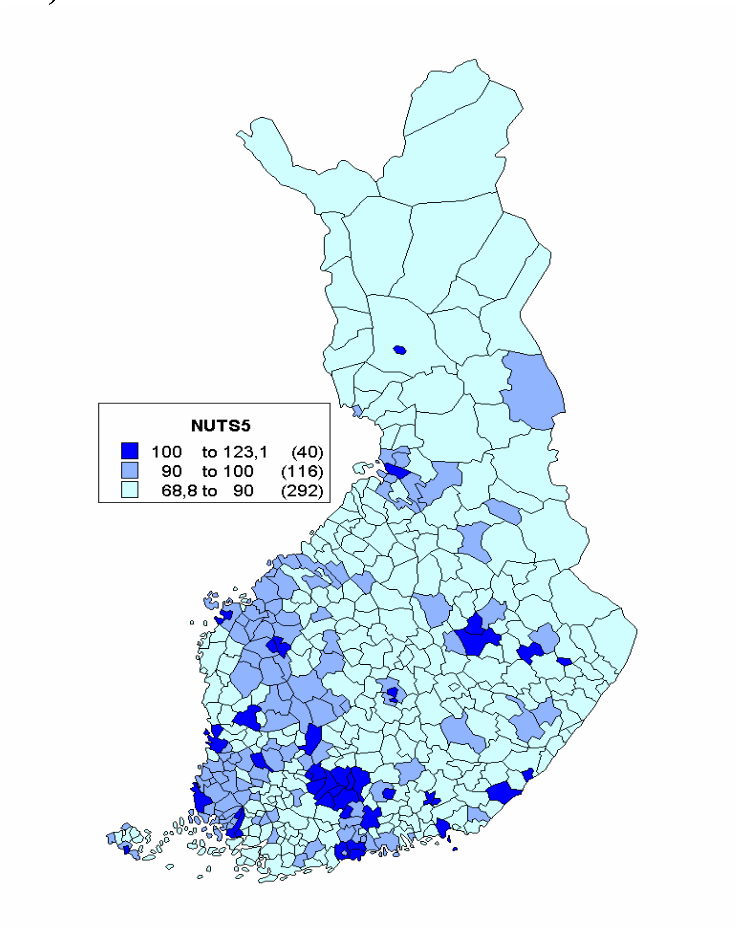
Source: IDATE/TACTIS

Figure 6.4 is based on a survey conducted by the Finnish Ministry of Transport and Communications into the availability of telecommunications services at the NUTS 5 level. The map shows differences in broadband services (ADSL, cable modem, fibre and WLAN) availability. The map shows that it is the densely populated areas which have the highest levels of availability.

Clearly it is early days for broadband roll-out but it seems clear from discussion with telecommunication companies during our research that many remain unprepared to invest in broadband in geographical areas where they see little prospect of a commercial return. This point, though not necessary our policy conclusions, is supported by a number of studies, including OECD's report 'Broadband Infrastructure Deployment: The Role of Government Assistance' (OECD, 2002). We would suggest that in the current environment telecommunications providers will, in general, tend to 'sweat' existing assets, trying to attract new customers to use them, rather than invest in new infrastructure[14] This may be particularly so in the context of technologies such as broadband, where, in some cases at least, take up has been very limited in territories where investment has occurred.

[14] This point will be further elaborated in our third interim report.

Figure 6.4: Availability of Broadband in Finland at NUTS 5 level (Population mean = 100)



Source: Mapping and analysis by Karelian Institute based on data drawn from 2001 Survey by the Finnish Ministry of Transport and Communications

There is general agreement that investment in less densely populated areas is lagging behind that in more populated areas. This can described as an urban-rural divide. [It should be noted, however, that differences in penetration can be witnessed within regions as well as across regions, so it is not purely a core-periphery phenomenon..] History suggests that as successive technologies are deployed, less favoured, remote and low population density areas will repeatedly suffer from non-investment or substantial lags in investment.

If these territorial differences are to be challenged it is likely that Structural Fund (or other government financial) support will be required.. One justification for the use of such funds is in cases in which 'market failure' can be demonstrated. Nevertheless, it is not easy to demonstrate market failure at the moment, due to asymetries in knowledge about the real costs of network deployment. In order to demonstrate 'market failure', therefore, it would be, firstly, necessary to demonstrate that the market for telecoms networks/services are fully liberalised (i.e., that there are competitive suppliers in the 'strong' markets). This is a matter for national governments. Secondly, a process would need to be established for demonstrating cases of 'market failure'.

Beyond the narrowly defined market failure argument, however, justification for public intervention can also be made in terms of ensuring that the broader social and economic benefits associated with broadband services are widely available. There are a range of mechanisms for ensuring that such goals are met, including adjustments to the licensing and regulatory systems for telecommunications, as well as direct financial support from the public sector. In order to avoid the public sector 'overpaying' for investment by the private sector, due to the information asymmetries mentioned above, a range of mechanisms can be envisaged, including tackling the asymmetry directly by building up public sector capacity and knowledge (eg. in the form of 'regional broadband agencies'), through to so-called 'dutch auctions', in which potential suppliers bid for how much public subsidy is needed in order to induce them to provide a given level of service in a given territory, with the contract awarded to the lowest public subsidy needed.

