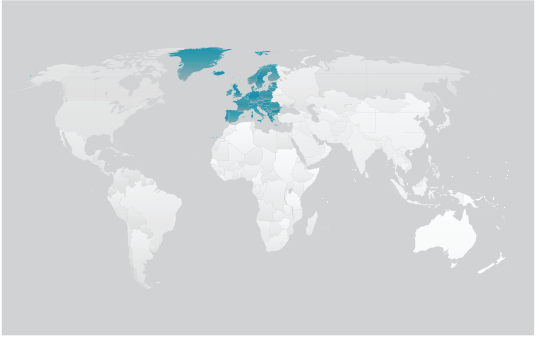
International Telecommunication Union

Information Society Statistical Profiles 2009

Europe



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In preparation for the World Telecommunication Development Conference 2010

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Foreword

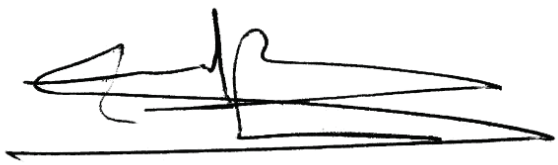
This report is the fifth of a series of regional statistical profiles on the information society prepared by ITU in 2009, as an input to the regional preparatory meetings (RPMs) for the ITU World Telecommunication Development Conference 2010 (WTDC-10). The fifth RPM - for the European region - takes place on 1-3 December 2009 and is hosted by the Government of Andorra.

The European region is a world leader when it comes to information and communication technology (ICT) access and use. It was the first region to adopt a uniform standard for mobile telephony in the early '90s, and to introduce next-generation mobile networks in 2000. Internet usage and fixed and mobile broadband uptake have increased significantly during the past few years. Today, the European market, with around ten per cent of the global population, accounts for more than 18 per cent of the world's mobile cellular subscriptions, 21 per cent of fixed telephone lines, 22 per cent of Internet users, and 31 per cent of both, fixed broadband subscribers and mobile broadband subscriptions. The large majority of European countries has surpassed the 100 per cent mobile penetration mark, and close to two out of three Europeans are using the Internet.

Much of the success in Europe is due to its harmonized approaches in the ICT and telecommunication sectors, driven by the European Union (EU) common regulatory and policy frameworks, which are usually followed by other countries in the region. Several governments have started to implement national "broadband-for-all" strategies focusing on digital inclusion of all citizens and geographic areas. Compared to other regions, the digital divide among European countries is relatively modest, although some less developed non-EU member countries are still behind their more advanced neighbours when it comes to ICT.

Given its advanced broadband infrastructure, the European market is now moving towards convergence of the traditional telecommunication operators and the media industry. An increasing number of service providers are offering triple and quadruple-play packages that include not only voice and data, but also IP television, Video-on-Demand and digital broadcasting services. One of the key questions policy makers need to address in this context is whether or not to merge the national telecommunication and media regulators into one single entity.

This report highlights the latest ICT developments in Europe and presents key statistical indicators for each country. The report also features a regional analysis of the ITU ICT Development Index (IDI) and the ICT Price Basket, two ICT benchmarking tools that were launched in March 2009. I am confident that the findings of the report as well as the resulting policy conclusions will provide useful inputs to our members in preparation of the WTDC-10.



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Chapter 1.

Market overview

Europe is widely recognized as one of the most innovative and technological savvy regions in the world. It has been traditionally leading the way in mobile telephony, being the first region in the world to adopt a uniform pan-European technological standard (2G/GSM) in the early '90s, and migrating, as early as 2000, to next-generation mobile telephony (IMT-2000/3G/UMTS). In parallel, Europe has experienced an exponential growth in the number of Internet users over the past decade and it is also leading the way in fixed and mobile broadband uptake.

The European region is a world leader when it comes to ICT services uptake

Regardless of the fact that the population of the extended European region[1] (i.e. E-42) represents less than ten per cent of the global population, it accounted, as of 2008, for more than 18 per cent of the world's mobile cellular subscriptions, 21 per cent of the world's fixed telephony lines, 22 per cent of the world's Internet users, 31 per cent of the world's fixed broadband subscribers and 31 per of the world's mobile broadband subscriptions.

Over the past decade (1999-2008), mobile telephony in E-42 has been growing annually by 11 per cent, reaching by the end of 2008, 118 per cent penetration (Chart 1.1). At the same time, the region had 42 fixed telephone lines per 100 inhabitants, and an estimated 58 out of 100 inhabitants were using the Internet. Moreover, the region, over the past five years, has experienced exponential growth of its fixed broadband subscribers and mobile broadband subscriptions, reaching in 2008, 21 and 22 per cent penetration, respectively.

Over the past five years, the region has experienced exponential growth of fixed and mobile broadband subscriptions

ICT developments in E-42, 1999-2008

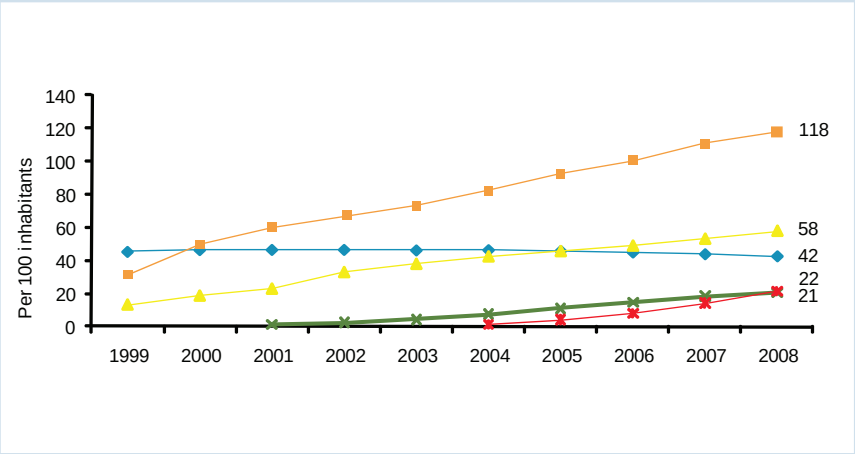


Chart 1.1

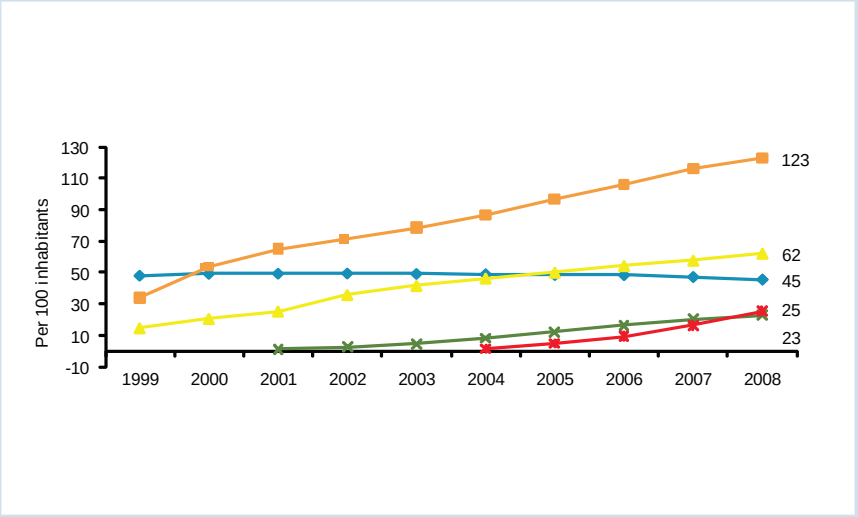
Mobile cellular subscriptions
Internet users
Fixed telephone lines
Mobile broadband subscriptions
Fixed broadband subscribers

Note: E-42 refers to the extended European region, including 42 countries, see Annex 1.

Source: ITU World Telecommunication/ICT Indicators database.

Chart 1.2

ICT developments in EU-27, 1999-2008



Source: ITU World Telecommunication/ICT Indicators database.

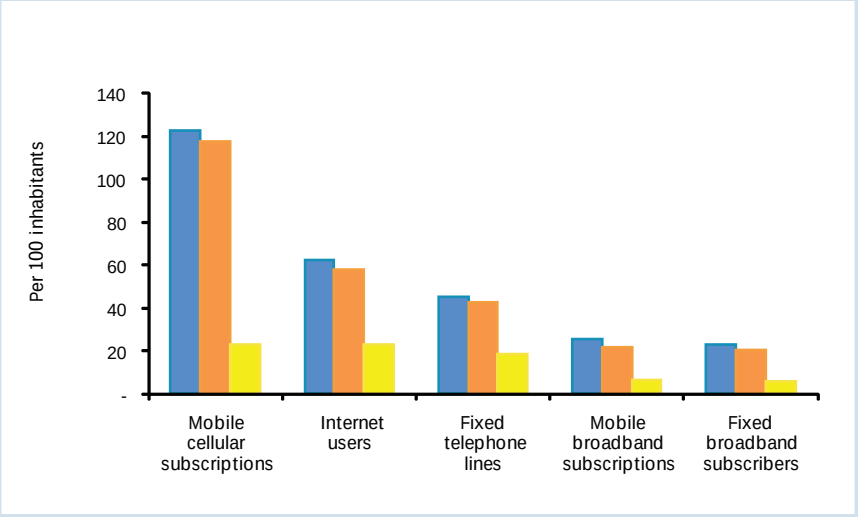
By examining the smaller group of EU-27, similar conclusions arise. EU-27[1] presents high population penetration numbers in fixed and mobile telephony, as well as Internet usage (Chart 1.2). By the end of 2008, the European region stood well above the worldwide average in all ICT services uptake (Chart 1.3)[2].

1.1 Fixed and mobile telephony

In 2008, the total number of mobile cellular subscriptions exceeded 722 million in the extended European region (E-42) and 607 million in EU-27 (Charts 1.4 and 1.5).

Chart 1.3

ICT uptake in Europe and the world, 2008



Source: ITU World Telecommunication/ICT Indicators database.

Mobile cellular subscriptions and fixed telephone lines in E-42, 1999-2008

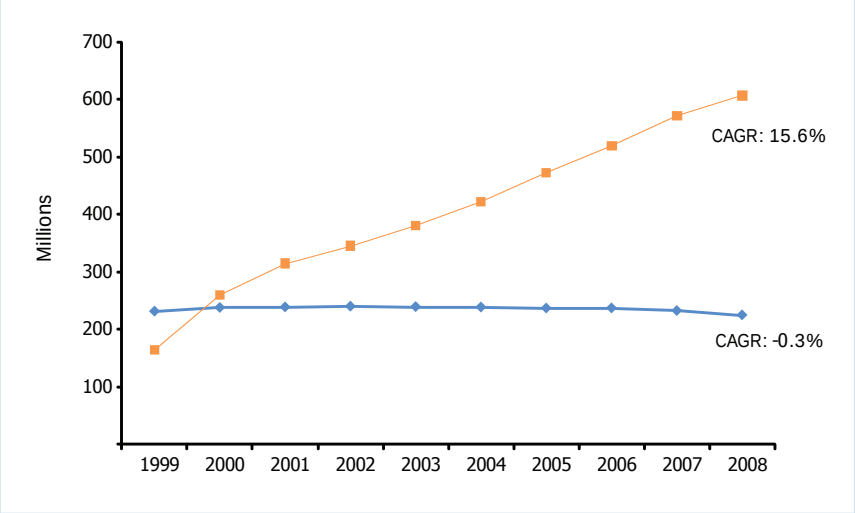


Chart 1.4

Mobile cellular subscriptions

Fixed telephone lines

Note: CAGR= Compound Annual Growth Rate

Source: ITU World Telecommunication/ICT Indicators database.

Similarly, there were 260 million and 225 million fixed telephone lines in E-42 and EU-27, respectively.

Interestingly, several Central Eastern European countries, such as Lithuania and Estonia, had mobile penetration rates well above 140 per cent by the end of 2008. In the case of Estonia, mobile cellular subscriptions penetration reached 188 per cent by the end of 2008, and it is currently exceeding 200 per cent, making the country one of the world leaders in mobile telephony uptake. High penetration rates in Central Eastern European markets are explained, on the one hand, by a relatively low fixed

In 2009, mobile cellular subscriptions in Estonia are exceeding 200 % penetration

Mobile cellular subscriptions and fixed telephone lines in EU-27, 1999-2008

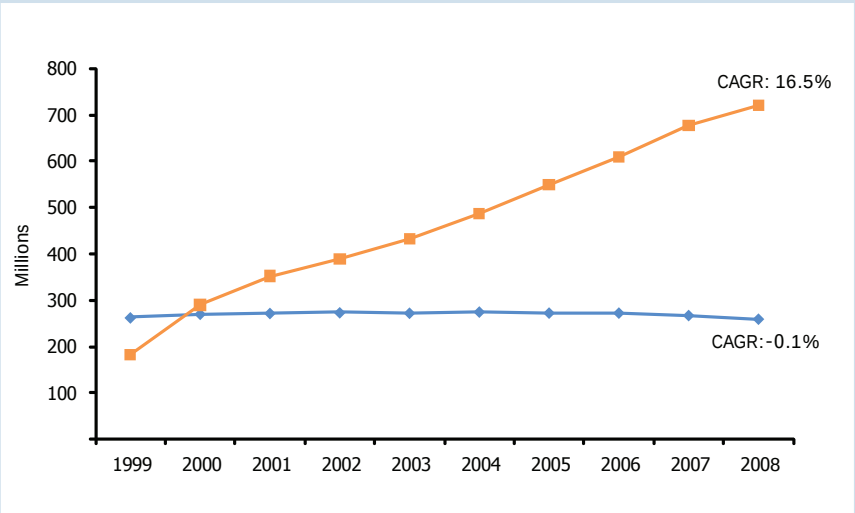


Chart 1.5

Mobile cellular subscriptions

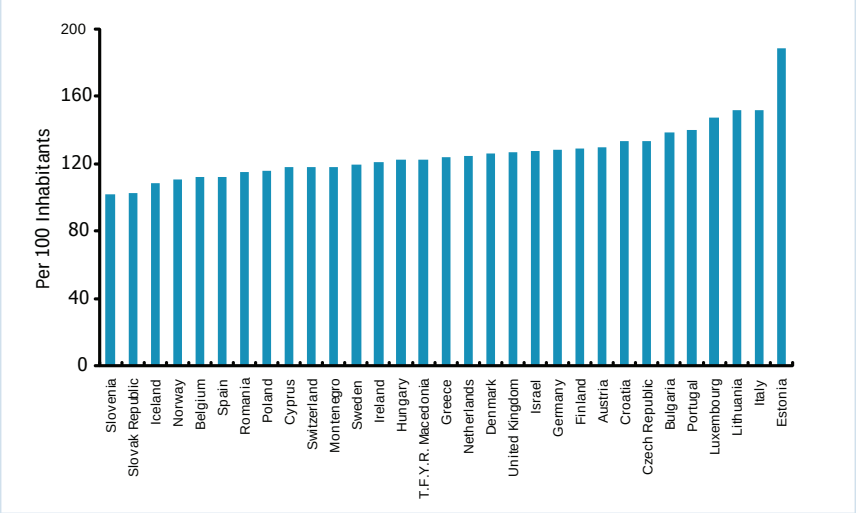
Fixed telephone lines

Note: CAGR= Compound Annual Growth Rate

Source: ITU World Telecommunication/ICT Indicators database.

Chart 1.6

E-42 countries with mobile cellular penetration above 100 per cent, 2008



Source: ITU World Telecommunication/ICT Indicators database.

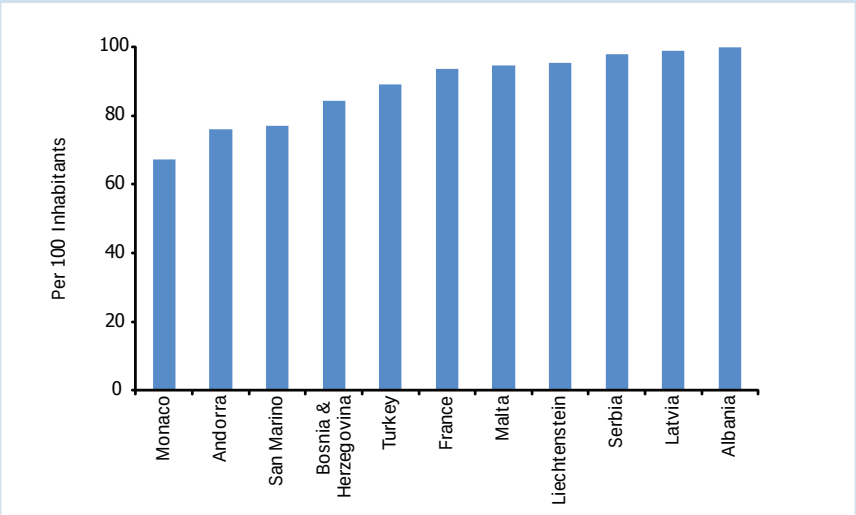
Most countries in Europe have mobile cellular penetration rates above 100 %

telephony uptake, and on the other hand, by the existing market structure, which is characterized by a very high share of prepaid subscribers (above 80 per cent) with some people holding multiple SIM cards (Chart 1.6). It must be also emphasized that in the case of Montenegro, where mobile population penetration currently exceeds 118 per cent, Mobile Number Portability (MNP) has not yet been implemented, forcing end-users to subscribe to multiple networks in order to enjoy lower on-net calls.

As further illustrated in Chart 1.7, there are only 11 out of the 42 examined European countries that have mobile cellular penetration rates below 100 per cent, with

Chart 1.7

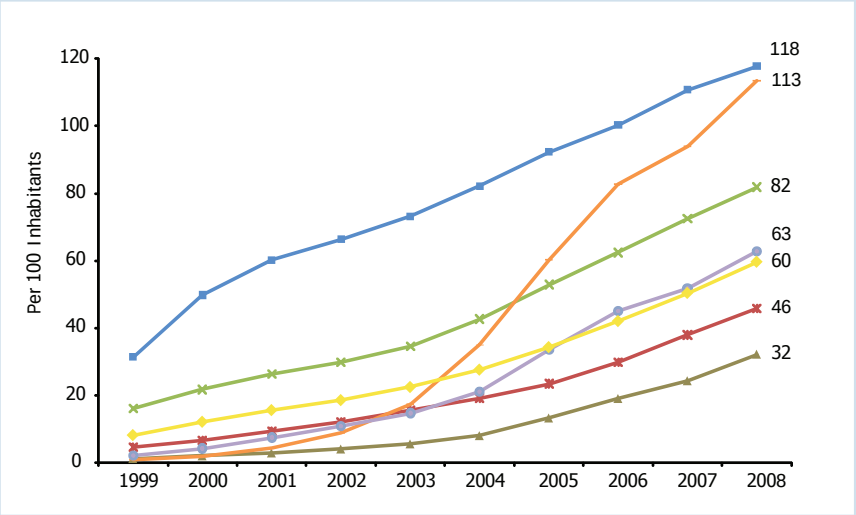
E-42 countries with mobile cellular penetration below 100 per cent, 2008



Source: ITU World Telecommunication/ICT Indicators database.

Mobile cellular subscriptions by region, 1999-2008

Chart 1.8



Source: ITU World Telecommunication/ICT Indicators database.

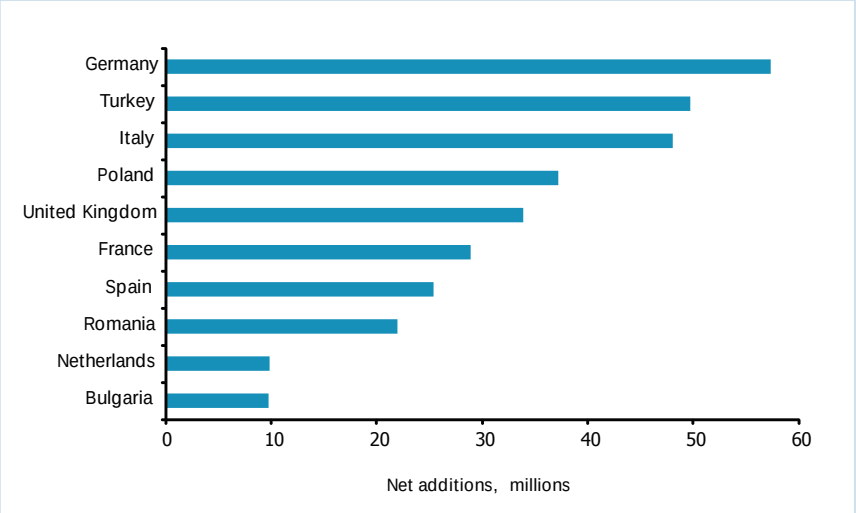
San Marino, Andorra and Monaco occupying the last three positions.