One question which will be important in respect of funding will be how structural and other state funds are targeted territorially. It is clear from our initial work on broadband that the roll-out is uneven *within* regions, based mainly on population densities and probably also on socio-economic (wealth) characteristics. So areas which do not fall within Objective 1 or Objective 2 regions, but where local loop unbundling and other elements of the liberalisation process are not resulting in up-graded capacity (e.g., ADSL enabled exchanges) may need some support.

These and other policy options will be considered in more detail in our third interim report.

6.3 Placing the regional question at the centre of the eEurope process

The regional question needs to become more central to the eEurope process. The documentation reviewed during WP2 suggests that, to date, it has been a marginal concern. This is particularly the case in terms of benchmarking (see Chapter 3 for detailed analysis).

This policy recommendation, incidentally, chimes with a key policy recommendation of the THEMIS Final report which stated that:

> "the Commision should ensure that the ongoing development of the eEurope Action Plan and its implementation should take the regional dimension more strongly into account" (p13).

The regional dimension was largely absent from the first Europe Action Plan and the benchmarking process which the plan engendered was designed around *national* performance. Similarly eEurope+ covering the candidate and accession countries does not have a clear regional dimension to its benchmarking process.

The regional dimension comes more to the fore in eEurope Action Plan 2005. From the point of view of ESPON 1.2.2 it importantly refers to broadband access in less favoured regions, stating that:

> "Member States in co-operation with the Commission should support, where necessary, deployment [of broadband] in less favoured areas, and where possible

may use structural funds and/financial incentives (without prejudice to competition rules). Particular attention should be paid to the outermost regions" (p17).

Again, however, the benchmarking process pays limited attention to the regional dimension. In discussing the need for indicators to be updated to reflect revised political objectives, for example, the eEurope 2005 Action Plan merely states, rather vaguely, that "*Where appropriate*, regional indicators will be developed (p19, italics added)."

In the event, the benchmarking exercise developed to assess the impact of eEurope 2005 has a very limited regional focus, with only one of the priority areas 'Citizens access to and use of the Internet" (sub-category A of Internet Indicators) being benchmarked at the sub-national level. Further, the only territorial distinction for this indicator is that between Objective 1 and non-Objective 1 regions. We were told in correspondence from the Commission that this is because to undertake a regional analysis would be too expensive.

Crucially, there is to be no regional benchmarking being undertaken in respect of Broadband penetration (priority J), notwithstanding that this is one of the few areas where the eEurope 2005 makes specific mention of the regional dimension. Given the acknowledged importance of broadband to regional development, this seems strange. There is, however, the suggestion that regions should be encouraged to undertake benchmarking exercises themselves.

6.4.1 There is a need to ensure that existing and future work on regional data and indicators for regional eEurope are effectively utilised

The EOS Gallup Report carried out in 1999 on behalf DG Information Society, but with input by DG Regional Policy, represents the largest scale exercise at the European level (only EU15) to try to establish regional patterns of ICT demand and usage at the regional level. The survey established a replicable model. The report argued that rapid changes in technology "plead in favour of more regular surveys in order to monitor and measure developments" (Forward to EOS Gallup Report, DG Information Society, 2000). However, not until the Summer of 2002 was a further study carried out and there is still no date for publication of the results of that study. Further, the EOS Gallup Report appears not to have been widely disseminated and we found that most respondents (within and without the Commission, including Eurostat) had little or no knowledge of the study. This unawareness was even more pronounced in the case of the 2002 study. This suggests that costly resources are not being fully utilised as a result of a lack of communication.

A number of studies are currently being undertaken under the FP5 IST Programme 1998- 2002 (see chapter 3). For example, the BISER study is taking a systematic approach to developing indicators and piloting these indicators in a sample of European regions. Assuming that this exercise is successful the indicators need to be followed up by regular regional surveys. This will, of course, have financial implications. It would appear that the Commission has decided, for the moment at least, not to carry out surveys to benchmark the regional implications of eEurope 2005. The key question is whether the work currently being carried out under BISER and other projects such as KEELAN and Regional IST will be utilised and built upon or whether cost constraints will militate against regional surveys. An alternative approach will be for nation states or regions to undertake such surveys using common tools and data collection techniques, but, if so, mechanisms need to put in place to ensure that data is collated and, crucially, the collated data feeds through into policy processes.

6.5 National governments should undertake surveys of telecommunications companies to obtain information on broadband roll-out

Huge amounts of data are collected by telecommunications regulators regarding the businesses they seek to regulate. A key deficiency is in territorial coverage of networks and services provided. National governments could place an obligation on regulators to collect that information and a license condition on operators to provide such information. Alternatively, the appropriate ministries could undertake regular surveys – particularly in the area of broadband and other new technologies – in order ascertain, in detail, which services are available at which locations. Such surveys have been undertaken, for example, in Finland, where data is published and can be further analysed as in section 6.2 above, and in the UK where detailed data has not been released and in France.