With regards to mobile cellular subscriptions uptake, with no doubt, Europe is the worldwide leader, significantly ahead of all other regions in the world (Chart 1.8). As already indicated, this is partly due to the adoption of a harmonized technological standard (e.g. GSM) during the early stages, the enforcement of enabling policies and effective regulations to further promote competition (e.g. cost-based interconnection rates, removal of retail controls), and the fact that in most European countries, citizens can afford to spend part of their disposable income for personal mobile communica-

The high uptake of mobile telephony in Europe is partly due to the early adoption of a harmonized technological standard

Countries with the highest net additions of mobile cellular subscriptions in E-42, 2000-2008

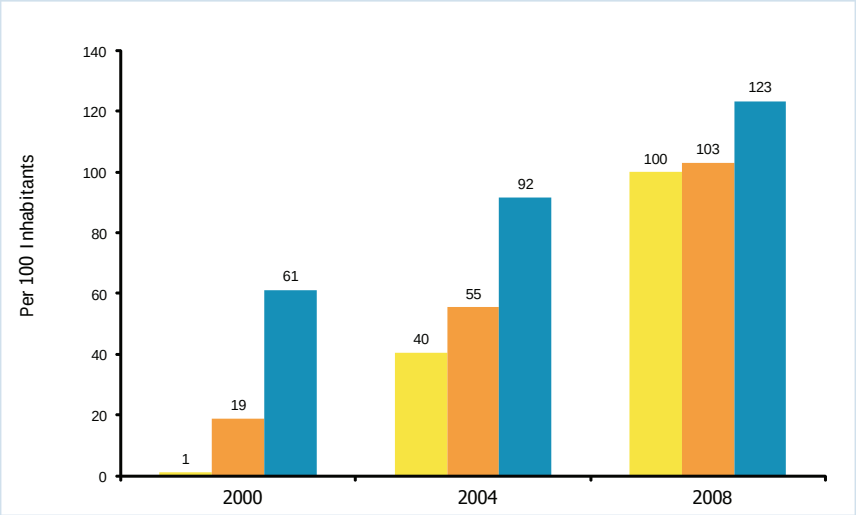
Chart 1.9



Source: ITU World Telecommunication/ICT Indicators database.

Chart 1.10

Mobile cellular penetration in E-42 by income grouping



Source: ITU World Telecommunication/ICT Indicators database.

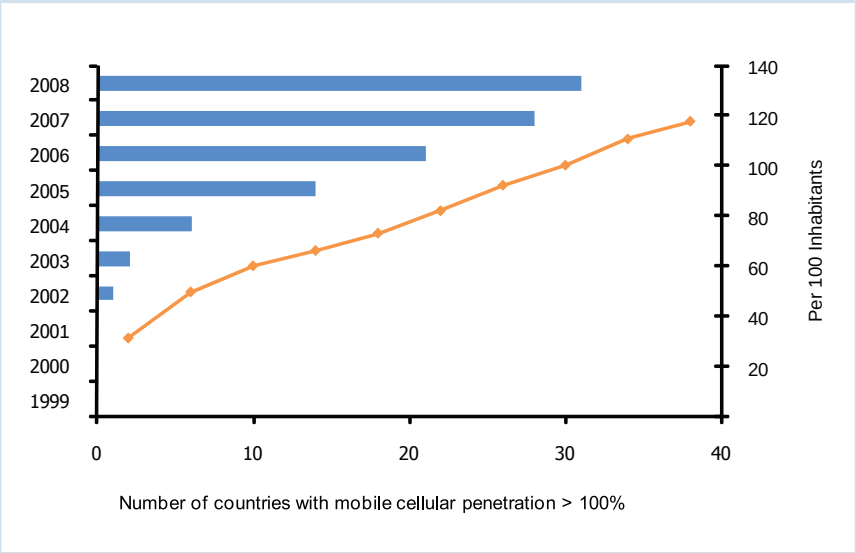
The first mobile cellular subscriptions were recorded in Finland as early as 1980

tions (32 out of 42 European countries are characterized as high-income economies[3]). European countries were also the first to launch and commercialize mobile cellular networks, with the first mobile cellular subscriptions recorded in Finland as early as 1980, followed soon after by Sweden, Norway, and Denmark.

In the extended European region (E-42), the countries with the highest number of net added mobile cellular subscriptions, in the period 2000-2008, include Germany, Turkey, Italy and Poland, followed by the U.K, France, Spain, Romania, and Bulgaria

Chart 1.11

"Double-SIM" effect in E-42, 1999-2008



Source: ITU World Telecommunication/ICT Indicators database.

Internet users by region, 2004-2008

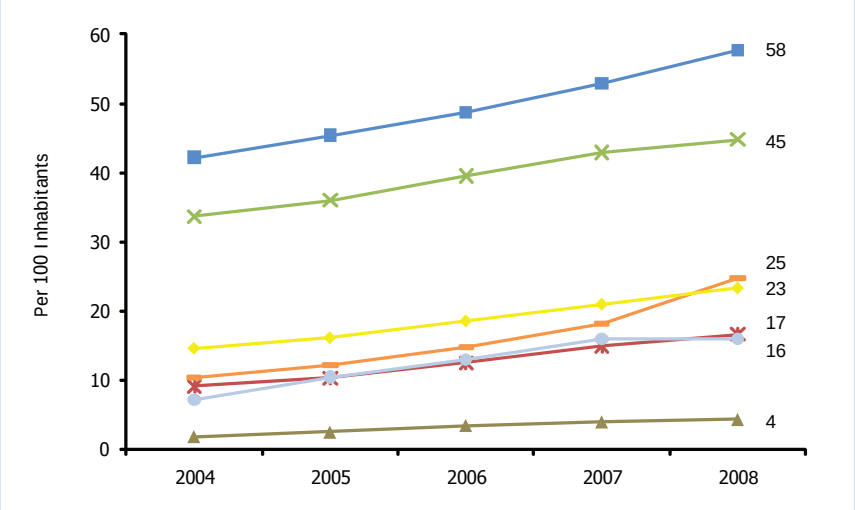


Chart 1.12

Source: ITU World Telecommunication/ICT Indicators database.

(Chart 1.9). However, in some cases, particularly in Turkey[4], the high number of net additions is mainly due to the large population base, with mobile penetration rates still behind those in Western European countries.

Moreover, significant inequalities exist among European countries with regards to mobile subscriptions uptake, with the most affluent ones leading the way (Chart 1.10).

An important phenomenon in the European mobile market is the so-called "double-SIM effect", which refers to cases where mobile subscription penetration is reported higher than 100 per cent. As presented in Chart 1.11, there is an exponential growth in the number of countries with more than 100 per cent mobile cellular penetration over the past decade. Different parameters that affect this trend are individual countries' market structures (e.g. high share of prepaid customers), the criteria applied for calculating active subscribers (e.g. de-activation period) and the number of businesses/enterprises per country (e.g. multi-SIM registration under one account)

1.2 Internet and broadband

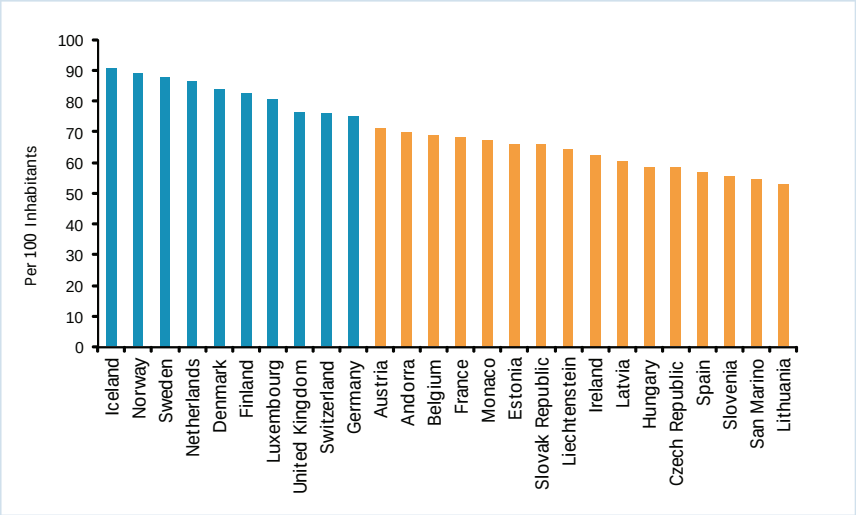
The European region has the highest number of Internet users per 100 inhabitants compared to any other region worldwide (Chart 1.12). The total number of Internet users has been growing at more than nine per cent annually during the past four years, currently reaching 58 per cent population penetration in the extended European region.

The European region has the highest number of Internet users per 100 inhabitants compared to any other region worldwide

However, it should be emphasized that there is a two-tier classification when examining individual countries' Internet user penetration in the E-42. On the one hand, there is a group of countries, such as the Nordic countries, the Netherlands, the UK, Luxembourg and Germany, which have very high Internet penetration rates (above 75 per cent in 2008); they are followed by a second group of European countries,

Chart 1.13

European countries with Internet user penetration above 50 %, 2008



Source: ITU World Telecommunication/ICT Indicators database.

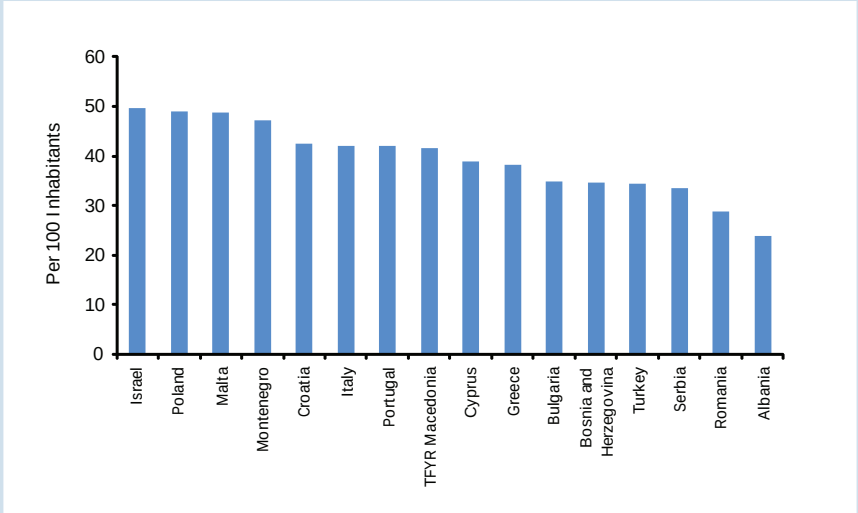
Internet user penetration is much lower in South Eastern European countries compared to the Nordic countries

such as Estonia, Latvia, Hungary, Poland and Lithuania, which have an Internet user penetration of more than 50 per cent (Chart 1.13). The effective implementation of the European i2010 initiative has played an important role in this development, which aims to foster digital inclusion and offer better public services and quality of life through the use of ICT, and which is assisted by the adoption of national strategies for Internet and broadband services diffusion[5].

Nevertheless, in most Eastern and South Eastern European countries, less than 50 out of 100 inhabitants are using the Internet (Chart 1.14). The main reasons for this

Chart 1.14

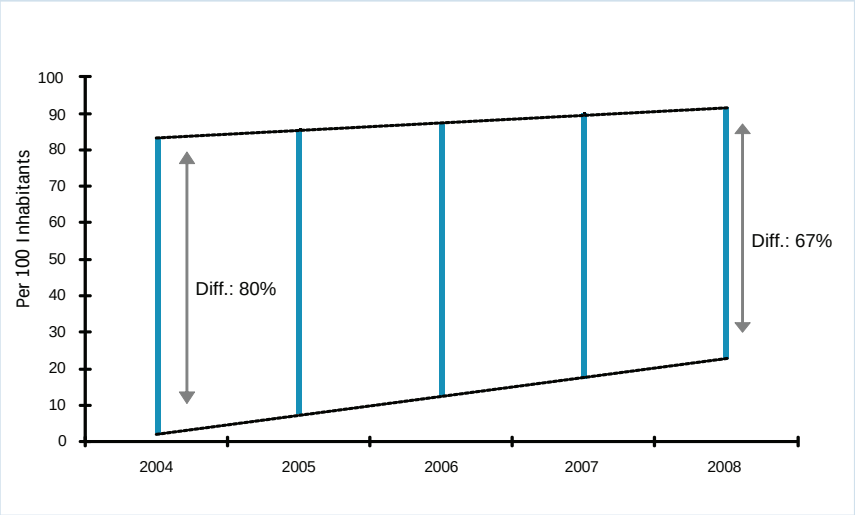
European countries with Internet user penetration below 50 %, 2008



Source: ITU World Telecommunication/ICT Indicators database.

Gap between countries with highest and lowest Internet penetration in E-42, 2004-2008

Chart 1.15



Source: ITU World Telecommunication/ICT Indicators database.

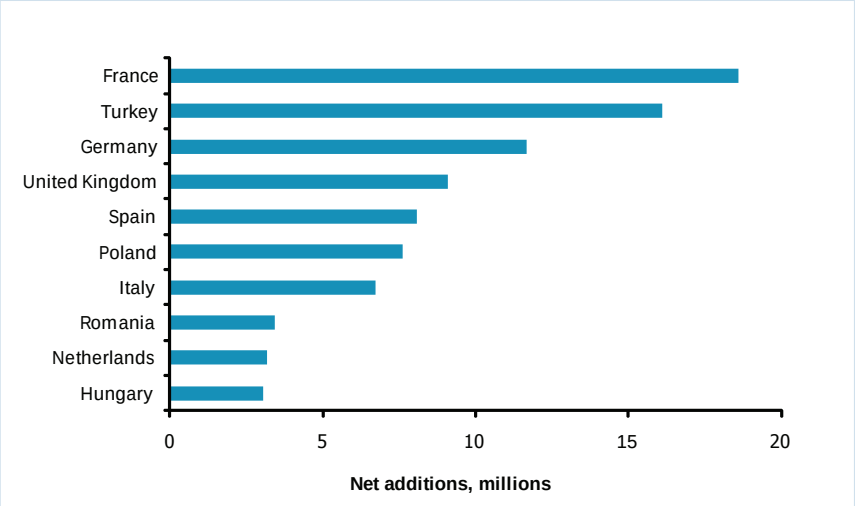
are the late market liberalization (i.e. incumbent's dominance, which implies lack of competition and hence relatively high prices for the mass market) and lower digital literacy (the worst performers in the EU-27 Index of Digital Literacy are Bulgaria, Romania and Greece[6]).

Between 2004 and 2008, the gap in Internet user penetration within the region has been constantly decreasing

However, it must be emphasized that the underlying gap between the country with the lowest Internet user penetration (Albania) and the countries with the highest one (the Nordic countries), has been constantly decreasing over the period 2004-2008 (Chart 1.15). This is explained by the fact that as more advanced countries are entering into

Countries with the highest net additions of Internet users in E-42, 2004-2008

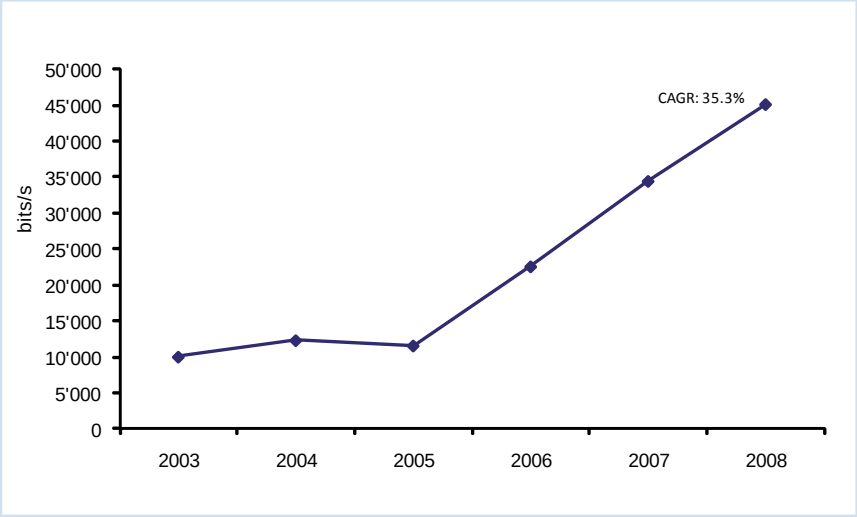
Chart 1.16



Source: ITU World Telecommunication/ICT Indicators database.

Chart 1.17

International Internet bandwidth per user in E-42, 2003-2008



Note: CAGR=Compound Annual Growth Rate

Source: ITU World Telecommunication/ICT Indicators database.

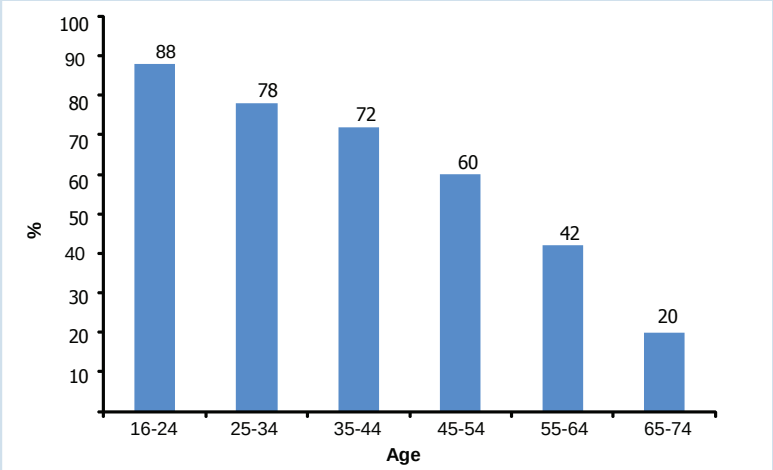
International Internet bandwidth in Europe has been growing at 35% annually during the past five years, reaching 45,000 bits/s/user in 2008

a mature phase, their annual growth rate is lower than in the countries that are at the early stages of Internet market development.

Among the countries with the highest number of net additions of Internet users, for the period 2004-2008, are France, Turkey, Germany, UK and Spain (Chart 1.16). The exponential growth of Internet users has come with a significant increase in the international Internet bandwidth available per user in the extended European region (E-42). Over the period 2003-2008, this number has reached 45'000 bits/s per user, accounting for a 35 per cent compound annual growth rate over the same period[7] (Chart 1.17[7]).

Chart 1.18

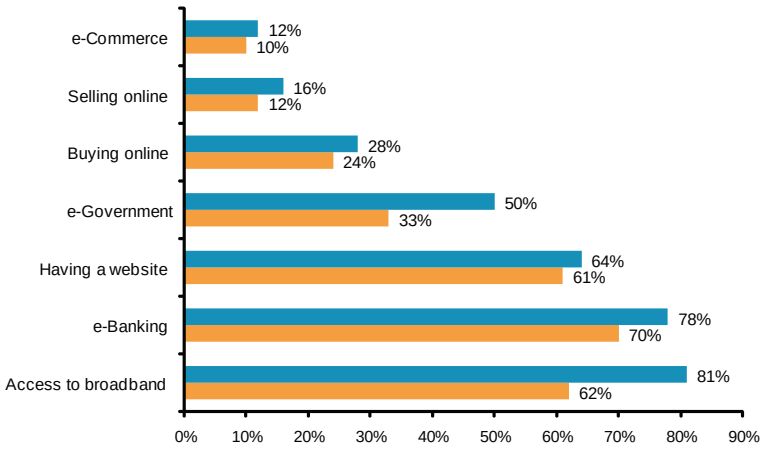
Internet user penetration per age group in EU-27, 2008



Source: ITU World Telecommunication/ICT Indicators database.

Type of Internet activities carried out by enterprises, EU-27, 2008

Chart 1.19



Source: Eurostat, Survey on ICT in Enterprises (10+ employees, excluding the financial sector)

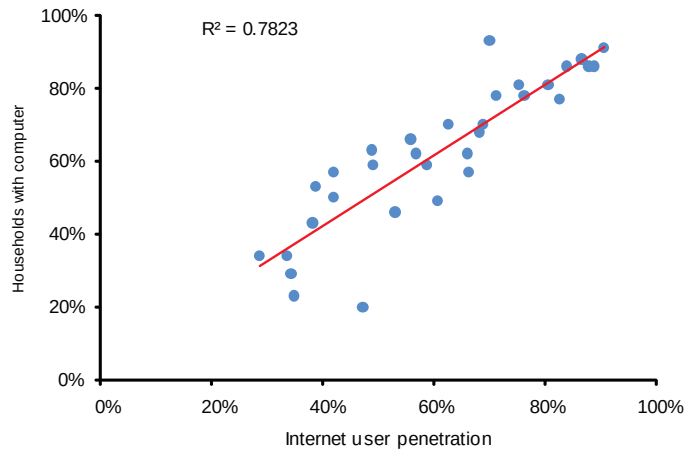
A recently published EC report on the benchmarking of the i2010 initiative, based on a 2008 survey on Internet usage[8] shows that the percentage of Internet users considerably varies across the different age groups (Chart 1.18). Therefore, "digital natives" (e.g. people between 16 and 34) and especially those aged 16 to 24, stand out as the most regular and intensive users of the Internet. The most frequent use of the Internet is for communicating, followed by entertainment and informative and social networking activities/applications.