Annexes:

Annex 1: List of people and organisations contacted during WP2

Annex 2: Contrasting examples of sub-national data availability for WP3

Annex 3: ESPON 1.2.2 WP3 Indicators

Annex 4: A list of 138 European city regions

Annex 5: SWOT Analysis: ESPON 1.2.2

ESPON 1.2.2 Second Interim Report

Annexes

Annex 1: List of people and organisations contacted during WP2

	Name	Organisation
Pan-European Telecommunications Carriers	Ann Caluwaerts (Vice President Strategy)	BT Ignite
	Pietro Catania (Public relations Europe)	Cable & Wireless
	Christian Huart, EMEA Program Direction	Equant (France Télécom)
		T-Systems(Deutsche Telekom)
	Kare Sjoholm / Astrid Chenard (public relations)	TeliaSonera
	Rachel Fairley (head of branch marketing) / Ken Starkey (chief network officer)	Colt
		WorldCom
	Henjo Groenewegen (KPN International director)	KPN
	Agostino Agamben (Telecom Italia Sparkle)	Telecom Italia
		Telefonica
	Jeff Ace (Business Development & Operations, EMEA)	AT&T
	Larry Morgan	Infonet
	Gianluca Nonnis	Tiscali
	Bert Holtkamp (Director corporate communications)	UPC
	Mike Caldwell (Corporate communications)	Vodafone
	Sarah Taylor (Corporate affairs)	Orange
		T-Mobile
European Commission		
	Frank Mather	DG Information Society (responsible for benchmarking eEurope Action Plan 2005
	Nicola De-Michelas	DG Regio
	Vlassios Venner,	DG Information Society

	Mikel Landabaso,	DG Regio
	Jean-Bernard Benahaeim,	DG Regio
	Paul Verhof	DG Information Society
	Maria Carbonne	DG Information Society
	Olivier Pascal	DG Information Society
	Antonio Pedro Marin Martinez	DG Information Society
	Richard Cawley	DG Information Society
Eurostat		
	Richard Deiss	Eurostat Information Society Statistics
	Martii Limio,	Eurostat Information Society Statistics
	Gareth Williams	Eurostat Datashop
Other		
	John Dickie	European Competitive Telecommunications Association (ECTA)
	Gareth Hughes	ERIS@
	Gareth Hughes	RISI
	Dimitri Ypsilanti, Head of Telecommunications	OECD
	Sam Paltridge	OECD
	Lee Pickavance	Local Futures
	Michael Minges	International Telecommunications Union
	Jason Kowal	Telegeography
	Michelle Kosimides	JRC-IPTS
	Marc Bogdanowicz	JRC-IPTS
	Dr Emmanuel Muller	Fraunhofer Institute (regional IST project)
	Reinhard Wickel	Empirica (BISER)
	Dorcie Santos	KMI Research
	Danny Brown	Analysys
	Marie-Laure Rinaudo	IDATE
	Louise Budde	Budde Comm
	Alberto Bramanti	Bocconi University
	David Osimo	Bologna
	Roberta Capello	Polytechnico Milan (ESPON 2.1.1)
	Alessia Spairani	Polytechnico Milan (ESPON 2.1.1)

	Nils Schneekloth	University of Kiel (ESPON 2.1.1)
	Lars Porsche	BBR (ESPON 3.1)
	Volker Schmidt-Seiwert	BBR (ESPON 3.1)

Annex 2: Contrasting examples of sub-national data availability for WP3

INDICATORS	NUTS 1	NUTS 2	NUTS 3	NUTS 4	NUTS 5
	FINLAND				
DEVELOPMENT OF TN&S					
Proportion of main lines connected to digital exchange	yes (100% since 1996)	yes (100%)	yes (100%)	yes (100%)	yes (100%)
ADSL lines as a proportion of total main lines	yes	maybe[i]	maybe	maybe	maybe
Cable modem lines as a proportion of total lines installed	yes (2001: 45% of households)	probably calculable[ii]	probably calculable	probably calculable	probably calculable
Proportion of exchanges with co-located equipment (local loop unbundling)	Probably yes[iii]	Probably yes	Probably yes	Probably yes	Probably yes
Availability of Internet service with (a) local rate charges (b) unmetered access	a) yes b) yes (survey 2001)	a) yes b) yes (survey 2001)	a) yes b) yes (survey 2001)	a) yes b) yes (survey 2001)	a) yes b) yes (survey 2001)
Number of PIAPs per 1000 inhabitants	Probably calculable[iv]	Probably calculable	Probably calculable	Probably calculable	Probably calculable
UP-TAKE AND USE OF TN&S					
Cellular subscribers per 100 inhabitants	yes (2001: 80,4%)	Probably yes[v]	Probably yes	no	no
ADSL subscribers per 10,000 inhabitants	yes (2001: 1,2% ie. 120)	Probably yes[vi]	Probably yes	no	no
Proportion of households with Internet access	yes (2001: 37,1%)	Probably yes[vii]	Probably yes	no	no
Proportion of households with broadband Internet access	Yes (2002: 15% including ISDN)	Probably yes[viii] (including ISDN)	Probably yes (including ISDN)	no	no
UP-TAKE AND USE BY					

BUSINESS					
Proportion of firms with access to the Internet	yes (2001: 94%, firms with at least 10 employees)	maybe[ix]	maybe	no	no

INDICATORS	NUTS1	NUTS2	NUTS3	NUTS4	NUTS5
	HUNGARY	Regions (7)	Counties + capital (19+1)	Statistical micro-regions (150)	Settlements towns and villages (3135)
DEVELOPMENT OF TN&S					
Proportion of main lines connected to digital exchange	yes (-91%)	no	no	no	no
ADSL lines as a proportion of total main lines	yes (1%)	no	no	no	no
Cable modem lines as a proportion of total lines installed	maybe (CM in -0.64% of all households)	no	no	no	no
Proportion of exchanges with co-located equipment (local loop unbundling)	no	no	no	no	no
Availability of Internet service with (a) local rate charges (b) unmetered access	no	no	no	no	no
Number of PIAPs per 1000 inhabitants	yes (close estimate: 0.05 – 500 PIAPs)	probably calculable	probably calculable	probably calculable	probably calculable
UP-TAKE AND USE OF TN&S					
Cellular subscribers per 100 inhabitants	yes (-69)	no	no	no	no
ADSL subscribers per	yes (-30)	no	no	no	no