The most frequent use of the Internet is for communicating, entertainment and social networking activities

Similarly, in the enterprise segment, there has been significant growth in the use of Internet over the past years (Chart 1.19 [9]). As of 2008, more than 80 per cent of

Correlation between Internet user penetration and proportion of households with access to a computer, E-42, 2008

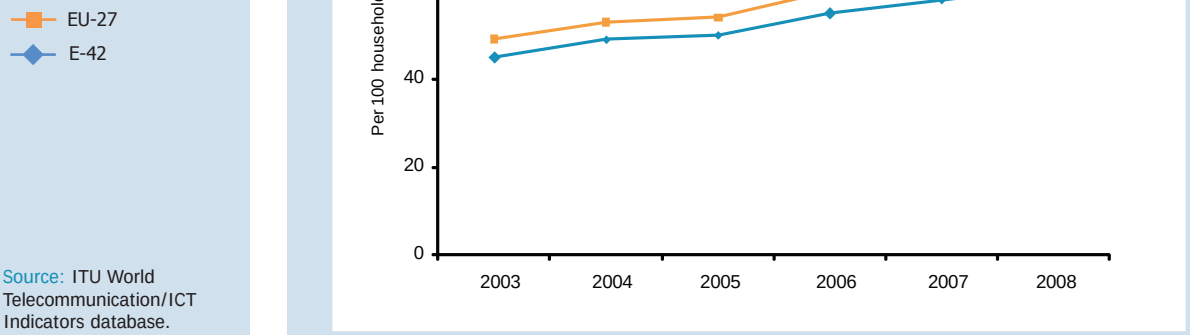
Chart 1.20



Source: ITU World Telecommunication/ICT Indicators database.

Chart 1.21

Proportion of Households with a computer in Europe, 2003-2008



Source: ITU World Telecommunication/ICT Indicators database.

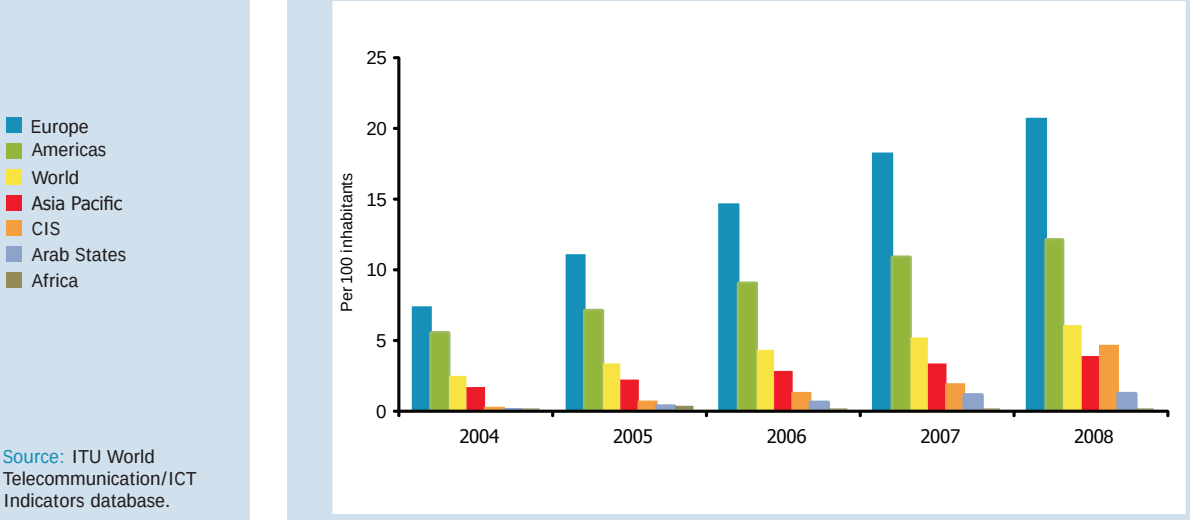
Household Internet uptake is closely linked to the availability of computers at home

enterprises (with more than ten employees) in EU-27 had a broadband connection and 12 per cent of total enterprise turnover was made online, compared to just 2 per cent in 2005.

At the household level, Internet usage uptake is closely linked to the availability of computers, as shown in Chart 1.20[10] (significant correlation coefficient). While, on average, Europe has a relatively high proportion of households with access to computers (Chart 1.21), there are a number of countries in the South-East European region (e.g. Bulgaria, Montenegro, Romania, Serbia, Turkey) with significant low computer penetration per household (i.e. below 35 per cent as of 2008).

Chart 1.22

Fixed broadband subscriber penetration by region, 2004-2008



Source: ITU World Telecommunication/ICT Indicators database.

Mobile broadband penetration by region, 2004-2008

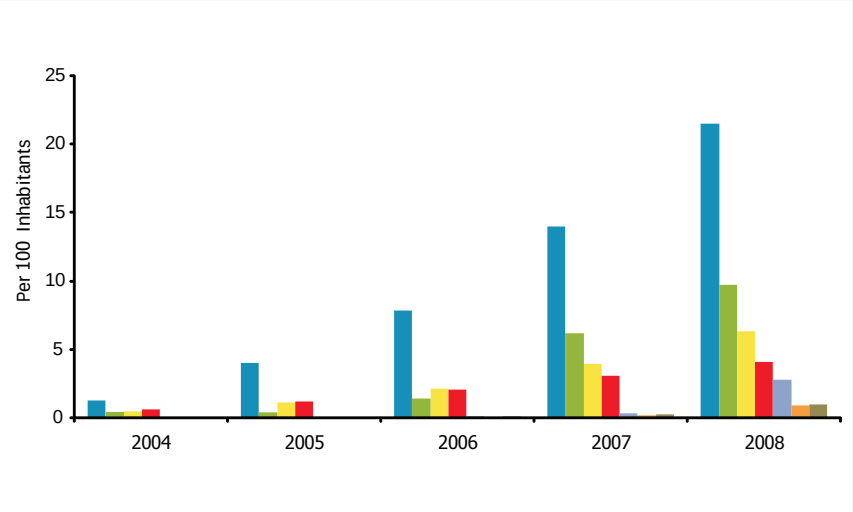


Chart 1.23

Source: ITU World Telecommunication/ICT Indicators database.

Europe is currently leading the way with regards to uptake of both fixed and mobile broadband services. By the end of 2008, fixed broadband penetration was 20 per cent in the extended European region (E-42) (Chart 1.22). This number is significantly higher than in any other region in the world. High adoption has been achieved mainly by enabling effective and efficient competition through introducing certain policies and regulations (e.g. unbundling, granting a high number of ISPs licenses) and by implementing national broadband plans (e.g. national plans of Germany, Nordic countries). In parallel, network effects also play an important role, as more people understand and appreciate the benefits of using broadband Internet services and applications.

Between 2004 and 2008, Europe has experienced more than 100 % annual growth of mobile broadband subscriptions

Similarly, over the period 2004-2008, the extended European region has experienced more than 100 per cent annual compound growth of mobile broadband subscriptions. The total number currently reaches more than 132 million, representing 21 out of 100 inhabitants (Chart 1.23). Remarkable growth occurred mainly during the past three years, as mobile operators have upgraded their access networks (migration to 3.5G / HSxPA), mobile broadband offerings have become more competitive in terms of pricing, and people increasingly appreciate the convenience provided by using "broadband on the move". However, it is widely believed that there is still significant room to grow for the mobile broadband market, as the mobile cellular telephone sector and related industries (e.g. application providers, handset manufacturers, vendors) become more mature, services more sophisticated and prices lower.

Endnotes

[1] Annex I includes the list of countries included in the ITU-BDT European regional classification. This report makes reference to the extended European region (E-42) and the European Union member countries (EU-27). Please note that, in most cases, data for Monaco were not available.

[2] Second-best performing region in fixed telephony and Internet usage is the Americas region, and in mobile cellular subscriptions the CIS region.

[3] The grouping of economies by income levels used is that defined by the World Bank (http://web.worldbank.org).

[4] In 2008, mobile cellular subscriptions penetration in Turkey was 87 per cent.

[5] See, for example, "Digital Britain" strategy in UK, "Avanza Plan" in Spain, "National Broadband Strategy" in Germany.

[6] Index of Digital Literacy, Commission of the European Communities, Europe's Digital Competitiveness Report, Annual Information Society Report 2009; Benchmarking i2010: Trends and main achievements.

[7] In 2005, international Internet bandwidth per user has been lower than 2004 since Internet users had grown at a faster rate compared to international Internet bandwidth available.

[8] Source: Commission of the European Communities, Europe's Digital Competitiveness Report, Annual Information Society Report 2009; Benchmarking i2010: Trends and main achievements / Survey data refer to the age group 16-74 (not the entire population) and take into account citizens who have used the Internet during the last three-month (not during the whole last year).

[9] Commission of the European Communities, Europe's Digital Competitiveness Report, Annual Information Society, August 2009.

[10] Individual country data on the proportion of households with access to a computer (2008) are mainly based on "OECD Key ICT Indicators – 6.a. Households with access to home computer", OECD, July 2009.

Chapter 2.

Telecommunication and media sector convergence: hype or reality?

2.1 Overview

The European telecommunication industry is characterized by stagnating revenues, the introduction of bundled services and increased competition by media players

Over the past years, new market, technological and business trends have significantly altered the dynamics in Europe's telecommunication sector. It is evident that as most markets are entering into a more mature phase, the industry is looking for the next "big bang" that will create new momentum and trigger the interest of end-users, as well as investors. The key characteristics of the European telecommunication industry today are:

- **Stagnating revenues and profitability for operators:** fixed and mobile revenues are flattening, if not declining. Operators are looking for new marketing activities and are launching a variety of subscriber retention/loyalty programmes[1].

- **Introduction of bundled services packages:** introduction of double, triple and quad-play is currently the "go-to-market" strategy for most operators. There is a trend among service providers to partner with content production and distribution houses and/or to move up the content creation and delivery value chain.

- **Increased competition by non-telecommunication players:** there is an ongoing trend by Web 2.0 and media players[2] entering the telecommunication sector, either through mergers and acquisitions or by offering traditional telecommunication services (e.g. voice) through their own access channels (e.g. VoIP calls).

On the other hand, traditional media players are also looking to move into the ICT market, trying to increase their market share while in parallel safeguarding traditional revenue streams. Some of the key characteristics of the media industry in Europe are summarized below:

- **Strong financial position:** media firms are trading at a higher value than traditional telecommunication operators (e.g. Enterprise Value (EV) of 7-8 times EBITDA[3] compared to 4-5 times EBITDA for telecommunication operators) as indicated by past financial stock market results[4]. This enables media firms to have excess free cash that can be leveraged for marketing/advertisement and/or acquisition activities.

- **Requirement to explore new markets:** media firms are currently looking for new advertisement revenue streams by leveraging on new ways of accessing

end-users. Increased broadband penetration coupled with increased e-literacy of European citizens provide a unique opportunity to produce customized and targeted advertisement, focusing particularly on the youth segment.

- **Digital switchover opportunity:** EU member countries have decided uniformly to complete the transition to digital broadcasting by 2012[5]. Digital broadcasting provides new opportunities for end-users, as more interactive and user-friendly features will become available. Media firms are hence looking for new opportunities to leverage on the existing subscriber base, to either increase revenues and/or retain loyalty.

Convergence of the telecommunication, IT and media sectors is currently underway in many European countries, yet another sign of the transition to the digital economy

Convergence of the telecommunication, IT and media sectors is currently underway in many European countries, which is yet another sign of the transition to the digital economy. The most successful example so far is France Telecom-Orange, where its media-oriented IP Television (IPTV) package, "Orange TV Livebox", attracts more than 2.1 million subscribers, corresponding to 16 per cent of its total broadband subscriber basis[6]. Similarly, alternative operator SFR offers a broad range of quadruple-play mass market services, also including media-centric services (e.g. IPTV and Video on Demand (VoD))[7]. In Spain, incumbent operator Telefonica has been also very successful with its IPTV service offering "Imagenio", which has currently more than 600,000 subscribers[8]. Moreover, in Italy, Telecom Italia's "Alice Case" triple-play package achieved a portfolio of 233,000 customers by 2008, corresponding to 3.5 per cent of its total broadband customers' basis[9], while alternative provider Fastweb provides triple-play services, including digital TV offerings, to all market segments, capturing around 260,000 subscribers[10].

In addition to the benefits accrued by telecommunication and media players offering these new services, national policy makers and regulators should ensure that all citizens will be able to enjoy ubiquitous, high-speed and high-quality access to services over the next years.

In view of these trends, policy makers and regulators need to re-assess their approach to regulating markets

In order to obtain a better understanding of the underlying key trends in the telecommunication/media convergence in Europe, three areas need to be further examined:

1. **Timing of convergence:** despite the fact that convergence has been discussed for quite a long time, it is only recently that a great variety of telecommunication/media converged service offerings, such as IPTV, VoD and interactive television have been available to end-users; hence, associated supply and demand drivers need to be further evaluated.

2. **Role of policy makers and regulators:** European policy makers and regulators should re-assess their overall positioning and approach to regulating markets. Most importantly, they need to re-examine the overall regulatory scope and objectives and decide on the best-fit governance model for a converged telecommunication/media regulatory authority. Additionally, they are required to assess and define applied regulatory levers evolution, such as content protection, interconnection of access networks and wholesale pricing of bundles.

Fixed broadband subscribers by technology in E-42, 2000-2008

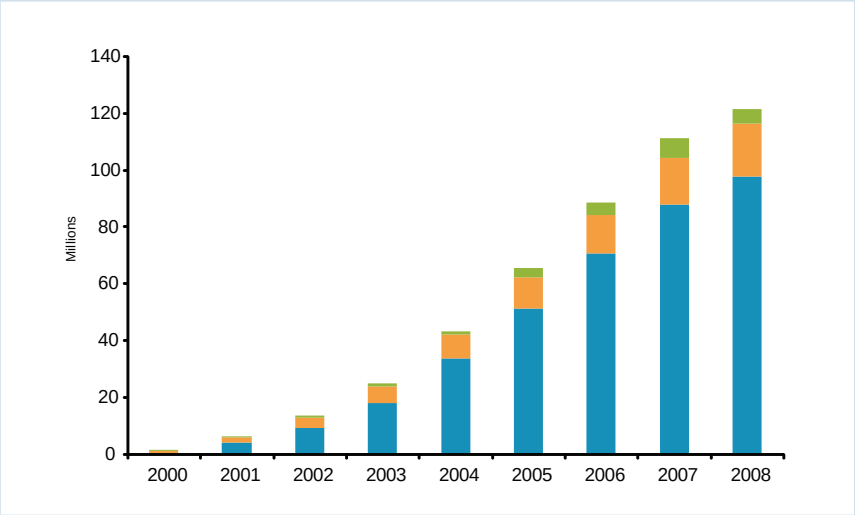


Chart 2.1

Source: ITU World Telecommunication/ICT Indicators database.

3. **Convergence momentum:** it is important to understand whether convergence is just another "hype" of the telecommunication industry or whether it has already gained significant momentum among the leading telecommunication/media players along the value chain; hence, relevant market cases should be examined

2.2 Supply drivers

As already presented in Chapter 1.2, there is currently a significant uptake in fixed broadband in the European region. The total number of fixed broadband subscribers is now exceeding 114 million, corresponding to a 29 per cent compound annual growth rate over the past five years. As further indicated in Chart 2.1 below, the majority of broadband connections in Europe are based on DSL technology (copper), representing around 69 per cent of total connections, followed by cable modem and other forms of broadband access, including fiber network topologies (e.g. FTTx), satellite, as well as aerial LAN broadband connectivity, which is most popular in Eastern European countries.

The majority of broadband packages in Europe are based on DSL technology, representing around 69 % of all connections

Broadband speeds greatly depend on the type of access technology used, the relevant network topology (e.g. distance of end-user premises to central office), as well as the number of users sharing a connection (e.g. sharing the available bandwidth). In most markets, end-users are able to choose among a variety of broadband packages offering different speeds (e.g. from 2 Mbps to 24 Mbps) at different prices. However, lately, there has been a continuous trend of subscribers migrating to higher-speed broadband packages (e.g. above 24 Mbps) available through new technologies. In some European countries, such as the UK, France or the Netherlands, Fiber-To-The-Curb (FTTC) and Very High Speed Digital Subscriber Line (VDSL2) network topologies are gaining significant momentum, offering speeds of more than 50 Mbps to end-users[11]. In 2008, total FTTx connections in Europe reached around two million and, according to the European FTTH Council[12], fiber connections are expected to represent around nine

There has been a continuous trend of subscribers migrating to higher-speed broadband packages

per cent of total broadband connections by 2013.

There has been a remarkable growth in mobile broadband connections in Europe

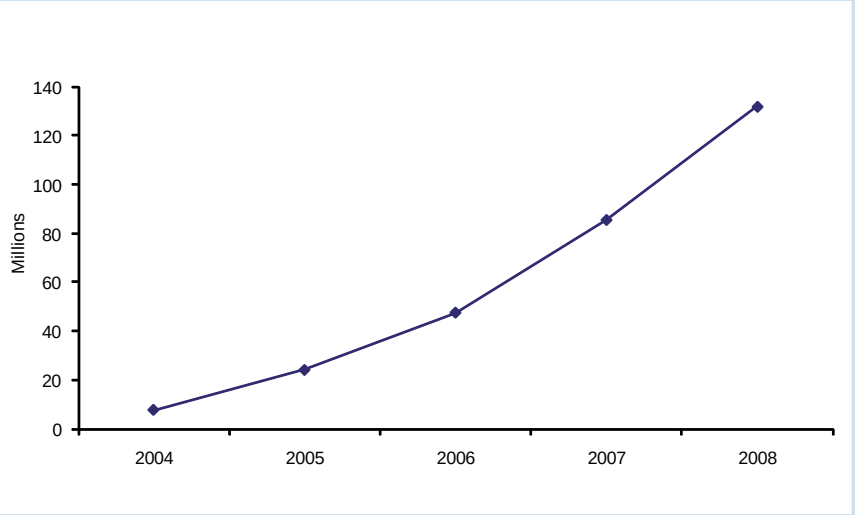
Europe's fixed operators are predominately migrating to Next Generation Networks (NGN) topologies on the core and transport layer, in an attempt to simplify network complexity, provide better and faster services, and subsequently reduce operational costs. On the access side, Next Generation Access (NGA) operators are deploying either fiber up to street cabinet level (up to the "last mile" before reaching end-users) and/or support VDSL technologies, expecting additional revenues per subscriber through the use of new and innovative services. Examples include KPN in the Netherlands and Telecom Italia in Italy.

In the mobile domain, there is a remarkable growth of mobile broadband connections. This is triggered by the significant network upgrade undertaken by mobile operators as well as by the convenience to consumers of "broadband on the move". Mobile operators have significantly increased their 3G coverage in national territory, while also engaged in upgrading to High Speed X-link Packet Access (HSxPA-3.5G) technologies in key urban areas. Mid to long-term plans imply that operators will be eventually migrating to Long Term Evolution (LTE)/Service Architecture Evolution (SAE) access network technology, being able to offer super-high broadband speeds of up to 50 Mbps. In this context, the European Commission has committed to invest more than Euros 700 million over the period 2007-2013, in the research and development of next-generation mobile access networks (e.g. LTE).[13]

In parallel, a decrease in mobile broadband prices, coupled with an intense promotion and marketing by operators, has resulted in creating an important momentum among subscribers, and led mobile broadband becoming one of the fastest growing market segments, accounting for more than 125 million subscriptions in the extended European region, by the end of 2008 (Chart 2.2). It is estimated that this number has increased to close to 190 million in 2009[14], experiencing steep growth in less than one year.

Chart 2.2

Mobile broadband subscriptions in E-42, 2004-008



Source: ITU World Telecommunication/ICT Indicators database.

Mobile broadband subscriptions (2008) and CAGR (2004-2008), selected European countries

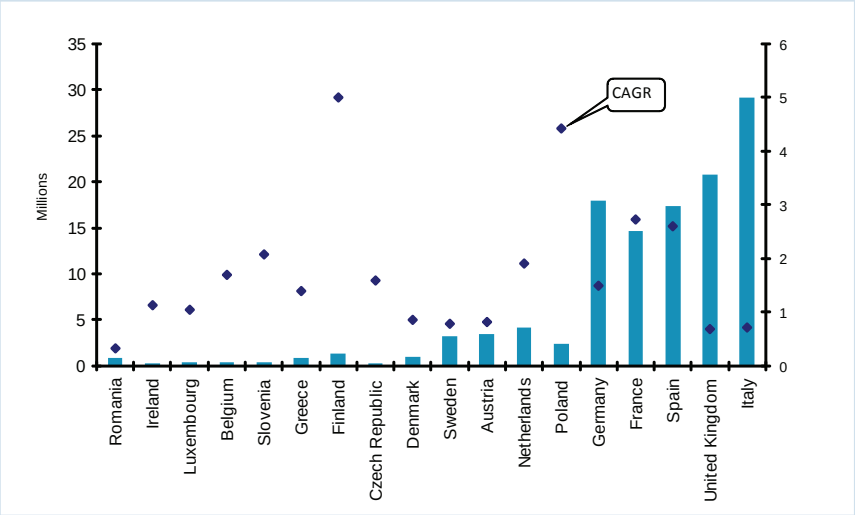


Chart 2.3

Note: CAGR= Compound Annual Growth Rate

Source: ITU World Telecommunication/ICT Indicators database.