10,000 inhabitants					
Proportion of households with Internet access	(yes 1999: 0.7%)	maybe	maybe	no	no
Proportion of households with broadband Internet access	yes (12% of hh. Internet access - - 0,001%)	an estimate, maybe, on basis of accessible infrastructure	an estimate, maybe, on basis of accessible infrastructure	an estimate, maybe, on basis of accessible infrastructure	an estimate, maybe, on basis of accessible infrastructure
UP-TAKE AND USE BY BUSINESS					
Proportion of firms with access to the Internet	yes (-75%)	maybe	maybe	no	no

[1] Regional data not available, but local operators are probably able and willing to estimate the share of ADSL lines. A survey concerning the availability of different Internet access services was carried out as an inquiry in Dec.-Nov. 2001, but in that publication, it is the availability (% of pop.) not the share of lines/subscriptions what is reported.

[1] Regional data not published. Available only in densely populated areas; if knowing the amount of subscriptions/network coverage of those local companies it is perhaps possible to estimate the share of cable modem lines. A survey concerning the availability of different Internet access services was carried out as an inquiry in Dec.-Nov. 2001, but in that publication, it is the availability (% of pop.) not the share of lines/subscriptions what is reported.

[1] Haven't found a data on this; based on "expert opinions", data exists, but it is likely not public.

[1] PIAP: exact indicators/definitions are lacking? In Finland, this could be estimated by using numbers of public libraries and their Internet facilities for public use.

[1] Regular survey by Statistics Finland; regional data not published but could be purchased on reguest (with a quite high price).

[1] See, footnote 5.

[1] See, footnote 5.

[1] See, footnote 5.

[1] A survey carried out in 2001 by Statistics Finland; regional data (according objective regions, not (?) NUTS) not published, but could be purchased on reguest (with a quite high price).

Annex 3: ESPON 1.2.2 WP3 Indicators (core indicators in bold)

Indicators	NUTS 0	NUTS 1	NUTS 2	NUTS 3	NUTS 4	NUTS 5
<u>Development of TN&S</u> • Number of telephone access lines per 100 inhabitants • Faults per 100 main lines per year • Investment in communication network by operators per 100 inhabitants • Net change in number of main lines (+/-) in previous year • Proportion of exchanges digitised • **Proportion of main lines connected to digital exchange** • Proportion of exchanges ISDN enabled • ISDN lines as a proportion of total main lines • Proportion of exchanges ADSL enabled • **ADSL lines as a proportion of total main lines** • Homes passed by cable per 100 residencies • Homes passed by digital cable • **Cable modem lines as a proportion of total lines installed** • **Proportion of exchanges with co-located equipment (local loop unbundling)** • **Availability of**						

Internet service with (a) local rate charges (b) unmetered access • **Number of PIAPs per 1000 inhabitants** • Number of secure servers per 10000 inhabitants (using IP address look up tables) • Competition in fixed network infrastructure (number of licenses; number of active providers?) • Competition in cellular phone infrastructure (number of licenses; number of active providers?) • Number of fixed network operators offering local national telecommunications • Number of fixed operators offering long distance national telecommunications • Number of operators offering international telecommunications • Number of cable service and satellite service providers • Maps of network configuration?						
<u>Up-take and use of TN&S</u> • Telephone subscribers per 100 inhabitants (i.e., fixed and mobile) • Percentage of households with a telephone • Installed PCs (with modem?) per 100 inhabitants						

• **Cellular subscribers per 100 inhabitants** • Proportion of households subscribing to Cable services • ISDN subscribers per 100 inhabitants • **ADSL subscribers per 10,000 inhabitants** • **Proportion of households with Internet access** • **Proportion of households with broadband Internet access** • Internet users per 1000 inhabitants (at work, at school or at home) <u>Up-take and use by business</u> • **Proportion of firms with access to the Internet** • Proportion of firms with own website • Proportion of firms making sales via e-commerce • Proportion of firms making purchases using e-commerce • Value of sales by businesses made via the Internet • Value of purchases made by businesses via the Internet • Use of broadband to access the internet by size of business • Level of business activity by type of internet access						