As expected, the most advanced and large European countries (e.g. Italy, Spain, France and Germany) have the highest numbers of mobile broadband subscriptions, based on a significant growth over the past years (Chart 2.3). However, it is important to note that a number of smaller countries (e.g. Finland, Denmark, Netherlands, Greece) have experienced an exponential growth in mobile broadband subscriptions, further indicating the momentum of high mobile broadband services adoption. This is partly explained by the fact that these smaller countries are starting from very low levels, with significant room to grow, when compared to more advanced countries.

On the supply side, it should be noted that there are continuous trends by governments and private entities to form PPPs (Public Private Partnerships), aiming to deploy fiber access networks at the municipality and/or national level. For example, in Sweden, Stokab[15] has been created based on an initiative by Stockholm's municipality, with the intent of deploying fiber access networks and offering wholesale dark fiber services to service providers and other public and private institutions.

The German "National Broadband Strategy" aims to provide broadband access to 75 % of households by 2014 and is expected to create 400,000 new jobs

At the national level, in early 2009, the German Government announced the "National Broadband Strategy", which aims to provide broadband connections of at least 50 Mbps to 75 per cent of German households by 2014[16]. The total required investment is estimated at around Euros 20.2 billion and although the strategy is predominantly market-driven, the deployment in locations where it would not otherwise be economically feasible will be partly financed by public subsidies. According to a recent study by German academics[17], the implementation of the strategy will yield 400,000 additional jobs and a 0.49 per cent GDP increase (corresponding to Euros 62.1 billion), based on both network construction and associated network externalities (e.g. enhanced innovation, additional business growth). In a scenario where 50 per cent of households will be connected with at least 100 Mbps and an additional 30 per cent with at least 50 Mbps by 2020, the total number of new jobs created is expected to reach 1,000,000, yielding an overall GDP growth of 0.6 per cent.

Similarly, in Greece, the Ministry of Communication has announced an ambitious Euros 2.1 billion PPP programme, aiming to connect around two million households nationwide to fiber access by 2017[18]. Over the course of the project, three new, independent network companies will be created, split among three distinct geographic areas, and offering dark fiber services under an open-access regime to service providers. One third of the cost of this programme is intended to be co-funded by the Greek Government, with the private sector covering the remaining two-thirds. Currently, the plan and its associate legal framework are under public consultation and implementation is expected to start by early 2010.

In Greece, the Ministry of Communication has announced an ambitious Euros 2.1 billion programme aiming to connect two million households nationwide to fiber access by 2017

Based on the European FTTH Council[19], more than 60 per cent of FTTx projects for 2007 were initiated by municipalities and power utilities. Only recently the incumbent and alternative operators have started participating in similar projects, either through PPP schemes and/or on a stand-alone basis (e.g. Fastweb – Italy, Deutsche Telekom – Germany, Swisscom – Switzerland, KPN – Netherlands, Illiad/Free – France).

In all of the above examples, the common characteristic is the recognition that countries need to develop high-speed access networks to enable their citizens to enjoy new, advanced, innovative services. Apart from enabling the transition to the digital economy, these projects are ultimately expected to yield large productivity gains.

The European Commission has adopted a uniform policy of migrating to 100 per cent digital broadcasting by 2012, based on DVB-T technology

In the media domain, the European Commission has adopted a uniform policy of migrating to 100 per cent digital broadcasting by 2012. The technological standard of choice for the European region has been the Digital Video Broadcasting - Terrestrial (DVB-T) technology, which is expected to achieve six-time the spectral efficiency of the existing analogue transmission. Most of the countries have already started the process of migrating to digital broadcasting by selecting compression techniques (e.g. Moving Picture Experts Group 4 - MPEG4), re-examining and reassessing the current regulatory regime, and - most importantly - deciding on the optimal use of the digital dividend. The latter refers to the spectrum in the Ultra High Frequency (UHF) band, which is currently occupied by analogue TV, and which will be released through the transition to digital broadcasting.

As shown in Chart 2.4, a number of leading countries, such as France, Germany, Spain, Norway and Finland, have already decided that released spectrum should be mainly utilized for the deployment of cost-efficient and advanced mobile broadband services, through a spectrum refarming process. Other countries, such as the UK, Sweden, Hungary and Turkey, are likely to follow soon. The remaining countries in the extended European region are currently reviewing their policies and available options.

Both next-generation access and digital broadcasting infrastructure are becoming increasingly available in most European countries

Overall, both next-generation access and digital broadcasting infrastructure are becoming increasingly available in most European countries. In this context, telecommunication and media firms are already developing their platforms in order to deliver truly converged services to end-users, ensuring that there will be no shortfalls on the supply side. The key question, however, is to what extent subscribers will adopt new telecommunication/media converged services and appreciate their expected added value.

Status of spectrum refarming – expected use of the "Digital Dividend"- in EU-27, 2009

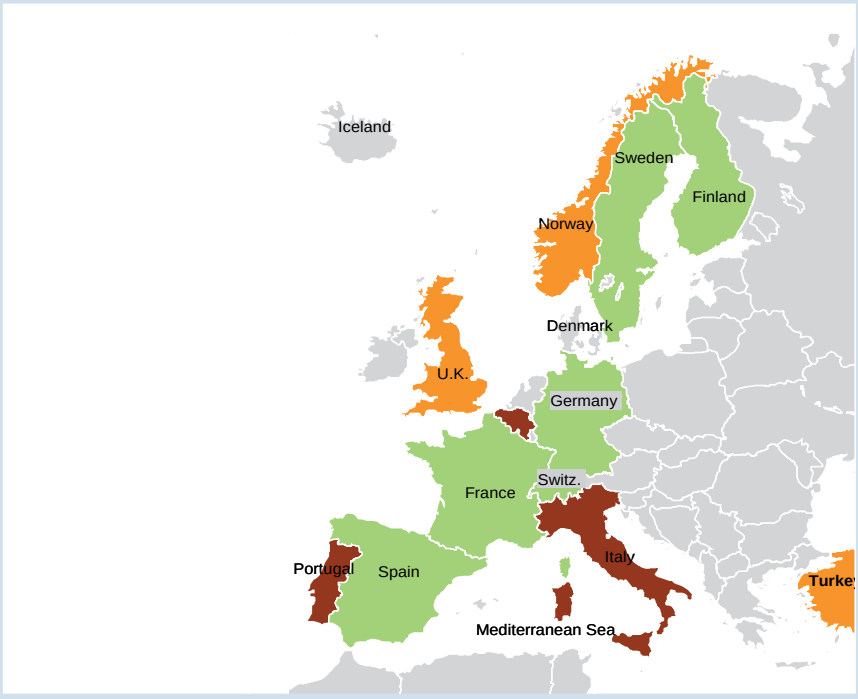


Chart 2.4

Refarming confirmed
Refarming favoured
Refarming opposed

Source: EETT Report [20]

2.3 Demand drivers

According to the OECD Communications Outlook 2009[21], between 2006 and 2008, mobile phone prices fell on average by 21 per cent for low-usage consumers, 28 per cent for medium-usage and 32 per cent for subscribers with the highest consumption patterns. Associated price decreases in individual countries vary across the different usage baskets (Chart 2.5). Reported price decreases, in combination with the fact that overall ARPU (Average Revenue Per User) remains at the same level, clearly indicate that usage has remarkably increased over the past years, further demonstrating end-users' "appetite" to use mobile services.

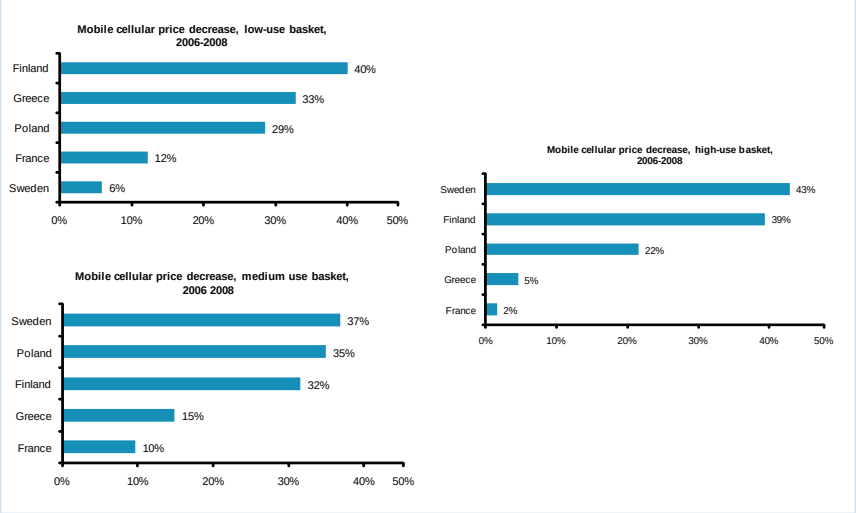
Between 2006 and 2008, mobile phone prices fell by 21% for low-usage, 28 % for medium-usage and 32 % for high-usage consumers

In the broadband domain, retail prices have been constantly falling or end-users have migrated to higher-speed packages, with no further price increases. As presented in Chart 2.6, in most European countries, there have been significant access speed upgrades, based on incumbents' migration to Asymmetric Digital Subscriber Line 2+ (ADSL2+) and FTTC network topologies. Similarly, in such countries as Hungary, Denmark, Finland and Greece, end-users have enjoyed substantial retail price drops of more than 40 per cent, over the period 2006-2008.

According to the recently published EU i2010 benchmarking study, and based on a 2008 survey in EU-27, more than ten per cent of the youngest age group for which data were collected (age 16-24) had paid for online content in the last three months[23].

Chart 2.5

Mobile cellular price decrease in selected EU countries, August 2006 – August 2008[22]



Source: OECD Communications Outlook, 2007 and 2009

According to the survey, this percentage may significantly increase if prices for online content decrease, further indicating the willingness of Europeans to pay for new and innovative ICT services.

The availability of new services and applications is expected to increase significantly the demand for bandwidth per household

Moving into the converged era, a key differentiating factor among service providers in their commercial offerings will be the discounts offered in the bundled, double/triple-play packages. So far, 20-30 per cent discounts have been reported in operators' bundled packages, when compared to stand-alone retail pricing of individual services[24]. Obviously, some regulatory constraints on predatory pricing and price margin squeeze may well prevail, coupled with the "Equivalent of Inputs" (EoI) obligation, in order to ensure that a truly level-playing field will be created in the new multi-bundled services market.

The availability of new and innovative services and applications is expected to yield a significant increase in the average demand for bandwidth per household. Today's typical European home has one phone, one broadband connection and possibly a High-Definition TV (HDTV) / IPTV service, leading to a total bandwidth demand of around 24 Mbps/household. However, as new services become available and as more citizens become technological savvy the demand is expected to rise to more than 44 Mbps/household (Chart 2.7), which would be needed to support multiple HDTV/IPTV connections, higher Internet bandwidth and such applications as on-line gaming and tele-working.

It is estimated that there will be more than 64 million IPTV subscribers worldwide by 2012, with Europe representing almost 38 %

In this regard, media and telecommunication companies have started joining forces to offer new converged products and services to end-users through new delivery platforms (e.g. IPTV), supported by high-speed broadband access technologies. It is estimated that there will be more than 64 million IPTV subscribers worldwide by 2012, with Europe representing almost 38 per cent of them (Chart 2.8). Interactive TV channels, VoD, movie libraries and other new features are available through new IPTV service

Incumbent broadband price and speed changes, selected European countries, September 2006- September 2008

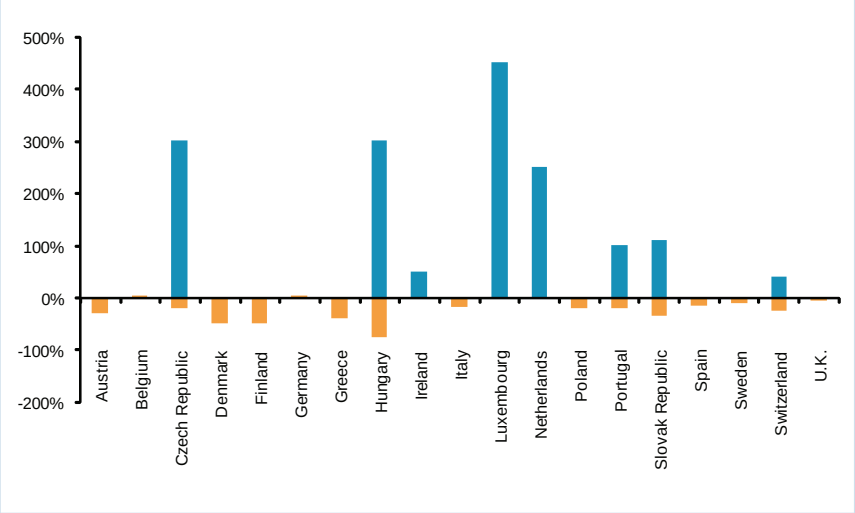


Chart 2.6

Access Speed Difference

Retail Price Difference

Source: ITU World Telecommunication/ICT Indicators database.

offerings and it is expected that a significant number of subscribers will be attracted to these packages over the coming 3-4 years.

2.4 Policy makers and regulators

The primary focus of national policy makers and regulators remains on sustaining and developing a comprehensive regulatory environment that will foster market growth, provide the right incentives to all stakeholders, increase the sector's investments and enable the development of a healthy competition with the ultimate goal of ensuring

Household demand for bandwidth (Mbps) in Europe, 2008

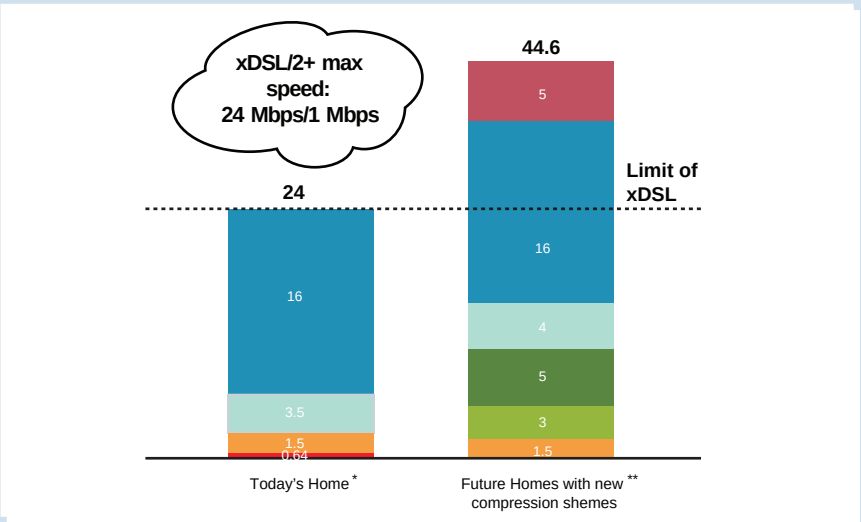


Chart 2.7

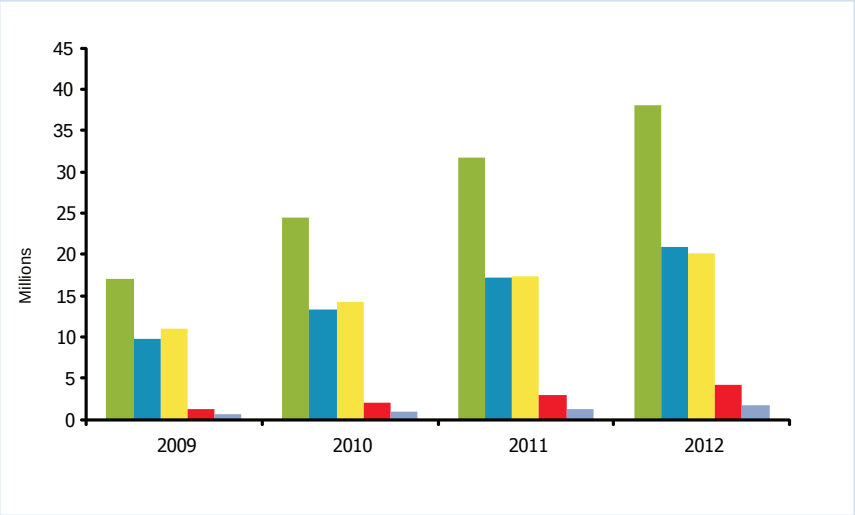
VOD/PVR
HDTV
SDTV
Teleworking
On-line Gaming
Internet
Phone Line

Note: *Today's home refers to 2008 and includes one phone, Internet, one Stand-ard Definition TV (SDTV) and one High Definition TV (HDTV) service
**Future home refers to 2012 and includes two phones, Internet, two SDTVs, two HDTVs and additional applications

Source: Corning Cable Systems, 2006.

Chart 2.8

Forecasted IPTV subscribers, by region, 2009-2012



Source: Ovum

consumers' access to ICTs. In most European countries, regulators' strategic initiatives are based on the overall objectives of their national ICT development policies. These set clear goals and objectives vis-à-vis the diffusion of infrastructure and broadband, the use of ICT services and applications, the uptake of e-services in the public and private domain, the availability of harmless content and the protection of minors (in line with the EU i2010 initiative[25]).

In view of the migration to a converged environment, policy makers need to review their regulatory bodies' governance structure

In this context, it is important to highlight the role of the European Commission Directorate General (DG) of Information Society and Media in the development of Member States' national ICT policies. For example, in 2002, following the initiative of DG Information Society and Media, all Member States agreed on the implementation of the harmonized EU Regulatory Framework, which sets clear guidelines on the institutionalization and enforcement of key regulatory levers such as interconnection, numbering, network access, spectrum policy and universal service[26]. In September 2009, the European Commission also published specific guidelines and rules on state-aid support in developing nationwide broadband networks. The guidelines contain specific provisions with regards to the development of Next Generation Access (NGA) networks, allowing public investment in the broadband sector, without creating undue distortions on competition[27].

In view of the ongoing migration to a converged environment, there are three key considerations that are most relevant for national policy makers and regulators. These include a review of (i) their economic and social objectives when regulating the market, (ii) their regulatory bodies' governance structure, and (iii) the applied regulatory levers. The migration to a converged environment does not necessarily imply that the sector's underlying objectives should be altered in any way. However, some key guidelines expressed by institutions such as the OECD and/or leading National Regulatory Authorities (NRAs) (e.g. Ofcom, Oftel) on "light-touch" regulation, infrastructure sharing, content sharing and consumer protection should be taken into account. One of the

biggest dilemmas policy makers currently face is whether to merge the national telecommunication and media regulators, under a common entity. In general, it can be inferred that there is no "best-practice" guideline, as every country is unique and every market should be treated in a different way. In the European extended region, the majority of NRAs are still traditional telecommunication and not converged telecommunication/media regulators (Table 2.1).

National governments and policy makers should carefully weigh the following advantages and disadvantages of creating a converged telecommunication/media regulator, prior to making any decisions.

One of the biggest dilemmas policy makers currently face is whether to merge the national telecommunication and media regulators under a common entity

Advantages:

- Stakeholders have a one-stop-shop for resolving regulatory issues
- Operational efficiencies, e.g. wider resources are available
- Less overlap and turf battles between government agencies
- Operators find it easier to comply with only one regulatory authority
- Clear and coherent analysis of a marketplace where operators offer triple and quadruple play services

Disadvantages:

- Harmonizing the different regulatory requirements and approaches for the telecommunication sector on the one hand and the media sector on the other hand
- Difficulties in defining single markets and applying remedies respectively
- Implications in defining board size and structure (governance), as well as authorization and decision making rights (management)
- Considerable time and effort required in merging two entities

A gradual approach to migrating to a unified telecommunication/media regulatory authority should be taken

In any case, the move towards a unified telecommunication and media national regulatory authority requires policy makers to first address, review and harmonize the various national laws that govern all networks and network-based services. It is generally believed, based on discussions with NRAs[29], that a gradual approach in migrating to a unified telecommunication/media regulatory authority should be taken.

Lastly, most of the already applied regulatory remedies should be re-examined, in light of the changing market and technological conditions. In this regard, regulators in some of the less developed markets, such as South-East Europe, have the unique opportunity to leapfrog traditional models that have been less successful, and consider migration approaches that take into consideration the expected convergence of the two sectors. Regulatory activities around convergence should be also linked to the current

Table 2.1

Status of E-42 NRAs governance models, 2008

Country	NRA	Converged regulator
Albania	AKEP	No
Andorra	n/a	n/a
Austria	RTR	Yes
Belgium	IBPT	No
Bosnia & Herzegovina	CRA	Yes
Bulgaria	CRC	No
Croatia	Hrvatska Agencija Za Poštu i Elektroničke Komunikacije	No
Cyprus	OCECPR	No
Czech Republic	Czech Telecommunications Office	No
Denmark	ITST	No
Estonia	NCB	No
Finland	Ficora	Yes
France	Arcep	No
Germany	Bundesnetzagentur (28)	No
Greece	EETT	No
Hungary	Ministry of Communications	No
Iceland	Ministry of Communications	No
Ireland	Comreg	No
Israel	Ministry of Communications	n/a
Italy	Agcom	Yes
Latvia	LTSI	No
Liechtenstein	Office of Communications	n/a
Lithuania	CRA	No
Luxembourg	ETAT	No
Malta	MCA	No
Monaco	n/a	n/a
Montenegro	AGENTEL	No
Netherlands	Opta	No
Norway	NPT	No
Poland	URTiP	No
Portugal	Anacom	No
Romania	ANCOM	No
San Marino	Industria Segreteria	n/a
Serbia	RATEL	No
Slovakia	Telecommunications Office of the Slovak Republic	No
Slovenia	Ministry of Transport and Communications	No
Spain	CMT	No
Sweden	PTS	No
Switzerland	Ofcom/Bakom	Yes
TFYR Macedonia	AEC	No
Turkey	ICTA	No
UK	Ofcom	Yes

Source: ITU based on National Regulatory Authorities' websites

considerations of the so-called "digital dividend", which refers to the options arising from the release of UHF spectrum, which becomes available through the transition to digital broadcasting, due by 2012 in EU-27. Potential new services include interactive, multi-play fixed and mobile broadband services, mobile TV and other mobile multi-media services. Some of the other E-42 countries are expected to follow the EU-27 and complete migration by 2012[30].

2.5 Market / business cases

In the most advanced European countries, TV is generally offered by telecommunication operators, in a triple-play bundle along with broadband and fixed telephony. Dual-play offerings are commonly offered as a combination of fixed line and broadband, and TV is considered an additional value added to those two services.

In many European countries, incumbent operators have developed triple/quad-play packages, including digital TV services

The main objective of telecommunication operators in introducing multi-bundle packages is to increase loyalty among their subscriber basis and, if possible, to increase the revenue per user. In this context, operators usually partner with content creation and production houses (e.g. EMI, Warner, Disney), as well as content acquisition and management providers (e.g. BBC, Studio Vision), in order to offer a media-oriented portfolio of services to their customers.

For example, in France, alternative operator SFR offers a broad range of quad-play mass market services and multi-service solutions for enterprises. The operator has already introduced a GSM-WiFi mobile handset and has launched a plug & play set top box with extensive convergence capabilities, based on IPTV and VoD features, allowing end-users to select their preferred TV programs and movies at anytime, Its quad-play offering includes fixed and mobile telephony, 20 Mbps high-speed broadband and more than 150 pay-TV channels.

Similarly, in Italy, Fastweb provides triple-play services to all market segments using a single integrated platform through IP technology. The operator has signed exclusive agreements with key content providers. Its digital TV offering includes more than 100 pay-TV channels, two libraries offering 3,000 VoD titles, PVR (Personal Video Recorder) support and a set of interactive and thematic channels.

Operators often partner with content providers to offer a media-oriented portfolio of services to their customers

In addition, in many European countries, as already mentioned, incumbent operators have already developed their triple/quad-play packages, positioning TV offerings as central to their packages. Examples include Orange's "TV Livebox" in France, Telefonica's "Imagenio" in Spain and OTE's "connx-TV" in Greece. Illustrative cases of integrated telecommunication and media operators offering the full portfolio of communication, information and TV services in the UK and Greece are presented in Box 2.1 and Box 2.2.

To conclude, it is evident that telecommunication and media convergence is currently taking place in Europe and that most leading operators have ambitious plans for offering new, innovative and integrated services to end-users. Consumers are benefiting from a variety of competitive and advanced packages and increasingly will be able to enjoy the next-generation of telecommunication/media digitized services.

Box 2.1

BSkyB case– UK[31]

BSkyB is one of the leading converged and integrated service providers in Europe, offering phone, broadband and TV services to its customers. Subscribers have the flexibility to customize their individual service by selecting from a range of TV channels, broadband speeds and telephony packages.

The initial business model of Sky was based on offering satellite pay-TV services, moving eventually to digital broadcasting while acquiring other smaller competitors. When local loop unbundling (LLU) started growing in the UK market, Sky was one of the first media companies to take full advantage of this and deployed its own network within different regions of the country. Through LLU, Sky has since been able to offer the complete package of telecommunication and media services, possibly becoming the leading integrated provider in the country.

Its current offerings are very compelling and competitive vis-à-vis other operators, and end-users can enjoy a basic triple-play package for just Euro 19/month, and a more advanced package for Euro 31/month *(e.g.* basic package: Sky TV, free evening calls, 2MB / *advanced package: Sky TV, unlimited calls, 2 MB)*. In parallel, for the high-end market, Sky provides access on an exclusive basis, to a set of games in the very popular Premier League.

The BSkyB subscriber base is close to reaching ten million, adding more than 0.5 million within the first half of 2009. Its growing platform has been mainly the HDTV packages, as quoted by its CEO Jeremy Darroch: *"This is the year where high definition TV moved centre-stage"*. In parallel, there has also been an increase in the number of people choosing combined packages for television, telephony and broadband services from BSkyB, with 16 per cent of all customers opting for these bundles in the past year, compared with only 11 per cent in the year before.

However, certain concerns arise with regards to BSkyB's lack of mobile broadband offerings, which are experiencing exponential growth in the UK market, as well as some pending legal actions on the grounds of anti-competitive practices, based on the provider's dominant position in the TV "pay-as-you-go" market segment[32].

Source: www.sky.com. Annual Reports and press releases.

Box 2.2

Forthnet case – Greece[33]

Forthnet is a dynamically developing Greek company in the telecommunication and Internet sector and is currently considered the leader in the "LLU investment race" in the country. In April 2008, the service provider made a strategic business turnaround move by acquiring the single national satellite TV company, Nova. This acquisition resulted in the creation of the first converged Pay TV and broadband player in Greece. Forthnet expects to enjoy, on the way forward, significant revenue synergies, through cross-selling and bundling of TV and broadband services, as well as cost synergies through the elimination of duplication in costs and the possibility of leveraging on economies of scale.

The acquisition of Nova was an important move for Forthnet, as Nova TV has strong growth potential in the country, where pay-TV penetration is significantly lower when compared to other European countries. Currently, Nova has over 350,000 subscribers in Greece, controlling almost a 100 per cent of the national pay-TV market, while in Cyprus its subscribers reach nearly 13,000. It offers a premium content portfolio that includes exclusive sports, movies and thematic packages of channels. On the other hand, Forthnet's current subscriber basis is estimated at approximately 160.000, while the management team estimates that close to 300.000 subscribers would be necessary to maintain its strong presence in the domestic market. Therefore, Nova's subscriber basis is an attractive pool that Forthent is looking to further leverage on the way forward. As stated by Forthnet's CEO, Panteli Tzortzaki, *"The Nova acquisition provides us access to the highly attractive Greek pay-TV market and has enhanced our competitive position in the under-penetrated Greek broadband market".*

By joining forces with Nova, Forthnet aims to introduce unique and attractive triple-play offerings in the Greek market, trying to increase its subscriber base over the coming months. Recently, Forthnet started to offer a primary triple-play package (fixed telephony, Internet and Nova TV) for Euro 39.90 per month on its own net work, which had been considered as the most complete service offering at the time. This has stimulated competition and corresponding IPTV offerings by the Greek incumbent operator, OTE, who launched its conn-x TV service, for Euro 15 per month, on top of the existing conn-x ADSL subscriptions. Also, discount packages that combine a double-play Forthnet subscription with different Nova TV offerings exist in the market for as low as Euro 19.90 per month.

In mid-2009, in an attempt to make its offerings increasingly attractive and stifle competition, Forthnet chose to support the popular national football championship. It resulted in the biggest investment in the history of television football transmissions in the country, acquiring exclusive TV transmission of games for an amount of Euro 105 million for the period 2009-2012. Subscriber and revenue gains are expected to skyrocket by the beginning of Q4 2009.

Source: www.forthnet.gr. Annual Reports and press releases.

Endnotes

[1] These are special marketing and/or sales initiatives aiming to retain subscribers in the operator's network.

[2] Web 2.0 services refer to highly interactive Internet services such as information sharing, hosted services, user-centric design services and collaboration on the World Wide Web. Media players refer to, for example, companies offering TV broadcasting services.

[3] EBITDA refers to Earnings Before Interest, Tax, Depreciation and Amortization.

[4] Examples, in 2008, of Mediaset (EV/EBITDA of 6.9) and BSkyB (EV/EBITDA of 13.1) in the media sector, compared to telecommunication operators that presented lower valuation, as France Telecom (EV/EBITDA of 5) and Telekom Austria (EV/EBITDA of 4.9) / Source: National Bank of Greece, 2009, "EU Universe Database".

[5] Source: http://europa.eu – "Switchover to Digital Television by 2012".

[6] Source: www.bloobble.com/broadband-presentations/presentations?itemid=2197

[7] Source: http://www.sfr.com/groupe/profil.html.

[8] Source: www.iptv-news.com/iptv_news/feb_09_2/telefonica_prepares_for_multi-screen_interactive_advertising

[9] Source: www.broadbandtvnews.com/2009/05/08/telecom-italia-iptv-reaches-233000-homes/

[10] Source: www.fastweb.it . Annual Reports and press releases.

[11] See, for example, in the UK the BT21CN next-generation plan, and in the Netherlands the KPN plan to invest in FTTC and VDSL2+ technologies.

[12] Source: www.ftthcouncil.eu/.

[13] On Tuesday, 18 August 2009, the European Commission announced that Euro 18 million will be invested during 2010, on the research and development of LTE technology.

[14] According to latest figures/ 2009 estimates published by ITU, "The World in 2009: ICT Facts and Figures", October 2009.

[15] Source: www.stokab.se

[16] See, for example, ICT Regulation Toolkit, Section 6.4.7 National Broadband Policies, www.ictregulationtoolkit.org/en/Section.3462.html

[17] Dr. Katz et al, "The impact of Broadband on Jobs and the German Economy", May 2009. The study was funded by Deutsche Telekom AG.

[18] Source: www.yme.gov.gr.

[19] FTTH Council Europe newsletter, dated 27 February 2008 (IDATE News 407).

[20] EETT Report, "Review of Digital Dividend Options for Greece", June 2009.

[21] OECD Communications Outlook 2009, source: http://browse.oecdbookshop.org/oecd/pdfs/browseit/9309031E.PDF

[22] Definitions according to the OECD Communications Outlook 2009: "low-use" profile includes 360 minutes of voice calls, 396 SMS messages and 8 MMS messages over one year, "medium-use" profile includes 780 minutes of voice calls, 600 SMS messages and 8 MMS messages over one year and "high-use" profile includes 1680 minutes of voice calls, 660 SMS messages and 12 MMS messages per year. Taxes are included in all price baskets.

[23] Based on the 2008 survey, less than 5 per cent of Europeans had paid for online content in the last 3 months. Despite pricing, other factors affecting their decision not to pay for online content are lack of wider choice and availability, lack of quality, payment methods and availability of free content.

[24] See section "2.5 Market/Business Cases".

[25] i2010 benchmarking report, 2009, Chapter 7 "Developments in National ICT Policies".

[26] EC Directorate General of Information Society and Media – Directive (2002/21/EC) on a Common Regulatory Framework, 2002.

[27] EC DG Information Society and Media, "Community Guidelines for the application of State aid rules in relation to rapid deployment of broadband networks". September 2009.

[28] Regulator responsible for Electricity, Gas, Telecommunications, Postal and Rail Networks sectors.

[29] Based on discussions with South-East European (SEE) NRAs, taken place during the 7th SEE Regulatory Brainstorming Meeting, organized by INA Academy in Greece, April 2009.

[30] Source: www.dvb.org . DVB Worldwide section.

[31] Source: www.sky.com. Annual Reports and press releases.

[32] In June 2009, Ofcom suggested that BSkyB should make its football (Premier League) and movie content available to other broadcasters to improve competition in pay TV. Source: www.ofcom.org.uk/media/news/2009/06/nr_20090626

[33] Source: www.forthnet.gr. Annual Reports and press releases.

Chapter 3.

Benchmarking ICT developments in Europe

3.1 Regional analysis of the ICT Development Index (IDI)

The ITU presented the ICT Development Index (IDI) in March 2009[1] in response to the calls for benchmarking information society developments made during the World Summit on the Information Society (WSIS)[2]. The IDI is a composite index made up of eleven different indicators, grouped into three sub-indices (Figure 3.1). The sub-indices measure ICT infrastructure and access (sub-index access[3]), ICT use and intensity of use (sub-index use[4]), and the capacity to use ICTs effectively (sub-index skills[5]). This chapter presents the results of the IDI for the European region. Out of the 42 countries considered in this report, 36 were included in the latest IDI[6].

Sweden tops the regional IDI 2007 ranking, maintaining its leading position of 2002, not only in Europe but also in the world

The results of the IDI in Europe for two benchmarking years, 2002 and 2007, ranked by the 2007 values are shown in Table 3.1 (for details on the three sub-indices see Annex 2). All European countries improved their IDI scores in the five-year period, as did most countries in the world. Indeed, access and use of ICTs are globally increasing, as well as the skills to use these technologies effectively.

Sweden tops the regional IDI 2007 ranking, maintaining its leading position of 2002, not only in Europe but also in the world[7]. Other countries in Europe's top ten, such as Denmark, the Netherlands, Iceland, Norway, Luxembourg, Switzerland, Finland,

ICT Development Index – Weighting of indicators

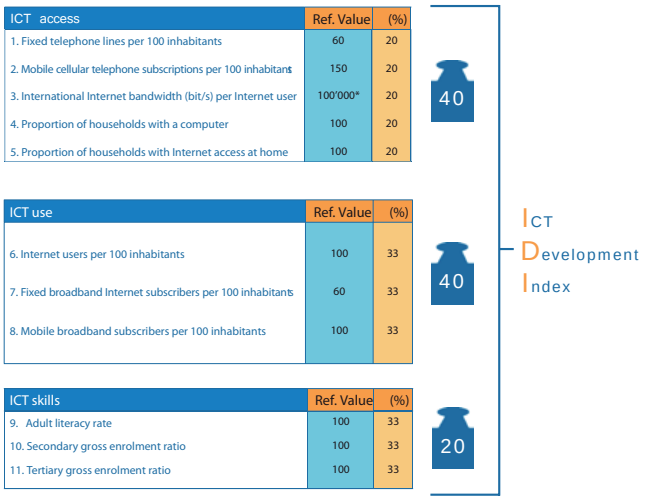


Figure 3.1

Source: ITU.

Table 3.1

ICT Development Index (IDI), 2002 and 2007, Europe

Country	Rank 2007	IDI 2007	Rank 2002	IDI 2002	Rank change 2002-2007	IDI change 2002-2007
Sweden	1	7.50	1	6.05	0	1.44
Denmark	2	7.22	3	5.78	1	1.45
Netherlands	3	7.14	5	5.43	2	1.71
Iceland	4	7.14	2	5.88	-2	1.25
Norway	5	7.09	4	5.64	-1	1.45
Luxembourg	6	7.03	12	4.62	6	2.42
Switzerland	7	6.94	6	5.42	-1	1.52
Finland	8	6.79	7	5.38	-1	1.41
United Kingdom	9	6.78	8	5.27	-1	1.51
Germany	10	6.61	9	5.02	-1	1.60
Ireland	11	6.37	16	4.36	5	2.01
Austria	12	6.32	11	4.64	-1	1.68
Italy	13	6.18	14	4.38	1	1.80
France	14	6.16	15	4.37	1	1.79
Belgium	15	6.14	10	4.91	-5	1.23
Estonia	16	5.97	21	3.93	5	2.04
Spain	17	5.91	18	4.10	1	1.82
Slovenia	18	5.88	13	4.47	-5	1.41
Israel	19	5.60	17	4.24	-2	1.36
Malta	20	5.54	19	4.04	-1	1.50
Portugal	21	5.47	22	3.87	1	1.60
Lithuania	22	5.29	30	3.17	8	2.12
Greece	23	5.25	20	3.94	-3	1.31
Hungary	24	5.19	26	3.49	2	1.70
Latvia	25	5.01	28	3.30	3	1.71
Cyprus	26	4.97	23	3.78	-3	1.19
Slovak Republic	27	4.95	25	3.51	-2	1.44
Poland	28	4.95	27	3.34	-1	1.61
Czech Republic	29	4.88	24	3.74	-5	1.14
Croatia	30	4.68	29	3.19	-1	1.49
Bulgaria	31	4.37	31	2.74	0	1.64
Romania	32	4.16	33	2.48	1	1.67
Bosnia & Herzegovina	33	3.54	35	2.33	2	1.21
Turkey	34	3.49	34	2.41	0	1.09
TFYR Macedonia	35	3.42	32	2.65	-3	0.76
Albania	36	2.73	36	1.92	0	0.81

Source: ITU.

and the United Kingdom are also among the world's top ten countries with highest 2007 IDI values. Luxembourg, Lithuania, Estonia, Ireland, Spain, Italy and France stand out for having achieved remarkable IDI gains in the five-year period[8]. Europe is one of the regions with the lowest relative differences in IDI value between the top and the bottom ranked countries. Indeed, Sweden has an IDI value less than three

IDI and GNI per capita, 2007

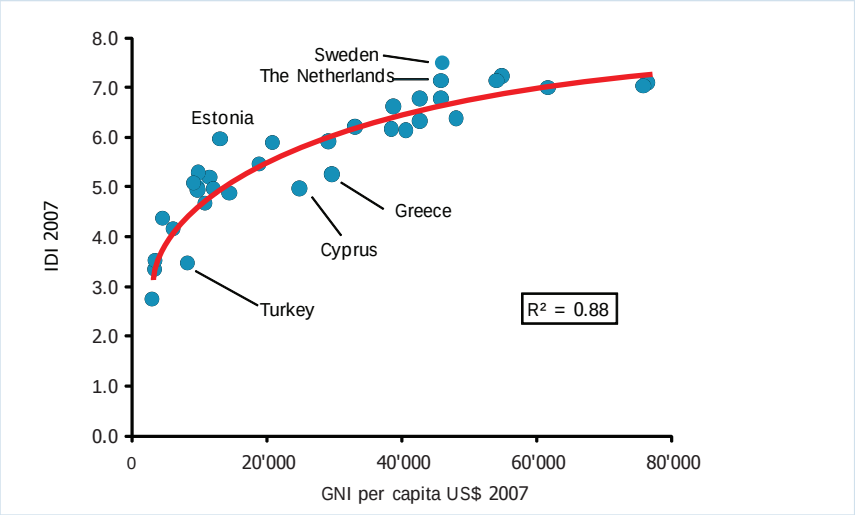


Chart 3.1

Observed
Logarithmic

Source: ITU and World Bank (GNI per capita data).

times higher than that of Albania. In other regions, the ratio between top and bottom IDI values can be as much as four (Africa), five (Americas) or even six (Asia and the Pacific). Smaller relative differences in Europe are due to the fact that bottom ranked countries in the region, such as Bosnia and Herzegovina, Turkey, TFYR Macedonia and Albania, have IDI values higher than many countries in other regions.

Chart 3.1 shows the relationship between the IDI and GNI per capita (expressed in US$) in Europe. The relation between ICT development and income in the region is strong (R square value of 0.88)[9], and in line with that found in the world (R square value of 0.88)[10] or, for example, in Asia and the Pacific (R square value of 0.93)[11], or the Americas (R square 0.85)[12].

Sweden, the Netherlands and Estonia have higher-than-expected ICT levels, given their income per capita. Sweden and the Netherlands are among the world's top ten IDI 2002 and 2007 rankings, and both countries have high per capita income, although not the highest in Europe[13]. Their high IDI score suggests that the link between ICT development and income is not so relevant in economies with relatively high incomes.

Estonia has achieved relatively high ICT levels given its income, based on remarkable growth in ICT access and uptake between 2002 and 2007

Estonia has achieved relatively high ICT levels given its income, based on remarkable growth in ICT access and uptake between 2002 and 2007. Indeed, since the launch of the Estonian Information Policy in 1998,[14] the country has made great strides in ICT development. The public sector is leading the way and offering some of the most advanced eGovernment services across Europe[15], and implementing very successful ICT policy initiatives, such as the Tiger Leap Programme, aimed at the internetization of schools[16]. The results show how strong policies can be drivers of ICT-led development.

On the other hand, Greece, Cyprus and Turkey have lower-than-expected IDI levels compared to other European countries with similar income per capita, and therefore ample room for further progress to reach higher levels of ICT-led development.

Table 3.2 summarizes the average changes for the five-year period in each of the three IDI sub-indices and in IDI value. In 2007, Europe's average IDI value was well above the world average, Albania being the only country in the region with a lower IDI value. The region is ahead of the world in ICT access, ICT use, and skills. Europe's increase in the five-year period was most remarkable in terms of ICT use and intensity of use, especially in terms of broadband uptake (both fixed and mobile). Indeed, several European countries are among the world's leading group of countries in terms of broadband development (see Chapter 1).

The IDI gain in European countries was mainly due to increases in the sub-indices access and use, higher than those of the world for the same period. Moderate progress was achieved in the sub-index skills, in which European countries had already high values in 2002. These dynamics are explained by the sequential three-stage model on which the index is based[17]: countries advance towards becoming information societies by developing first ICT infrastructure and access, then ICT use and intensity of use, and finally achieving ICT impact, which is enabled by ICT capabilities or skills.