Annex 4: A list of 138 European city regions

City / region	Country	Pop (000s)	World city ranking	Telegeography ranking
Vienna	Austria	2065	Di	24
Linz	Austria	282		
Graz	Austria	271		
Salzburg	Austria	163		
Brussels	Belgium	1135	B	11
Antwerp	Belgium	468	Diii	45
Ghent	Belgium	230		
Charleroi	Belgium	207		
Liege	Belgium	195		
Bruges	Belgium	117		
Sofia	Bulgaria	1187		
Plovdiv	Bulgaria	340		
Varna	Bulgaria	306		
Nicosia	Cyprus	198		
Prague	Czech Republic	1203	C	48
Brno	Czech Republic	385		
Ostrava	Czech Republic	322		
Copenhagen	Denmark	1332	C	12
Aarhus	Denmark	287	Diii	
Odense	Denmark	184		
Aalborg	Denmark	162		
Tallinn	Estonia	418		
Helsinki	Finland	937	Di	35
Espoo	Finland	207		
Tampere	Finland	192		
Turku	Finland	172		
Paris	France	9630	A	4
Lyon	France	1353	Di	25
Marseille	France	1290	Diii	28
Lille	France	991	Diii	40
Toulouse	France	761		33
Bordeaux	France	697		23
Nice	France	517		
Nantes	France	495		29
Toulon	France	438		
Grenoble	France	405		
Strasbourg	France	388		27
Rouen	France	380		
St-Etienne	France	313		
Montpellier	France	248		54
Rennes	France	245		41
Dijon	France	230		60
Rhein-Ruhr North (Duisberg-Essen-	Germany	6531		47

Bochum-Dortmund)				
Rhein-Main (Frankfurt)	Germany	3681	A	2
Berlin	Germany	3319	C	6
Rhein-Ruhr Middle (Dusseldorf)	Germany	3233	C	3
Rhein-Ruhr South (Bonn-Cologne)	Germany	3050	Dii	17
Stuttgart	Germany	2672	Dii	9
Hamburg	Germany	2664	C	5
Munich	Germany	2291	C	7
Rhein-Neckar (Mannheim)	Germany	1605		46
Bielefeld	Germany	1294		58
Hannover	Germany	1283		10
Nuremberg	Germany	1189		15
Aachen	Germany	1060		
Karlsruhe	Germany	977		42
Saarland	Germany	891		
Bremen	Germany	880		38
Leipzig	Germany	490		18
Nurnberg	Germany	487		
Dresden	Germany	477	Diii	39
Kehl	Germany	234		57
Wurzburg	Germany	127		56
Athens	Greece	3116	Dii	
Thessaloniki	Greece	789		
Volos	Greece	384		
Patrai	Greece	170		
Budapest	Hungary	1819	C	51
Debrecen	Hungary	204		
Dublin	Ireland	985	Di	32
Cork	Ireland	127		
Milan	Italy	4251	A	14
Naples	Italy	3012		
Rome	Italy	2649	C	
Turin	Italy	1294	Diii	49
Genoa	Italy	890	Diii	
Florence	Italy	778		
Palermo	Italy	689		
Bologna	Italy	386	Diii	
Catania	Italy	342		
Bari	Italy	336		
Riga	Latvia	761		
Vilnius	Lithuania	578		
Kaunas	Lithuania	414		
Luxembourg	Luxembourg	77	Di	
Valletta	Malta	7		

Amsterdam	Netherlands	1105	C	8
Rotterdam	Netherlands	1078	Dii	21
The Hague	Netherlands	609	Dii	59
Eindhoven	Netherlands	301		
Utrecht	Netherlands	233	Diii	
Groningen	Netherlands	172		
Oslo	Norway	779	Dii	20
Bergen	Norway	228		
Trondheim	Norway	148		
Katowice	Poland	3494		
Warsaw	Poland	2274	C	
Lodz	Poland	1053		
Gdansk	Poland	893		
Crakow	Poland	859		
Wroclaw	Poland	637		
Poznan	Poland	578		
Szczecin	Poland	417		
Bydgoszcz	Poland	387		
Lublin	Poland	356		
Lisbon	Portugal	3861	Dii	
Porto	Portugal	1940		
Bucharest	Romania	2001	Dii	
Bratislava	Slovakia	449	Dii	
Ljubljana	Slovenia	264		
Madrid	Spain	3976	B	19
Barcelona	Spain	2729	C	22
Valencia	Spain	736		52
Sevilla	Spain	695		
Zaragoza	Spain	601		
Malaga	Spain	543		
Bilbao	Spain	351		55
Stockholm	Sweden	1612	C	16
Gothenburg	Sweden	776	Diii	34
Malmo	Sweden	519		26
Uppsala	Sweden	188		
Zurich	Switzerland	939	B	13
Geneva	Switzerland	173	C	37
Basel	Switzerland	170		43
Bern	Switzerland	124		
London	UK	7640	A	1
Birmingham	UK	2272	Dii	30
Manchester	UK	2252	Dii	31
Leeds	UK	1433	Diii	44
Tyneside	UK	1011		
Liverpool	UK	939		
Glasgow	UK	616	Diii	
Sheffield	UK	530		

Bradford	UK	483		
Edinburgh	UK	449	Diii	50
Bristol	UK	400		36
Cardiff	UK	315		
Belfast	UK	297		

Annex 5: SWOT Analysis: ESPON 1.2.2

0. ESDP Context

The ESDP's policy aims with respect to telecommunications services and networks are stated in Section 3.3 'Parity of Access to Infrastructure and Knowledge'. The relevant sections are reproduced below:

3.3.1 An Integrated Approach for Improved Transport Links and Access to Knowledge

(107) Urban centres and metropolises need to be efficiently linked to one another, to their respective hinterland and to the world economy. Efficient transport and adequate access to telecommunications are a basic prerequisite for strengthening the competitive situation of peripheral and less favoured regions and hence for the social and economic cohesion of the EU. Transport and telecommunication opportunities are important factors in promoting polycentric development. Efficient transport and telecommunication systems and services have a key role in strengthening the economic attractiveness of the different metropolises and regional centres.