In 2007, Europe's average IDI value was well above the world average, mainly due to strong gains in the sub-indices access and use

From 2002 to 2007, most European countries (22 out of 36) experienced a higher increase in the sub-index use than in the sub-index access. This suggests that most countries are in the second stage of ICT development, and therefore ICT growth is focused on use and intensity of use. In some countries, where the increase in the sub-index access was higher than in the sub-index use, such as Estonia, Latvia, Lithuania or Poland, this was due to remarkably high gains in the sub-index access, rather than low gains in the sub-index use. These countries are probably finishing the first stage of ICT development. Their significant improvements in the sub-index use suggests that they will further improve their IDI value by progressing towards the second stage of ICT development in the following years, and focus their progress on improving ICT use and intensity of use. Finally, there are a few European countries that have witnessed rather low gains in the sub-index use over the five-year period, and which are in the first stage of ICT development. This is the case of Albania, Bosnia and Herzegovina, TFYR Macedonia and Turkey.

Table 3.2

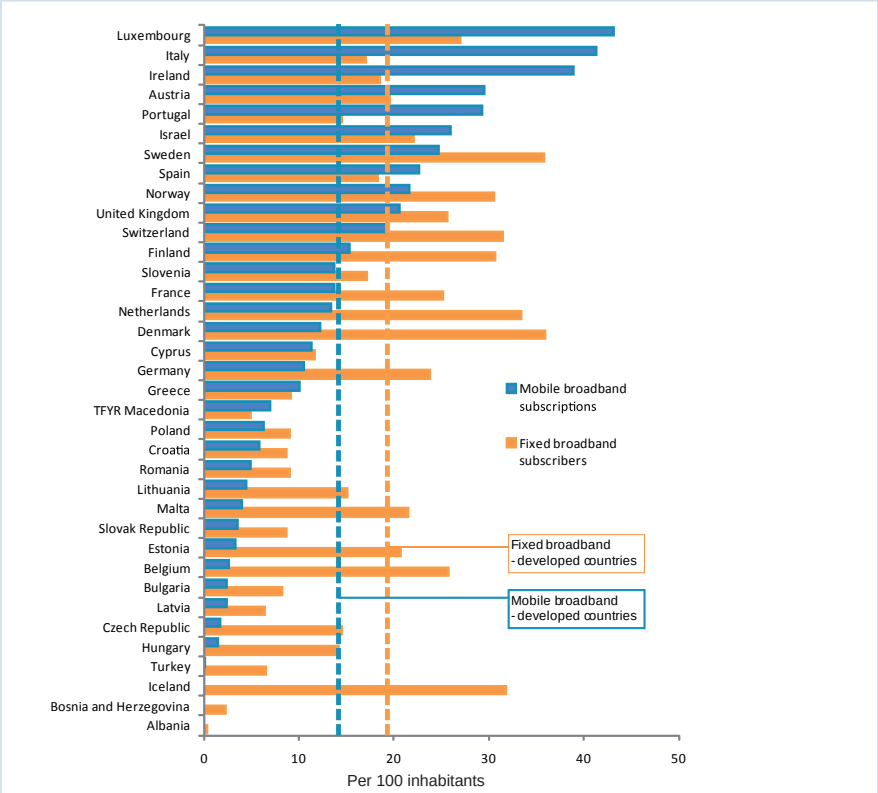
IDI changes in Europe and the world, 2002-2007

	Europe			World	
	Average value 2002	Average value 2007	Change in value 2002-2007	Average value 2007	Change in value 2002-2007
IDI	4.10	5.63	1.52	3.40	0.92
Sub-index access	4.98	6.63	1.65	3.91	1.23
Sub-index use	1.25	3.24	1.98	1.43	0.89
Sub-index skills	8.06	8.42	0.36	6.31	0.37

Source: ITU.

Fixed and mobile broadband penetration in European countries, 2007

Chart 3.2



Source: ITU

Europe's progress in the sub-index access was due to improvements in all sub-index access indicators except fixed lines per 100 inhabitants, which decreased from 47 per cent in 2002 to 44 per cent in 2007. Mobile cellular penetration reached 111 subscriptions per 100 inhabitants by the end of 2007, the highest of any region. Between 2002 and 2007, the proportion of households with a computer also increased remarkably in Europe (from an estimated 38 to 58 per cent), and so did the proportion of households with Internet access at home (from an estimated 28 to 49 per cent).

Europe's progress in the sub-index access was due to improvements in all indicators except fixed line penetration, which decreased from 47 % in 2002 to 44 % in 2007

During the five-year period, Europe experienced high progress in the sub-index use, more than doubling the average increase in the world for the same period. In particular, broadband use grew significantly in the region. Fixed broadband penetration increased steeply in Europe, and mobile broadband, which practically did not exist in 2002, had been introduced in nearly all countries of the region by the end of 2007[18] (Chart 3.2). The comparison of broadband penetration in European countries with the levels of the developed world shows some countries in the region, such as Luxembourg, Sweden, Norway, Israel, the United Kingdom, Switzerland and Finland, leading broadband deployment and uptake. Additionally, Internet usage also grew significantly in Europe during the five-year period (from 33 to 53 per cent). As highlighted in this report, effective regulation, including local loop unbundling (LLU), has been instrumental in fostering competition in the broadband access market, bringing down retail prices and thus increasing uptake.

All European countries had a sub-index skills value above the world average in 2007. Despite the high values, some countries, such as Greece, Hungary, Romania or Iceland, made significant progress in the tertiary enrolment ratio in the five-year period. The secondary enrolment ratio and adult literacy remained nearly unchanged in the region, as almost all countries had already relatively high values in 2002.

The following section takes a closer look at the IDI performance of selected countries in the region, and highlights key developments[19]:

In Denmark, fixed broadband penetration has witnessed the highest increase in the region, and in 2007 it had the highest penetration in Europe (36 %)

- Sweden tops the regional IDI 2007, unchanged from 2002. Sweden has maintained its leading position in many of the ICT indicators, and made strong gains on the ICT use sub-index (2.60 points). In particular, Internet use (80 users per 100 inhabitants in 2007) and fixed broadband penetration (36 subscribers per 100 inhabitants in 2007) are very high in Sweden, whereas mobile cellular penetration (part of ICT access) of 114 per cent is lower than some other top ranking countries.

- Denmark ranks 2nd in the regional IDI 2007, advancing one place from its position in 2002. The country has gained on all three sub-indices, but in particular on ICT use (2.51 points). Fixed broadband penetration has witnessed the highest increase in the region, and has reached the highest penetration in Europe (36 per cent in 2007). Household Internet access has also remarkably improved in the five-year period (from 56 to 78 per cent), and the country has progressed in terms of tertiary enrolment ratio (from 63 to 79 per cent). On the other hand, the number of fixed telephone lines per 100 inhabitants has decreased from 69 to 52, one of the highest drop in the region.

- The Netherlands moved up two places, to become third in the regional IDI 2007. It has gained both on ICT access and ICT use. Together with Iceland, Norway, and Denmark, it has one of the highest Internet user penetration rates worldwide. By the end of 2007, the country had a high proportion of households with computer (86 per cent), and households with Internet access (83 per cent), only surpassed in Europe by Iceland.

The Netherlands, Iceland, Norway and Denmark have the highest Internet user penetration rates worldwide

- Iceland has moved down 2 places, to rank 4 in 2007. Among the top ten countries, it is the one that has gained least in terms of index value points (1.25), although gains on the ICT skills sub-index were the highest among the top ten countries, with an increase in tertiary enrolment from 54 per cent in 2002 to 75 per cent in 2007. With mobile broadband only starting to become available in Iceland by the end of 2007, the country is likely to increase its value even more as soon as this service becomes available to more people. In the five-year period, Iceland has maintained its leading position in Europe and in the world in terms of Internet usage, reaching an estimated record penetration of 90 users per 100 inhabitants in 2007.

- Norway moved down one place between 2002 and 2007, ranking 5th in the regional IDI 2007. It has gained on the ICT use sub-index, on both fixed and mobile broadband, but not as much on ICT access, with a decrease in fixed telephone line penetration (from 51 to 42 per cent).

- Luxembourg jumped up 6 places, from rank 12 (2002) to rank 6 (2007). Among all countries included in the global IDI, Luxembourg gained most in IDI value within the five-year time period (2.42 points or 52 per cent). It increased its performance in all sub-indices (access, usage and skills), but especially in the use sub-index (4.16 points in value gained, or almost 300 per cent, the highest globally). In particular, household access to computers and the Internet grew significantly during this time period, and international Internet bandwidth achieved a global record value in 2007 (3.5 Tbits/s), transforming Luxembourg into the biggest hub of international connectivity in Europe and in the world. In addition, fixed and mobile broadband use increased steeply, and by the end of 2007, the country reached the highest mobile broadband penetration in Europe (43 per cent).

In Luxembourg, international Internet bandwidth achieved a global record value in 2007 (3.5 Tbits/s), transforming the country into the biggest hub of international connectivity

- Switzerland lost one place between 2002 and 2007 and is now ranked 7th on the regional IDI 2007. Although it improved on both the ICT access and use sub-indices, it gained less compared to some of the other top ten countries (for example, in mobile penetration). In the five-year period, Switzerland improved fixed broadband penetration (32 per cent in 2007) and, despite a significant decrease in fixed line penetration (from 75 to 66 per cent), it had the highest penetration in the region and worldwide in 2007. However, Switzerland has made little improvements on the ICT skills sub-index, and tertiary enrolment remains relatively low.

- Finland lost one place and ranks 8th in the regional IDI 2007. It has gained on all three sub-indices, but less than some of the other top ten countries, in particular on ICT access (fixed line penetration decreased from 52 to 33 per cent, the highest drop in the region). Also, mobile broadband penetration in Finland is (still) behind some of its neighbours. On the other hand, the country made remarkable improvements in fixed broadband penetration, reaching 31 per cent in 2007, and ranking among the leading countries in fixed broadband uptake in Europe.

In 2007, Italy was the country with the highest mobile penetration in the region (153 %), while Internet usage was among the lowest in Europe (38 %)

- The United Kingdom ranks 9th in 2007, down one place from 2002. The country has gained on both ICT access (in particular international Internet bandwidth) and usage, including the two broadband indicators, however, not as much as some of the other top ten countries. Also, little progress was made on the skills side – in fact, tertiary enrolment decreased over the five-year period (from 63 to 59 per cent).

- Ireland, Italy and Spain all moved up. They all are among the top 30 countries worldwide, and among the world's top ten countries that gained most in IDI value over the five-year period. Ireland and Italy are (with Luxembourg) the countries which have reached the highest mobile broadband penetration in Europe. Italy was the country with the highest mobile penetration in the region in 2007 (153 per cent), while on the other hand, Internet usage in the country was among the lowest in Europe (38 per cent in 2007). Spain improved steadily in all indicators, and caught up with the region's average in some indicators in which it lagged behind, such as Internet usage, and the proportion of households with Internet access.

- France has gained one place moving to rank 14 in the regional IDI 2007. It still has relatively low mobile telephone penetration (90 per cent in 2007, the lowest of all EU-27 countries) and lower Internet penetration (both households and individuals) compared to Denmark, Sweden or the Netherlands. However, France is also among the ten countries worldwide that have gained most in IDI value between 2002 and 2007, with ICT growth focused on the sub-index use, such as fixed broadband penetration, which increased from 3 to 25 per cent during the five-year period.

The Baltic States have made significant improvements in their evolution towards becoming information societies

- Belgium lost five places, mainly due to lower mobile cellular penetration (103 per cent) and mobile cellular broadband values (2.7 per cent) compared to some other EU countries.

- The Baltic States have made significant improvements in their evolution towards becoming information societies. Estonia, Latvia and Lithuania all increased their ranks (by five, three and eight places respectively). Lithuania and Estonia are among the top ten countries worldwide that have increased their index values most between 2002 and 2007. This is due to improvements in both access and usage indicators. For example, Estonia and Lithuania have one of the highest mobile subscription penetration rates globally (148 per cent up from 65 per cent and 145 per cent up from 47 per cent in 2002, respectively). Latvia has considerably improved household access to computers and Internet (49 and 51 per cent respectively, up from 15 and 8.5 per cent in 2002).

- Romania has moved up one place to rank 32 in the regional IDI 2007. Romania's improvement in the index is primarily based on increased ICT access (2.44 points value increase of the use sub-index, or 102 per cent). For example, mobile cellular penetration increased from 23 to 107 per cent. Also, international Internet bandwidth increased significantly during the five-year period. In addition, Romania gained much on the ICT skills sub-index (mainly on tertiary enrolment, which increased from 32 per cent in 2002, to over 60 per cent in 2007). With 1.00 points increase it is among the top ten countries worldwide that most increased this sub-index.

TFYR Macedonia and Albania are the only two countries in Europe with IDI value gains lower than the world average

- TFYR Macedonia and Albania occupy the last two places in the regional IDI 2007, being the only two countries in Europe with lower IDI value gains than the world's average for the five-year period. Albania has the lowest mobile and fixed telephone penetration rates in the region (72 and 9 per cent respectively in 2007). TFYR Macedonia has higher mobile telephone penetration (95 per cent in 2007), but very limited international Internet bandwidth per Internet user (61 bits / s / user in 2007 or 19 times less than Albania, the country with the second-lowest international connectivity per Internet user in the region). Both countries have low fixed broadband penetration, especially Albania, which also had no mobile broadband available in 2007. On the other hand, TFYR Macedonia had 7 per cent mobile broadband penetration in 2007, above that of other countries with much higher IDI value, such as Belgium, the Baltic States, Malta or Hungary.

3.2 Regional analysis of the ICT Price Basket

The ITU presented the ICT Price Basket in March 2009[20] in order to raise awareness of the impact of ICT prices on ICT usage and to allow policy makers to evaluate the cost of ICT services in their country and benchmark them against those of other countries. ITU's global 2008 ICT Price Basket included a total of 150 countries.[21] The ICT Price Basket is made up of three sub-baskets, which measure the prices of fixed telephone, mobile cellular and fixed broadband Internet services. Each sub-basket is presented in US$[22], in PPP$[23] and as a percentage of monthly GNI per capita. The three sub-baskets are combined into a single ICT Price Basket value, which determines the overall rank.

The 2008 ICT Price Basket value in Europe corresponds to 1.7 % of the countries' average GNI per capita

The ICT Price Basket is the value computed as the sum of the price of each sub-basket (in US$) as a percentage of a country's monthly GNI per capita (World Bank, US$, Atlas Method), divided by three (Figure 3.2). For this exercise, the cost of each sub-basket as a percentage of the monthly GNI per capita is limited to a maximum value of 100, so that the final ICT Price Basket value may vary between a theoretical 'zero' (tariffs represent zero per cent of average monthly GNI per capita, and all three services are for free), and 100 (the price of all three sub-baskets is equal to or exceeds the monthly GNI per capita). Based on the ICT Price Basket value, countries are ranked. This section analyses the results of the 2008 ICT Price Basket in Europe.[24]

Overall results of the ICT Price Basket

On average, the 2008 ICT Price Basket value in Europe corresponds to 1.7 per cent of the countries' average GNI per capita, in line with the average of developed countries (1.6 per cent). It varies from 0.5 per cent in Denmark and Luxembourg to 7.1 per

ICT Price Basket methodology

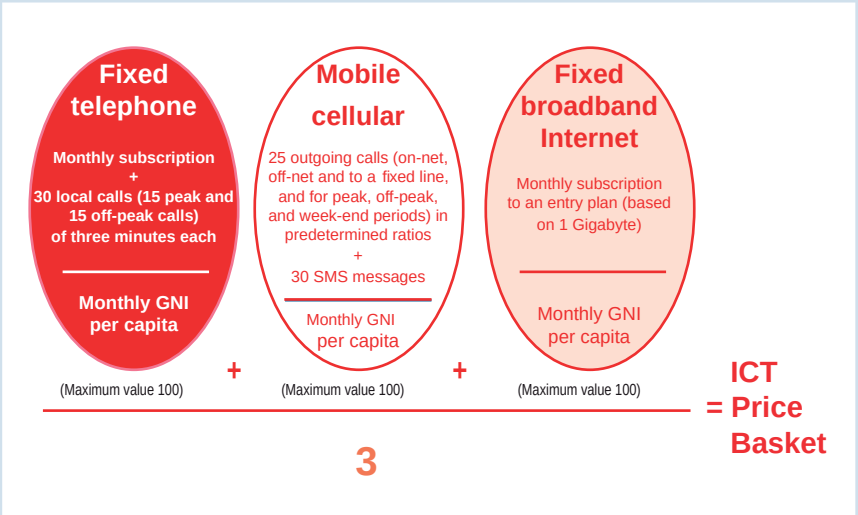


Figure 3.2

Note: In countries where no mobile prepaid offers are available, the monthly fixed cost (minus the free minutes included, if applicable) of a postpaid subscription is added to the basket. For monthly fixed broadband Internet plans that limit the amount of data transferred by including caps below 1 Gigabyte, the cost for additional bytes is added.

Source: ITU

cent in Albania, which is the only European country with an ICT Price Basket that corresponds to more than 5 per cent of its monthly GNI per capita.

22 out of 36 European countries have an ICT Price Basket less costly than the developed countries' average

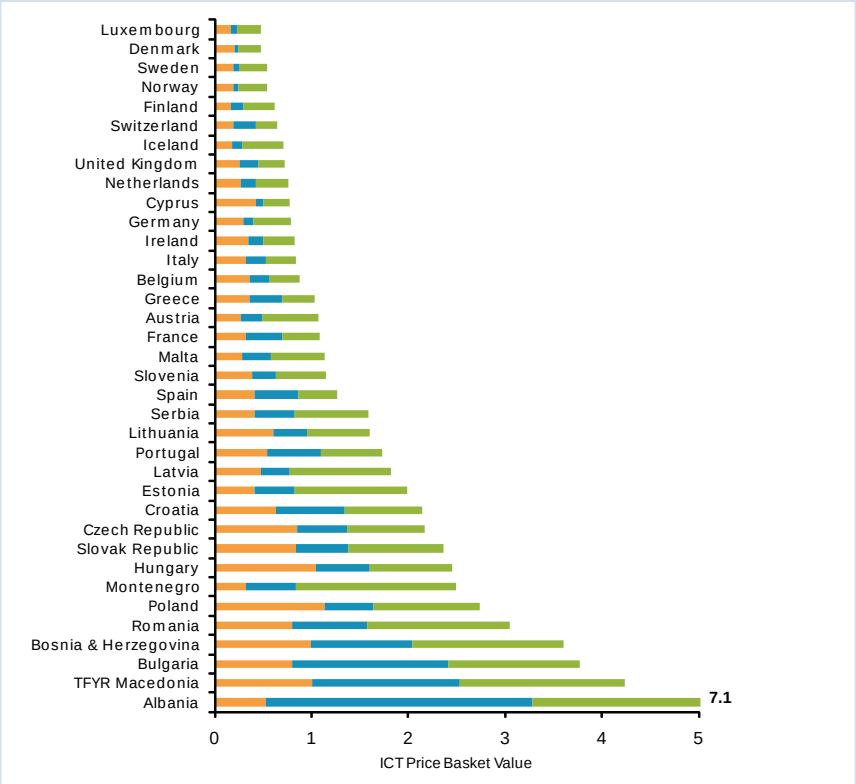
Most European countries (22 out of 36) have an ICT Price Basket less costly than the developed countries' average. Although the countries with more costly ICT Price Baskets are those with the lowest income in the region, there are some exceptions, such as Lithuania, Latvia,[25] and Serbia,[26] which show that affordability of ICT services does not necessarily depend on national income.

Chart 3.3 shows in more detail the distribution of the ICT Price Basket in European countries, as well as the contribution of each sub-basket to the overall cost of the ICT Price Basket[27]. The countries with less costly ICT Price Baskets in the region stand out for having moderate fixed broadband prices, and very low mobile cellular prices, which can be explained by the highly competitive mobile market environments in most countries.[28] That is the case of countries such as Luxembourg, Denmark, Sweden or Norway.

On the other hand, those European countries with relatively high ICT Price Basket values, such as Albania, TFYR Macedonia, Bulgaria, and Bosnia and Herzegovina, have relatively expensive fixed broadband and mobile cellular sub-baskets. High fixed broadband prices have already been flagged in previous reports as the main cause of

Chart 3.3

Cost of the ICT Price Basket by sub-basket, Europe, 2008



Source: ITU

ICT Price Basket 2008, Europe

Table 3.3

Rank	Economy	ICT Price Basket Value**	Sub-baskets: Fixed (% of GNI per capita*)	Sub-baskets: Mobile (% of GNI per capita*)	Sub-baskets: Broadband (% of GNI per capita*)	GNI per capita*, USD
1	Luxembourg	0.5	0.5	0.2	0.7	75'880
2	Denmark	0.5	0.6	0.1	0.7	54'910
3	Sweden	0.5	0.6	0.2	0.8	46'060
4	Norway	0.5	0.6	0.2	0.9	76'450
5	Finland	0.6	0.5	0.4	1.0	45'820
6	Switzerland	0.6	0.6	0.7	0.6	59'880
7	Iceland	0.7	0.5	0.3	1.3	54'100
8	United Kingdom	0.7	0.8	0.6	0.8	42'740
9	Netherlands	0.8	0.8	0.5	1.0	45'820
10	Cyprus	0.8	1.3	0.3	0.8	24'940
11	Germany	0.8	0.9	0.3	1.2	38'860
12	Ireland	0.8	1.1	0.5	1.0	48'140
13	Italy	0.8	1.0	0.6	0.9	33'540
14	Belgium	0.9	1.1	0.6	0.9	40'710
15	Greece	1.0	1.1	1.0	1.0	29'630
16	Austria	1.1	0.8	0.7	1.7	42'700
17	France	1.1	1.0	1.1	1.2	38'500
18	Malta	1.1	0.9	0.9	1.7	15'310
19	Slovenia	1.2	1.2	0.7	1.6	20'960
20	Spain	1.3	1.3	1.4	1.2	29'450
21	Serbia	1.6	1.2	1.3	2.3	4'730
22	Lithuania	1.6	1.8	1.1	1.9	9'920
23	Portugal	1.7	1.6	1.7	1.9	18'950
24	Latvia	1.8	1.4	0.9	3.1	9'930
25	Estonia	2.0	1.2	1.2	3.5	13'200
26	Croatia	2.1	1.9	2.1	2.4	10'460
27	Czech Republic	2.2	2.6	1.5	2.4	14'450
28	Slovak Republic	2.4	2.5	1.7	2.9	11'730
29	Hungary	2.5	3.1	1.7	2.6	11'570
30	Montenegro	2.5	1.0	1.6	4.9	5'180
31	Poland	2.7	3.4	1.5	3.3	9'840
32	Romania	3.0	2.4	2.3	4.4	6'150
33	Bosnia	3.6	3.0	3.1	4.7	3'790
34	Bulgaria	3.8	2.4	4.9	4.1	4'590
35	TFYR Macedonia	4.2	3.0	4.6	5.1	3'460
36	Albania	7.1	1.6	8.3	11.5	3'290
	DEVELOPED	1.6	1.4	1.4	2.1	28'686†

Note: *GNI per capita is based on the World Bank's Atlas Method.
** The ICT Price Basket Value is the sum of the three sub-baskets as a percentage of GNI per capita, divided by three
† GNI per capita of developed countries is computed as the average GNI per capita of the 41 developed countries included in the world's ICT Price Basket 2008.

Source: ITU.

high ICT Price Basket values.[29] High mobile cellular prices in the countries mentioned before are on the contrary unusual, and make their mobile cellular sub-basket more than twice as costly (in terms of monthly GNI per capita) as the average of developed countries.[30] Policy makers should therefore look into ways of lowering mobile cellular prices – for example, by strengthening competition, by reviewing operators' revenues

and efficiency, or by reviewing specific tariff policies, such as those concerning mobile termination rates. Moving to cost-based interconnection regimes will lead to lower wholesale termination rates and hence lower retail prices.

Serbia and Lithuania stand out for having low ICT prices despite their low income levels compared to other European countries

Table 3.3 presents the results of the ICT Price Basket in Europe. The ranking is topped by Luxembourg and Denmark, with an ICT Price Basket that represents 0.47 of their monthly GNI per capita. Among the top ranked countries there are little price differences (e.g. Belgium occupies the 14th place in the European ranking, with an ICT Price Basket that represents 0.87 of its monthly GNI per capita). Among the top ten, Cyprus stands out for having a significantly lower income than other countries, which underscores the low ICT prices in the country.

Serbia and Lithuania also stand out for having low ICT Prices despite their low income levels compared to other European countries. Moreover, both countries have ICT Price Baskets below the average of developed countries. In the case of Lithuania, low ICT prices may have been a relevant factor in the remarkable ICT developments witnessed in the period 2002-2008.[31]

European countries with the most costly ICT Price Basket include the region's lowest income economies – excluding Serbia – and Poland. Among them, Albania stands out for having the most expensive ICT Price Basket (nearly four and a half times higher than the average of developed countries), while other bottom ranked countries, such as Poland, Romania, Bosnia and Herzegovina, Bulgaria and TFYR Macedonia, have an ICT Price Basket value that ranges from 1.5 to 2.6 times the average of developed countries. Nevertheless, all European countries have an ICT Price Basket value well below the world average (15.1).

Fixed telephone sub-basket

The lowest fixed telephone prices in Europe are those of Montenegro, Albania and Serbia

The fixed telephone sub-basket represents the cost of local fixed residential telephone service. It includes the fee of the monthly subscription, plus the cost of 30 local calls to the same (fixed) network (15 peak and 15 off-peak calls) of three minutes each[32].

The lowest fixed telephone prices in Europe are those of Montenegro (US$ 4.1, PPP$ 5.9), closely followed by those of Albania (US$ 4.3, PPP$ 7.3) and Serbia (US$ 4.9, PPP$ 8.0). When compared to global fixed telephone prices, Montenegro is the only European country among the global top 15 economies with the least costly fixed telephone prices in PPP terms. On the other hand, Ireland has the most expensive fixed telephone prices of all countries included in the regional ICT Price Basket measured in US$ (US$ 42.2)[33]. In PPP terms, Cyprus has the most expensive prices (PPP$ 41.0).

The ten countries in the region with the least costly fixed telephone prices as a percentage of monthly GNI per capita are shown in Chart 3.4. Prices range from 0.49 per cent of the monthly GNI per capita in Luxembourg to 0.82 per cent in the Netherlands, and 3.42 per cent in Poland, the European country with the most expensive fixed telephone prices taking into account its income. Luxembourg, Finland, Iceland and Switzerland are among the world's top 15 countries with the least costly fixed telephone sub-basket as a percentage of GNI per capita.

Top ten economies with the least costly fixed telephone sub-basket in Europe, 2008

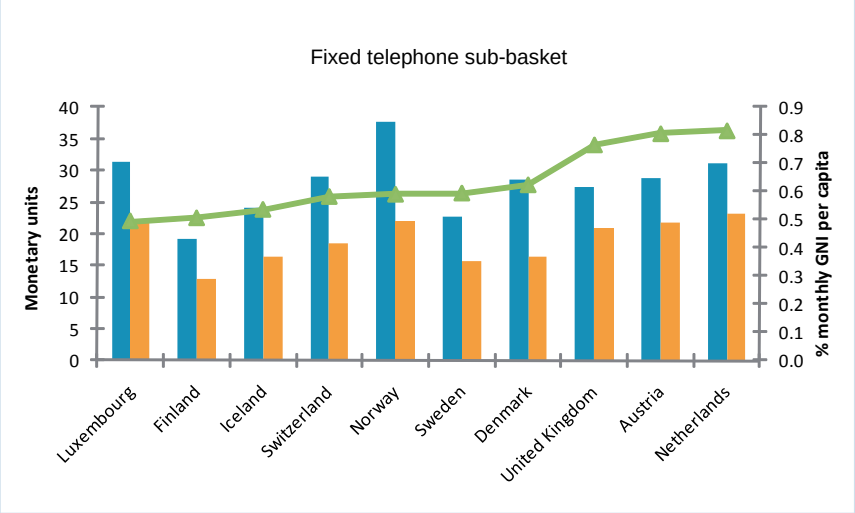


Chart 3.4

US$
PPP $
% monthly GNI per capita

Source: ITU

On average, in Europe the fixed telephone sub-basket corresponds to 1.4 per cent of the countries' monthly GNI per capita, the same as in developed countries. All European countries are below the world's average (7.3 per cent).

Mobile cellular sub-basket

The mobile cellular sub-basket corresponds to the price of a standard (low-user) basket of mobile monthly usage based on the OECD/Teligen methodology.[34] It includes 25 outgoing calls per month (on-net, off-net and to a fixed line), in predetermined ratios of minutes, plus 30 Short Message Service (SMS) messages[35]. On average, the cost of the mobile sub-basket in European countries represents 1.4 per cent of their monthly GNI per capita, which is equivalent to the cost of the fixed telephone sub-basket.

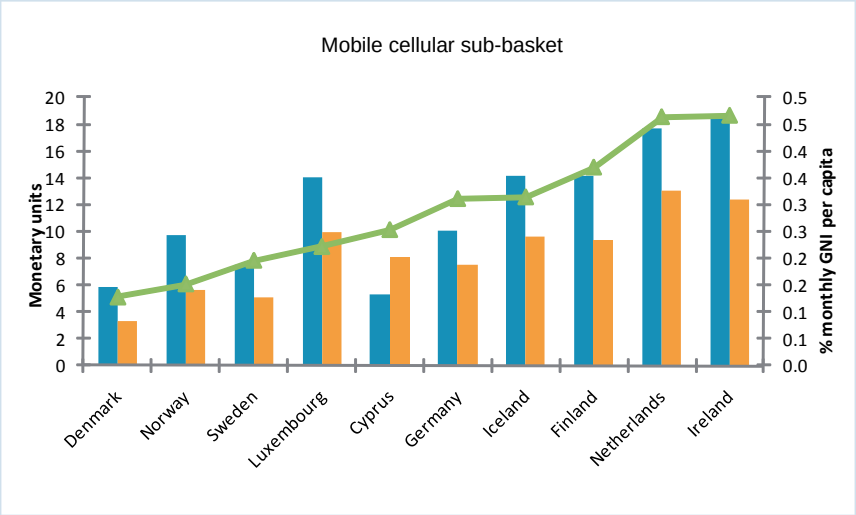
Denmark, Sweden, Norway, Luxembourg and Cyprus are among the world's top ten countries with the least costly mobile cellular sub-basket

Mobile cellular prices measured in US$ in Serbia (US$ 4.9) and Cyprus (US$ 5.3) are the lowest of the region. In PPP terms, Denmark (PPP$ 3.3), Sweden (PPP$ 5.1) and Norway (PPP$ 5.7) have the lowest prices and rank among the world's top ten economies with the least costly mobile cellular sub-basket in PPP$. On the other hand, Switzerland (US$ 35.5) and France (US$ 35.7) have the most expensive prices in US$, while Albania has the highest mobile sub-basket in PPP terms (PPP$ 38.3).

The ten European countries with the least costly mobile cellular prices in terms of GNI per capita are shown in Chart 3.5. They have mobile cellular sub-baskets that range from 0.13 per cent in Denmark to 0.46 in the Netherlands, all of them below the cost of the least costly fixed telephone sub-basket in Europe (0.49 per cent). Denmark, Sweden, Norway, Luxembourg and Cyprus are among the world's top ten countries with the least costly mobile cellular sub-basket as a percentage of GNI per capita, which shows that several European countries are leaders in terms of low mobile cellular prices.

Chart 3.5

Top ten economies with the least costly mobile cellular sub-basket in Europe, 2008



Source: ITU.

Albania is the only country in the region with a more costly mobile cellular sub-basket in terms of GNI per capita than the world's average (8.3 compared to 7.6 per cent), although other European countries such as TFYR Macedonia (4.6 per cent) and Bulgaria (4.9 per cent) have prices well above the average of developed countries (1.4 per cent), and therefore have also room for lowering mobile cellular prices.

Fixed broadband Internet sub-basket

As in other regions, in Europe the fixed broadband Internet sub-basket is the most expensive one, but price differences between sub-baskets are less pronounced

The fixed broadband Internet sub-basket is calculated based on the price of the monthly subscription to an entry level fixed broadband plan, at a minimum of 256 kbit/s.[36]

Similar to global patterns, in Europe the fixed broadband Internet sub-basket is the most expensive one, although price differences between sub-baskets are less pronounced than in other regions. Prices range from US$ 9.0 in Serbia to US$60.9 in Austria. Measured in PPP terms, they vary from PPP$ 14.7 in Serbia to PPP$ 53.1 in Albania. Serbia stands out for being the second country in the world with the least costly fixed broadband Internet sub-basket in PPP terms. Denmark and Italy also figure in the world's top ten list.

The ten countries in Europe with the least expensive fixed broadband prices as a percentage of monthly GNI per capita are shown in Chart 3.6. Fixed broadband prices range from 0.65 per cent of monthly GNI per capita in Switzerland to 11.5 per cent in Albania. Relative prices in Albania are twice as high as the next European country on the list, TFYR Macedonia (5.1 per cent)[37]. Excluding Albania, European countries with relatively expensive fixed broadband prices, such as Romania (4.3 per cent), Bosnia and Herzegovina (4.7 per cent), Montenegro (4.9 per cent) and TFYR Macedonia have a fixed broadband sub-basket that ranges from two to two and a half

Top ten economies with the least costly fixed broadband Internet sub-basket in Europe, 2008

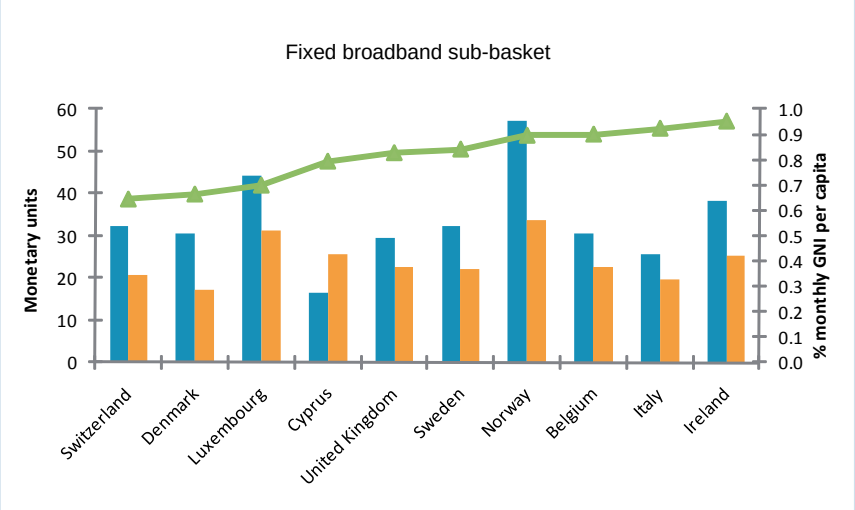


Chart 3.6

Source: ITU.

times the average of developed countries. This ratio is lower than that of the mobile cellular sub-basket, which shows that fixed broadband prices in Europe are not so disparate. Only Albania's fixed broadband prices are clearly out of range.

Endnotes

[1] See ITU (2009a).

[2] For more information on the WSIS and its outcome documents, see http://www.itu.int/wsis/index.html.

[3] The sub-index access includes the following indicators: fixed telephone lines per 100 inhabitants, mobile cellular telephone subscriptions per 100 inhabitants, international Internet bandwidth (bits/s) per Internet user, proportion of households with a computer, and proportion of households with Internet access at home.

[4] The sub-index use includes the following indicators: Internet users per 100 inhabitants, fixed broadband Internet subscribers per 100 inhabitants, and mobile broadband subscribers per 100 inhabitants.

[5] The sub-index skills includes the following indicators: adult literacy rate, secondary gross enrolment ratio, and tertiary gross enrolment ratio.

[6] The following countries were not included in the regional IDI because of lack of data: Andorra, Liechtenstein, Monaco, San Marino, and the Vatican. ITU only started collecting data for Serbia and Montenegro (separately) in 2004. Therefore these two countries could not be included in the 2002/2007 IDI.

[7] Sweden ranked first in the global IDI 2002, with an IDI value of 6.05, followed by Iceland, with an IDI value of 5.88. Sweden has maintained the first position in the global IDI 2007 ranking, achieving an IDI value of 7.50, while the Republic of Korea has reached the second position, with an IDI value of 7.26.

[8] Luxembourg, Lithuania, Estonia, Ireland, Spain, Italy and France are European countries among the top ten economies in IDI growth in the world (2002-2007).

[9] The R square value of a logarithmic regression provides a measure of how well the trendline approximates the real data points. It varies from 0 to 1, being 1 the value obtained by a perfect fit of the data points.

[10] For a more detailed analysis of the link between income and IDI in the world, see ITU (2009a).

[11] See ITU (2009b), Chapter 3, for more details.

[12] See ITU (2009d), Chapter 3, for more details.

[13] Sweden had in 2007 a GNI per capita of US$ 46'060, while the Netherlands had a GNI of US$ 45'820. Both countries had lower GNI per capita than Ireland (US$ 48'140), Iceland (US$ 54'100), Denmark (US$ 54'910), Switzerland (US$ 59'980), Luxembourg (US$ 75'880) and Norway (US$ 76'450).

[14] In Estonia, the development of the information society has been promoted through the "Principles of Estonian Information Policy", adopted by the Estonian Parliament in 1998. This was succeeded by the "Principles of Estonian Information Policy 2004-2006", which were approved in 2004. The "Estonian Information Society Strategy 2013" entered into force in January 2007. See MKM (2004, 2006) for more details.

[15] Such as the eVoting system of the 2005 local elections, also used in the 2007 general elections. According to MKM (2006), Estonia has "the largest functioning public key infrastructure in Europe, based on the use of electronic certificates maintained on the national ID card […] More than 80% of the population possess the ID card that enables both electronic authentication and digital signing." See MKM (2006) for more details.

[16] See Tiger Leap Foundation (2007) for more information on the Tiger Leap Programme (1997-2000), as well as its follow-ups: the Tiger Leap Plus Programme (2001-2005), and the Learning Tiger (2006-2009).

[17] See ITU (2009a), Chapter 3, for more details on the conceptual framework of the IDI.

[18] In 2007, only Albania, and Bosnia and Herzegovina did not have mobile broadband services commercially available to the public. By the end of the same year, Iceland had just launched the first 3G networks, and mobile broadband penetration was still negligible in the country.

[19] References to rankings made in this section apply to rankings of economies within the region. It is to be noted that these rankings differ from the world IDI ranking, which includes 154 economies (see ITU, 2009a).

[20] See ITU (2009a) for more details.

[21] The main reason for not including a specific country in the ICT Price Basket was the unavailability of one or several of the tariffs used to calculate the Price Basket.

[22] The average United Nations operational rate of exchange from January 2008 to September 2008 was used (the month when prices were gathered).

[23] Current international dollars (PPP $) are calculated using Purchasing Power Parity (PPP) conversion factors instead of regular exchange rates. The use of PPP exchange factors helps screening price and exchange rate distortions, thus providing a measure of the cost of a given service taking into account the purchasing power equivalences between countries. PPP data used in the ICT Price Basket were provided by the World Bank. For more information on PPP methodology and data, see http://go.worldbank.org/UI22NH9ME0 and the World Bank (2008).

[24] The following European economies included in the ITU World Telecommunication/ICT Indicators database were not included in the ICT Price Basket because of lack of data: Andorra, Israel, Liechtenstein, Monaco, San Marino, Turkey, and the Vatican.

[25] As previously analysed in this chapter, both Lithuania and Latvia have witnessed remarkable ICT developments in recent years, advancing considerably in terms of ICT uptake, for which affordability of ICT services is an important factor. In its 2008 Progress Report on the Single European Electronic Communications Market, the European Commission highlighted the strong competition in the Lithuanian mobile market, and the fact that consumers enjoy one of the lowest prices for mobile phone calls (see European Commission 2009c). The European Commission has reached a similar conclusion in the case of Latvia, where in February 2008 mobile number portability became available to mobile prepaid customers, enhancing the competition in the market (see European Commission 2009b). These findings are in line with the low mobile cellular sub-baskets of both countries

[26] ITU started collecting data separately for Serbia and Montenegro in 2004. Therefore, the two countries were not included in the IDI analysis. Serbia has made great strides towards more liberalized and competitive ICT markets since the launch of the "Strategy for the Development of Telecommunications in the Republic of Serbia from 2006 until 2010", and the related Action Plan. For instance, mobile penetration increased from 89 per cent in 2006 to 128 per cent in 2008, in parallel to the launch of "VIP mobile" as the third mobile operator in the country in 2007. The country is advancing towards an ICT regulatory framework convergent with that of the European Union, with such features as ex-ante regulation (including cost oriented price obligations for operators with significant market power), carrier selection and pre-selection, and local loop unbundling. According to RATEL (2009), this has lead to a reduction in ICT prices, and Serbia has achieved some of the lowest ICT price levels of South Eastern Europe. Once the "Law on Electronic Communications" is approved (a draft is currently under public consultation), the country will further advance towards the liberalization of the ICT sector and the full compliance with the regulatory framework of the EU.

[27] The ICT Price Basket is the value computed as the sum of the price of each sub-basket (in US$) as a percentage of the country's monthly GNI per capita (World Bank, US$, Atlas Method), divided by three. Therefore, the contribution of each sub-basket to the ICT Price Basket is a third of the price of the sub-basket expressed as a percentage of the monthly GNI per capita.

[28] Most European countries have at least four big mobile operators, for example Luxembourg (four operators), Denmark (five), Sweden (four), Finland (four), the United Kingdom (six), the Netherlands (six), etc. See http://ec.europa.eu/information_society/activities/roaming/consumer/operators/index_en.htm for a complete list of EU operators. Additionally, many European countries have several active mobile virtual network operators (MVNO) that contribute to strengthen the competitive environment in terms of pricing. For instance, by the end of 2008 Norway had as many as 29 operational providers of mobile phone services (see PT (2009) for more details on the Norwegian market). Other European countries with a significant number of MVNO include Italy, Belgium, the Netherlands, and the United Kingdom.

[29] See chapters 3 of ITU (2009b, 2009c, 2009d and 2009e).

[30] The average mobile cellular sub-basket in developed countries represents 1.4 per cent of their GNI per capita, compared to 3.1 per cent in Bosnia and Herzegovina, 4.6 per cent in TFYR Macedonia, 4.9 per cent in Bulgaria, and 8.3 per cent in Albania.