(108) The mobility of people, goods and information in the EU is characterised by concentration and polarisation tendencies. Increasing competition in the transport and telecommunication markets can intensify this development. Policy must ensure that all regions, even islands and peripheral regions, have adequate access to infrastructure, in order to promote social and economic and, therefore, spatial cohesion in the Community. It should also ensure that high quality infrastructure, for instance high-speed /high-capacity rail lines and motorways, do not lead to the removal of resources from structurally weaker and peripheral regions ("pump effect"); or that these areas are not crossed without being connected ("tunnel effect"). Spatial development policy should work towards having high quality transport infrastructure supplemented by secondary networks to bring about their positive effects in the regions.

(110) These problems cannot be solved solely through building new infrastructure, however important it may be for all regions. Transport and telecommunication structures are not sufficient prerequisites on their own for regional development. Accompanying measures in other policy areas, such as regional structural policy or promotion of education and training, in order to improve the locational advantages of the regions are required. This applies especially to structurally weak regions.

3.3.2 Polycentric Development Model: A Basis for Better Accessibility

(111) The future extension of the Trans-European Networks (TENs) should be based on a polycentric development model. That means, in particular, ensuring the internal development of the globally important economic integration zones and facilitating their integration into the global economy. In addition, more attention should be paid to regions with geographical barriers to access, especially islands and remote areas. Spatial differences in the EU cannot be reduced without a fundamental improvement of transport infrastructure and services to and within the regions where lack of access to transport and communication infrastructure restricts economic development. A fundamental improvement of infrastructure and accessibility requires more than just providing the missing links in the TENs.

(116) Telecommunication networks can play an important role in compensating for disadvantages caused by distance and low density in peripheral regions. The relatively

small market volumes in regions with low population density and correspondingly high investment costs for telecommunication infrastructure can thus lead to lower technical standards and high tariffs, which bring competitive disadvantages. In many spheres (tele-working, distance education courses, tele-medicine, etc.) the provision of high-quality services at affordable prices is a key factor for regional development. Nevertheless, the application of modern technologies does not depend solely on the availability of advanced infrastructure, equipment or services and their affordability, but also on the development level of each region. Particular attention should, therefore, be focused on measures to stimulate demand, the development of application-related knowledge and the fostering of awareness of opportunities in order to stimulate investment. A prerequisite for all infrastructure projects should be an early assessment of the anticipated spatial impacts and a fine-tuning of Community, national and regional or local measures.

(117) **Policy Options**

27. Improvement of access to and use of telecommunication facilities and the design of tariffs in accordance with the provision of "universal services" in sparsely populated areas.

3.3.3 Efficient and Sustainable Use of the Infrastructure

(123) Telecommunications, information and communications technologies are important supplementary instrument for regional integration. Thus, they cannot be seen as substitutes for transport development. A major focus should be on co-ordination between decision-makers for transport and for telecommunications. Regional planning and transport planning should also be more strongly integrated with each other.

(124) **Policy Options**

30. Better co-ordination of spatial development policy and land use planning with transport and telecommunications planning

3.3.4 Diffusion of Innovation and Knowledge

(129) Information and communication technology can help to reduce deficits in the field of access to innovation and knowledge and, by this means, support the settlement of companies in rural regions. This creates investment incentives in regions which normally have lower relative location costs. A polycentric development of the territory of the EU can support this policy.

(130) The dissemination of the new information technologies in all regions involves the provision of a general basic service of equally high quality and the adoption of an appropriate policy of charges. As the northern countries demonstrate, low population density is not an insurmountable obstacle to the provision and widespread use of high-quality telecommunications services. In addition to regulative measures, strategies aimed at stimulating demand for knowledge promote the operation and use of information and communications technologies. This includes, for example, awareness-raising campaigns and better training opportunities.

(131) **Policy Options**

39. Development of packages of measures which stimulate supply and demand for improving regional access and the use of information and communication technologies.

1. **In the light of the policy aims of the ESDP: What are the main strengths identified by your TPG?**

The main strengths are:

- The combination of liberalisation of telecommunications markets and the development and deployment of new technologies has created a highly dynamic environment. Competition is providing pressures which are leading to reduced costs of network access and to service improvements. Rates of Internet penetration and use, and of mobile telephony uptake and use, are very rapid, and thus at the European scale, the supply of telecommunications networks and services is improving markedly.
- The rapid roll-out of digital mobile telephony networks has had particularly significant positive territorial implications, in that almost universal service coverage has been achieved across the whole of the European territory in a very short space of time (less than a decade). For peripheral regions and rural areas, which have tended to find themselves under-provided by advanced networks which rely on wires and cables, the development and very rapid deployment of wireless telephony has transformed the supply of telecommunications services. In central and eastern Europe, wireless networks have had similarly important impacts, and very high rates of adoption, helping to overcome the legacy of inadequate fixed wire networks.
- The Internet has provided a very strong stimulus to the up-take of advanced telecommunications services. In a very real sense, the bundle of generic applications which the Internet delivers, particularly but not confined to the world wide web, has overcome much of the resistance to the up-take of advanced telecommunications services which was so prevalent until the late 1990s. Competition between ISPs has aided the adoption process considerably, by driving down the real cost of accessing the Internet and by facilitating marketing-led strategies aimed at different segments of both business and domestic subscriber markets.
- The market-led developments in the fields of mobile telephony and Internet access have been complimented at the regional level by considerable interest in the promotion of both the supply and demand for telecommunications services, within the context of regional information society strategies. The stimulation of the information society at regional level can be said to have been successfully 'mainstreamed' within the current round of Structural Funds.

2. **In the light of the policy aims of the ESDP: What are the main weaknesses identified by your TPG?**

The main weaknesses are:

- There remains a significant territorial dimension to the deployment of new fixed wire technologies, with rural areas tending to be considerably more poorly served than metropolitan areas. Of the three main delivery mechanisms for broadband services, for example (DSL, cable modems and wireless), the first two have a very marked territoriality, with the up-grading of networks to provide broadband services being considerably more advanced in metropolitan areas than in rural areas. In part, this differential will begin to narrow if broadband services are rapidly adopted; at present, the telecommunications companies are reluctant to invest in network upgrades in rural areas without first seeing clear evidence of buoyant demand in the cities, a situation which has not yet been reached.

- This reflects a more general weakness from a territorial perspective that market-driven telecommunications networks (which is what liberalised telecommunications markets in Europe have become) are always likely to discriminate between metropolitan and rural areas in their investment priorities. Not only are the former seen as having the critical mass upon which new services can be launched, but they are also deemed to have the type of sophisticated consumers (in both business and domestic markets) that will generate the most revenues. Rural and peripheral areas are further handicapped by being more expensive to serve, particularly for wire based networks.

3. In the light of the policy aims of the ESDP: What are the main opportunities resulting from the identified frame conditions?

- At the regional level, the deployment of broadband networks is likely to provide a very substantial improvement in the telecommunications environment of peripheral and remote regions. Although the 'death-of-distance' is unlikely to be realised, the advances currently underway in telecommunications do offer significant opportunities for peripheral and less-favoured regions to enhance their levels of integration with the core regions of Europe.
- For rural areas, the deployment of new wireless based technologies (both mobile and fixed) could offer a real opportunity for reducing the service-supply gap they suffer from in relation to metropolitan and urban areas.

4. In the light of the policy aims of the ESDP: What are the main threats resulting from the identified frame conditions?

- The main threat in the identified frame conditions is that rural areas lag persistently behind metropolitan and urban areas in the level, quality and cost of telecommunications services to which they have access. In the highly uncertain telecommunications markets which are likely to prevail for some time (in the wake of the bursting of the dot-com bubble and the realisation that telecommunications companies have considerably over-invested in 3G mobile licences), there is a real risk that rural areas are not only placed low-down on a roll-out queue, but may fall-off the queue altogether.
- This risk is likely to be a real threat if broadband fails to be adopted on an appreciable scale; in this circumstance, broadband may only be deployed in 'islands' where demand is sufficiently concentrated. If this situation persisted, then communication-intensive SMEs operating in rural areas might find it increasingly difficult to communicate with their customers and suppliers, in which broadband communications capability will be likely to be taken for granted. A new urban-rural divide could emerge, in which only lower level, non-communications intensive activities can be undertaken from rural areas.

5. **Looking back on the questions 1) to 4): What are the 3-4 driving forces dominating the thematic sector? Please explain each driving force in one or two paragraphs.**

The main driving forces are:

- **Liberalisation/Competition** – without doubt, it is liberalisation, in conjunction with new technologies, that has transformed the territoriality of telecommunications markets; the stable pattern of universal service provision in a basic telephony service context has been transformed by dynamic, contested (albeit to degrees which vary considerably according to territory) and multiple markets. The focus of telecommunications provision has shifted from an engineering, supply-driven condition to a market-pulled provision. The result of this is a major differentiation between territories in terms of their demand for telecommunications, with 'hot spots' of multiple, competing suppliers in locations such as the financial services centres of Europe, contrasting with the uncontested markets of rural areas, in which there is little incentive for (de facto) monopolistic suppliers to invest.
- **The deployment of new technologies -** Technological innovation - represented most obviously by the Internet and mobile wireless technologies – in conjunction with liberalisation has opened up new services which have diffused considerably more rapidly than any previous communications technologies have done. These innovations are opening up new opportunities for peripheral and rural areas, but are at the same time serving to accentuate the inherent territoriality of telecommunications networks (in the sense that these networks require investments in fixed infrastructures – wires, cables, switches, wireless masts, etc – in order to provide services to particular places) . The roll-out of new technologies and the services based upon them is, then, one of the main driving forces accentuating the territoriality of telecommunications networks. Currently, it is the roll-out of broadband technologies (in addition to specialised networks targeted at large firms and institutions, there are currently three different delivery technologies which can deliver broadband services for domestic consumers – digital subscriber lines [DSL], cable modems and broadband wireless) which are most amply demonstrating the territoriality of telecommunications networks, with a strong urban bias evidence in the initial deployment of these technologies.
- **National regulatory and support policies** – although the European telecommunications market has now been predominantly liberalised, there remain marked national differences in the extent to which 'the state', broadly defined to include national and local governments, choose to intervene in telecommunications provision in order to achieve territorial equity, or 'universal service'. As is evidenced in the Scandinavian countries, territorial equity in telecommunications provision can be achieved even in liberalised markets, through the use of the regulatory and licensing system, through e-government policies, through subsidies to operators where market-failure is expressed territorially, and through the 'state' becoming directly involved as a telecommunications supplier in instances where the market is not providing the required level of network access. Clearly this provides significant scope for the Structural Funds to contribute to territorial equity in telecommunications provision, as is already evidenced by the increasing share

of Structural Funds investment being devoted to Information Society measures, including telecommunications provision. The opposite example is provided by central and eastern Europe, in which the past legacy of under-investment in telecommunications remains a significant feature of the current telecommunications landscape.

These driving forces can be measured in the following ways.

Liberalisation can be measured in terms of the extent to which territorially-defined markets are subject to competition, measured either in terms of the number of competitors present in a market, or in terms of the new entrants' share of the market. Such measures can be applied to fixed telephony services, mobile telephony services, and broadband services.

The deployment of new technologies can be measured with respect to whether particular technologies – such as, in the case of broadband, ADSL – are available in particular territories (and, if they are, what the costs of accessing the services are). The geography of such availability is finely differentiated, with decisions effectively being made by the telecommunications companies at the level of individual exchanges. For regional aggregates, therefore (such as NUTS Level 2 or even Level 3), the indicator would need to specify the proportion of the population able to access ADSL services.

National regulatory and support policies can be measured in terms of the degrees of political commitment and associated resourcing for ensuring that all territories share in the benefits of the information society, and, specifically, the extent to which interventions are made in telecommunications markets to ensure that telecommunications networks and services are deployed across all parts of the territory. Although the national level of decision-making is in most cases the most significant (due to regulatory policy usually being determined at the national level within Europe), regional level (and indeed urban and municipal levels) can also be significant in stimulating the IS and the introduction of new telecommunications networks and services. The appropriate indicators would therefore deal with degrees of state commitment to ensuring that territorial disparities in telecommunications provision are minimised (ie to universal service), on a qualitative scale ranging from strong to weak. For a given territory, such an indicator would need to be a composite reflecting the role of different levels of government in meeting this objective, which can be expected to vary between member states (in Spain, for example, the regional government's role in telecommunications regulation and provision is particularly strong).

6. Commencing from these driving forces please develop a typology which can be used to classify the European regions.

The three factors – liberalisation or competition, the deployment of broadband technologies and national regulatory and support policies – can each can be dichotomized according to whether they are above or below the European (EU27) average.

Competitive markets – Highly contested vs. uncontested or limitedly contested markets;
Deployment of broadband – Widespread availability of broadband vs. limited or no availability of broadband;
Universal service policy – High policy commitment to universal, high quality service vs. weak commitment to universal, high quality service.

In each case, the indicators used are composites produced by combining various sources, and due to data inadequacies, exercising considerable judgement in order to arrive at an indicator value (either low or high), for each of the three factors for each region in Europe. There is more data at Level 2 than at Level 3, but for the broadband availability indicator in particular variability is more apparent at a small geographical scale, and so attempts will be made to construct these three data sets at both Level 2 and Level 3.

Combining these typologies into a 2 x 2 x 2 matrix gives 8 possible classes, into which Europe's regions can then be classified:

1 High competition, high broadband availability, high universal service commitment
2 High competition, high broadband, low universal service
3 High competition, low broadband, high universal service
4 High competition, low broadband, low universal service
5 Low competition, high broadband, high universal service
6 Low competition, high broadband, low universal service
7 Low competition, low broadband, high universal service
8 Low competition, low broadband, low universal service

7. Please map the spatial patterns resulting from this typology of main driving forces.

The typology has not yet been implemented, due principally due to the considerable effort that has had to be expended in searching for data that would enable us to develop the indicators in a robust way. Given the severe limitations on available data which remain, it is clear that some creativity will need to be used in order to arrive at estimations for each of the three variables which underpin the typology, even in their most simple dichotomized states.

This typology will be implemented in the next stage of the project, and reported in our Third Interim Report in August.

8. Please prepare a data set which contains the data of the driving forces and the regional classification.

As 7 above.

9. Refer to the concept of sustainable development and regional competitiveness: Please describe on a half page how the spatial pattern and developments in your sector outlined above relate to sustainable

development and balanced competitiveness as overall aims in the field of spatial development and EU policies.

In significant respects, developments in telecommunications networks and services are contributing very positively to sustainable development and regional competitiveness. The deployment of advanced telecommunications networks is occurring in both the core and periphery of Europe, and the geography of telecommunications networks reveals a highly polycentric rather than centralised form. The main qualification to this positive assessment concerns the distinction between metropolitan areas and rural areas, for the combination of market-driven provision and the deployment of new technologies, notably broadband, is creating uncertainties about how far down the urban hierarchy the new services will be made available. However, the Scandinavian experience demonstrates the effectiveness and viability of policy interventions to ensure that spatial disparities are not widened, even in liberalised telecommunications environments.

The implications for the environmental aspects of sustainable development of advances in telecommunications are further complicated by the complementarities between electronic communications and physical movement. All the evidence suggests a very limited scope for substituting electronic for physical movement; indeed, it is clearly apparent that telecommunications networks are underpinning increasingly mobility-intensive forms of interaction.

10. Please name for both aims the three or four most important indicators you use to measure and assess these trends.

In addition to the three indicators in section One indicator which could be used to measure the extent to which telecommunications networks are contributing to polycentricity at the European scale is a measure of network connectivity, applied at the urban scale, similar to those measures we develop and apply in Chapter 5 of this report. The indicator reveals the highly polycentric nature of the pan-European telecommunications networks, but also highlights those parts of Europe's periphery, particularly on its south-eastern edges, which are poorly connected to the rest of Europe.

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