[31] As previously analysed in this report, progress was especially relevant in terms of ICT access, and

the country achieved one of the highest mobile penetration rates worldwide, with 151 mobile cellular subscriptions per 100 inhabitants in 2008.

[32] See ITU (2009a), Annex 2, for more details.

[33] In a recent report, the European Commission has also highlighted the high consumer prices in the Irish fixed telephone market (see European Commission, 2009a). The report states that "the incumbent increased its local call tariffs in 2008, and its consumer monthly line rental charge of €25 remained the highest in the EU."

[34] See OECD (2002).

[35] See ITU (2009a), Annex 2, for more details.

[36] Broadband is considered any dedicated connection to the Internet at speeds equal to, or greater than, 256 kbit/s, in one or both directions. Where several offers were available, preference was given to a 256 kbit/s connection. The tariff represents the cheapest broadband entry plan (although special offers – limited in time or to specific geographic areas – were not taken into consideration) but does not necessarily represent the fastest or most cost-effective connection since often the price for a higher-speed plan is relatively cheaper (in terms of the caps). See ITU (2009a), Annex 2, for more details.

[37] In the case of TFYR Macedonia, relatively high fixed broadband prices can be explained by the low proportion of international connectivity per Internet user in the country. Indeed, available international Internet bandwidth falls short of the needs of the country, which may be a direct cause of high fixed broadband prices.

Chapter 4.

Conclusions

This section highlights key findings and draws conclusions, with a view to providing recommendations that policy makers could implement to enhance the development of the information society in the European region and increase access to ICTs. Policy recommendations are mainly focused on the transition to a new telecommunication and media-converged environment, which is characterized by the availability of high-speed access broadband networks, the migration to digital broadcasting and the availability of multi-bundled, media centric services.

Estonia, Montenegro, Lithuania and Italy are approaching mobile penetration rates of 200 %

The European region is undoubtedly a world leader in ICT services uptake. In 2008, in the extended E-42 region, mobile cellular penetration reached 117 per cent, representing 17 per cent annual compound growth over a ten-year period. In total, 31 out of the 42 examined countries now have present penetration rates above 100 per cent, with some of the countries, such as Estonia, Montenegro, Lithuania and Italy having penetration rates of more than 150 per cent, and approaching 200 per cent. Main reasons include high digital literacy among citizens, relatively low fixed-telephony uptake, high share of prepaid customers (holders of dual-SIM cards) and in some cases lack of mobile number portability (MNP) enforcement. In the fixed telephony domain, the European region had 44 fixed telephone lines per 100 inhabitants in 2008; however, it experienced a slight negative growth over the past decade, mainly due to the Fixed Mobile Substitution (FMS) effect.

The European region also presents the highest number of Internet users per 100 inhabitants among all regions in the world, and, over the past five years it has experienced an exponential growth of its fixed broadband subscribers and mobile broadband subscriptions, reaching in 2008, 20 and 21 per cent penetration, respectively.

Key success factors for the significant ICT services uptake in Europe are the adoption of a harmonized framework and common technological platforms

The key success factors for the significant ICT services uptake in Europe are the adoption of a harmonized legal and regulatory framework and common technological platforms among EU member states. As early as 2002, following the initiative of the European Commission DG Information Society and Media, all Member States agreed on the implementation of a harmonized regulatory framework, addressing key regulatory bottlenecks, such as networks interconnection, open access, unbundling, spectrum policy and universal service. Adopting common, well-engineered guidelines, and customizing them to individual countries' characteristics and needs, allowed Member States to effectively grow their ICT sector through fostering competition among service providers and stimulating demand among end-users. Moreover, in 2005, EU Member States agreed on the i2010 strategy for further developing the ICT sector, giving special emphasis to broadband network development the transition to the new digital economy. Since then, efforts have been focused on bridging the digital divide and enhancing digital inclusion. In this respect, EU Member States are a very useful

and concrete example for other European countries, which are currently reviewing their national ICT policies and overall regulatory environment. One of their priorities is to harmonize national policies and regulations in-line with the commonly adopted EU regulatory framework.

The migration to next-generation mobile telephony has allowed European citizens to enjoy high-speed mobile broadband services as early as 2000

On the technology side, the adoption of a uniform pan-European wireless cellular technological standard (2G/GSM) in the early '90s, has played an instrumental role in enabling mobile telephony uptake, as the benefits of economies of scale enjoyed by telecommunication vendors and operators have been passed on to end-users. Similarly, the migration to next-generation mobile telephony (IMT-2000/3G/UMTS), as early as 2000, has allowed European citizens to enjoy high-speed mobile broadband services early on.

On the way forward, key policy making and regulatory challenges are centered around ensuring digital inclusion among all age groups and geographic regions in all European countries. This can be achieved by effectively implementing national "broadband for all" strategies and policies and by enabling the migration to next-generation access (NGA) networks, while at the same time excluding the possibility of creating a new digital divide by allowing stakeholders to focus only on commercially viable areas. In this context, the European Commission has recently published guidelines and rules with regards to public financing for the development of nationwide high-speed broadband networks.

Policy makers in European countries need to carefully manage the transition to digital broadcasting

The European Commission has mandated the transition to digital broadcasting in all Member States by 2012. This will enhance the quality of TV broadcasting for all European citizens, while the freed-up spectrum in the UHF band (the so-called "digital dividend") can be used for other purposes and applications, such as mobile broadband. Policy makers in European countries therefore need to carefully manage the transition to digital broadcasting and decide on the optimal use of the digital dividend, aiming to maximize end-users' benefits.

The following recommendations may assist policy makers and regulators in the region to achieve their goal of effectively facilitating the migration to the new telecommunications and media-converged environment, keeping in mind how to best safeguard citizens' interests and maximize consumers' benefits.

- High-speed access network deployment: End-users' demand patterns have consistently changed over the past years and industry players should thus ensure increased bandwidth for all citizens. Taking into consideration that operators tend to focus on urban areas for high-speed access network deployments, targeting the high-end market, policy makers should ensure that broadband networks are also available in suburban and rural areas. During early stages, they should hence develop and implement strategies for facilitating network deployment in all regions of the country, allowing different technological options to be applied and ensuring that certain speed rates and quality of service (QoS) indicators are warranted.

- Public support in broadband network development: There is a recent trend

among governments, municipalities and other public institutions to engage in the development of fiber access networks. Policy makers should ensure that an "orchestrated" approach is adopted, offering all citizens the possibility to connect to high-speed broadband networks. The creation of "islands" of high-speed connectivity in the country should thus be avoided, which could create a new digital divide and possibly raise anti-competitive concerns. Financial and institutional support should be in line with the optimal business model that caters to all stakeholders interests, avoiding infrastructure duplication and allowing the creation of an "open access", level-playing field in the new NGA environment.

Public support in broadband network development should ensure that all citizens have access to high-speed broadband networks

- Demand stimulation: Policy makers and regulators should ensure the continuous demand for new and advanced ICT services, which will justify investments in next-generation access networks. Recent market developments demonstrate that end-users are eager to subscribe to multi-play packages, such as IPTV and Video on Demand (VoD) services. However, especially in the South-Eastern European (SEE) countries, significant effort is still required to increase computer penetration and digital readiness among citizens.

- Digital dividend and spectrum refarming: Policy makers and regulators should not only develop the appropriate legal and regulatory framework for ensuring an effective migration to digital broadcasting, but also ultimately decide on the optimal use of the digital dividend. Their decision should be based on the one hand, on a cost-benefit analysis, which takes into consideration special market dynamics and characteristics. On the other hand, it should consider streamlining national policies with other European counterparts, to harmonize the overall approach taken and benefit from economies of scale.

Policy makers need to decide whether a converged telecommunication and media regulator is required

- Converged regulatory environment: An important challenge for policy makers and regulators is the assessment of the optimal governance model required to effectively and efficiently regulate the emerging converged telecommunication/media sectors. Based on latest industry trends, operators are either forming partnerships and/or engaging into mergers and acquisitions activities, in an attempt to create integrated entities capable of offering a full range of basic and media-centric services. In light of these developments, policy makers need to decide whether a converged telecommunication and media regulator is required in the marketplace and what would be the overall approach in reviewing key regulatory levers, such as content creation and distribution, access to broadcasting infrastructure and wholesale pricing of bundled offerings. A set of fundamental regulatory principles, such as equality of inputs, cost-oriented pricing and non-discrimination should prevail, in order to ensure that new emerging trends will not distort the current competitive landscape and end-users will benefit from the variety of new, advanced and low-priced telecommunication/media combined services.

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Annex 1. List of countries in Europe

Albania	Portugal*
Andorra	Romania*
Austria*	San Marino
Belgium*	Serbia
Bosnia and Herzegovina	Slovak Republic*
Bulgaria*	Slovenia*
Croatia	Spain*
Cyprus*	Sweden*
Czech Republic*	Switzerland
Denmark*	TFYR Macedonia
Estonia*	Turkey
Finland*	United Kingdom*
France*	
Germany*	
Greece*	
Hungary*	
Iceland	
Ireland*	
Israel	
Italy*	
Latvia*	
Liechtenstein	
Lithuania*	
Luxembourg*	
Malta*	
Monaco	
Montenegro	
Netherlands*	
Norway	
Poland*	
EU-42 countries	

Note: * EU-27 member countries.
The EU-42 in this report refers to the countries/economies included in the BDT region of Europe.
Vatican is included in the region, however, it was excluded from the report due to lack of data.

Annex 2. IDI sub-indices (access, use, skills) for countries in Europe

IDI access sub-index (2002-2007)

Country	Rank 2007	Access 2007	Rank 2002	Access 2002	Rank change 2002-2007	Access change 2002-2007
Sweden	1	8.67	1	7.68	0	1.00
Luxembourg	2	8.60	8	6.68	6	1.92
Iceland	3	8.48	3	7.40	0	1.07
Netherlands	4	8.42	5	6.90	1	1.52
Switzerland	5	8.41	4	7.27	-1	1.13
Germany	6	8.39	9	6.62	3	1.77
Denmark	7	8.33	2	7.47	-5	0.85
United Kingdom	8	8.16	7	6.82	-1	1.34
Norway	9	7.89	6	6.90	-3	0.98
Ireland	10	7.40	13	5.82	3	1.58
Austria	11	7.35	12	5.97	1	1.38
Italy	12	7.33	14	5.74	2	1.59
Finland	13	7.23	10	6.36	-3	0.87
Belgium	14	7.23	11	6.01	-3	1.22
France	15	7.16	17	5.57	2	1.59
Estonia	16	7.12	25	3.96	9	3.17
Malta	17	7.09	18	5.41	1	1.67
Israel	18	6.86	15	5.71	-3	1.16
Slovenia	19	6.83	16	5.65	-3	1.18
Spain	20	6.83	19	5.06	-1	1.77
Portugal	21	6.39	23	4.69	2	1.70
Cyprus	22	6.33	21	4.80	-1	1.52
Greece	23	6.22	20	5.04	-3	1.19
Lithuania	24	6.04	30	2.94	6	3.09
Hungary	25	5.97	24	4.05	-1	1.92
Slovak Republic	26	5.83	26	3.76	0	2.07
Poland	27	5.77	28	3.34	1	2.43
Latvia	28	5.76	29	3.16	1	2.61
Czech Republic	29	5.68	22	4.73	-7	0.95
Croatia	30	5.66	27	3.70	-3	1.96
Bulgaria	31	5.26	31	2.64	0	2.62
Romania	32	4.84	34	2.40	2	2.44
Turkey	33	4.43	33	2.46	0	1.97
Bosnia & Herzegovina	34	4.27	35	2.19	1	2.08
TFYR Macedonia	35	3.56	32	2.61	-3	0.95
Albania	36	2.83	36	1.87	0	0.97

Note: Based on ITU (2009a).

IDI use sub-index (2002-2007)

Country	Rank 2007	Use 2007	Rank 2002	Use 2002	Rank change 2002-2007	Use change 2002-2007
Luxembourg	1	5.56	13	1.40	12	4.16
Sweden	2	5.48	2	2.89	0	2.60
Norway	3	5.25	3	2.67	0	2.58
Netherlands	4	5.11	5	2.44	1	2.67
Denmark	5	5.10	4	2.60	-1	2.51
Switzerland	6	4.97	6	2.42	0	2.56
Finland	7	4.84	7	2.36	0	2.49
Iceland	8	4.80	1	3.10	-7	1.71
United Kingdom	9	4.51	8	1.99	-1	2.52
Austria	10	4.29	12	1.54	2	2.75
Ireland	11	4.23	20	0.88	9	3.35
Germany	12	4.07	10	1.85	-2	2.22
France	13	3.99	16	1.16	3	2.83
Belgium	14	3.76	9	1.97	-5	1.79
Italy	15	3.67	18	1.01	3	2.65
Spain	16	3.50	21	0.83	5	2.67
Estonia	17	3.40	11	1.58	-6	1.82
Slovenia	18	3.18	17	1.10	-1	2.08
Portugal	19	3.10	24	0.77	5	2.33
Israel	20	3.05	23	0.79	3	2.26
Malta	21	2.77	15	1.21	-6	1.56
Lithuania	22	2.61	27	0.63	5	1.98
Hungary	23	2.57	28	0.61	5	1.96
Slovak Republic	24	2.47	14	1.34	-10	1.13
Czech Republic	25	2.40	22	0.80	-3	1.60
Cyprus	26	2.29	19	0.98	-7	1.31
Latvia	27	2.27	25	0.75	-2	1.51
Poland	28	2.17	26	0.72	-2	1.46
Croatia	29	2.12	29	0.58	0	1.53
Greece	30	1.94	31	0.50	1	1.44
Bulgaria	31	1.57	33	0.30	2	1.27
Romania	32	1.47	34	0.22	2	1.25
TFYR Macedonia	33	1.42	30	0.58	-3	0.84
Bosnia & Herzegovina	34	1.01	35	0.09	1	0.93
Turkey	35	0.88	32	0.37	-3	0.51
Albania	36	0.63	36	0.01	0	0.62

Note: Based on ITU (2009a).

IDI skills sub-index (2002-2007)

Country	Rank 2007	Skills 2007	Rank 2002	Skills 2002	Rank change 2002-2007	Skills change 2002-2007
Greece	1	9.94	10	8.65	9	1.29
Finland	2	9.78	1	9.45	-1	0.32
Slovenia	3	9.36	4	8.85	1	0.51
Denmark	4	9.26	5	8.74	1	0.52
Norway	5	9.18	3	9.08	-2	0.10
Sweden	6	9.17	2	9.14	-4	0.03
Iceland	7	9.14	15	8.43	8	0.71
Lithuania	8	9.13	8	8.68	0	0.45
Latvia	9	8.99	9	8.66	0	0.33
Italy	10	8.92	19	8.40	9	0.51
Spain	11	8.91	7	8.70	-4	0.21
Hungary	12	8.88	23	8.12	11	0.76
Poland	13	8.85	12	8.57	-1	0.28
Estonia	14	8.79	13	8.57	-1	0.22
Belgium	15	8.73	11	8.62	-4	0.11
Netherlands	16	8.65	14	8.48	-2	0.16
Ireland	17	8.60	16	8.41	-1	0.19
United Kingdom	18	8.53	6	8.72	-12	-0.19
France	19	8.50	18	8.40	-1	0.10
Portugal	20	8.34	17	8.41	-3	-0.07
Austria	21	8.32	21	8.18	0	0.15
Czech Republic	22	8.23	26	7.65	4	0.58
Bulgaria	23	8.21	24	7.81	1	0.40
Israel	24	8.19	20	8.20	-4	-0.02
Slovak Republic	25	8.17	28	7.36	3	0.81
Germany	26	8.17	22	8.16	-4	0.01
Romania	27	8.16	30	7.16	3	1.00
Malta	28	7.97	32	6.95	4	1.02
Switzerland	29	7.92	25	7.73	-4	0.19
Croatia	30	7.83	27	7.37	-3	0.46
Cyprus	31	7.61	29	7.31	-2	0.30
TFYR Macedonia	32	7.14	34	6.89	2	0.25
Bosnia & Herzegovina	33	7.14	31	7.08	-2	0.06
Turkey	34	6.85	35	6.38	1	0.47
Luxembourg	35	6.84	33	6.91	-2	-0.07
Albania	36	6.69	36	5.82	0	0.87

Note: Based on ITU (2009a).

Annex 3. Statistical tables

Introduction

The following signs and symbols are used in the document:

*	Estimate
000s	Thousands (e.g., 1'000)
M	Millions (e.g., 1'000'000)
B	Billions (e.g., 1'000'000'000)
US$	United States dollars. See the *Technical notes* for how US$ figures are obtained.
%	Per cent
-	Zero or a quantity less than half the unit shown.
...	Data not available
CAGR	Compound Annual Growth Rate. See the *Technical notes* for how this is computed.

The absence of any sign or symbol indicates that data are in units.

List of economies

Full designation	Designation in document	Fiscal year
Albania (Republic of)	Albania	Ending 31.12
Andorra (Principality of)	Andorra	Ending 31.12
Austria	Austria	Ending 31.12
Belgium	Belgium	Ending 31.12
Bosnia and Herzegovina	Bosnia and Herzegovina	Ending 31.12
Bulgaria (Republic of)	Bulgaria	Ending 31.12
Croatia (Republic of)	Croatia	Ending 31.12
Cyprus (Republic of)	Cyprus	Ending 31.12
Czech Republic	Czech Republic	Ending 31.12
Denmark	Denmark	Ending 31.12
Estonia (Republic of)	Estonia	Ending 31.12
Finland	Finland	Ending 31.12
France	France	Ending 31.12
Germany (Federal Republic of)	Germany	Ending 31.12
Greece	Greece	Ending 31.12
Hungary (Republic of)	Hungary	Ending 31.12
Iceland	Iceland	Ending 31.12
Ireland	Ireland	Beginning 01.04
Israel (State of)	Israel	Ending 31.12
Italy	Italy	Ending 31.12
Latvia (Republic of)	Latvia	Ending 31.12
Liechtenstein (Principality of)	Liechtenstein	Ending 31.12
Lithuania (Republic of)	Lithuania	Ending 31.12
Luxembourg	Luxembourg	Ending 31.12
Malta	Malta	Ending 31.12
Monaco (Principality of)	Monaco	Ending 31.12
Montenegro	Montenegro	Ending 31.12
Netherlands (Kingdom of the)	Netherlands	Ending 31.12
Norway	Norway	Ending 31.12
Poland (Republic of)	Poland	Ending 31.12
Portugal	Portugal	Ending 31.12
Romania	Romania	Ending 31.12
San Marino (Republic of)	San Marino	Ending 31.12
Serbia (Republic of)	Serbia	Ending 31.12
Slovak Republic	Slovak Republic	Ending 31.12
Slovenia (Republic of)	Slovenia	Ending 31.12
Spain	Spain	Ending 31.12
Sweden	Sweden	Ending 31.12
Switzerland (Confederation of)	Switzerland	Ending 31.12
The Former Yugoslav Republic of Macedonia	TFYR Macedonia	Ending 31.12
Turkey	Turkey	Ending 31.12
United Kingdom of Great Britain and Northern Ireland	United Kingdom	Beginning 01.04

1. Main (fixed) telephone lines

		Main (fixed) telephone lines (000s)		Main (fixed) telephone lines CAGR (%)	Main (fixed) telephone lines per 100 inhabitants		Main (fixed) telephone lines per 100 inhabitants CAGR (%)
		2003	2008	2003-2008	2003	2008	2003-2008
1	Albania	255.0	316.4	4.4	8.3	10.1	4.0
2	Andorra	35.2	37.4	1.2	47.4	44.3	-1.4
3	Austria	3'877.0	3'285.0	-3.3	47.7	39.4	-3.7
4	Belgium	4'875.0	4'456.6	-1.8	47.3	42.1	-2.3
5	Bosnia and Herze-govina	938.0	1'031.4	1.9	24.8	27.3	2
6	Bulgaria	2'817.5	2'189.8	-4.9	35.9	28.8	-4.3
7	Croatia	1'871.3	1'878.1	0.1	42.0	42.5	0.2
8	Cyprus	424.1	388.7	-1.7	51.9	45.1	-2.8
9	Czech Republic	3'626.3	2'264.2	-9	35.6	21.9	-9.2
10	Denmark	3'614.2	2'490.9	-7.2	67.1	45.6	-7.4
11	Estonia	461.0	498.1	1.6	34.1	37.1	1.7
12	Finland	2'567.6	1'650.0	-8.5	49.3	31.1	-8.8
13	France	33'913.0	35'000.0	0.6	56.3	56.4	-
14	Germany	54'233.0	51'400.0	-1.1	65.9	62.5	-1.1
15	Greece	6'300.4	5'975.2	-1.1	57.2	53.7	-1.3
16	Hungary	3'602.9	3'094.0	-3	35.6	30.9	-2.8
17	Iceland	192.6	193.5	0.1	66.8	61.3	-1.7
18	Ireland	1'955.0	2'203.6	2.4	48.6	49.7	0.4
19	Israel	2'913.0	3'224.0	2	45.1	45.7	0.3
20	Italy	26'596.0	21'246.0	-4.4	45.9	35.7	-4.9
21	Latvia	653.9	644.0	-0.3	28.2	28.5	0.2
22	Liechtenstein	19.9	19.6	-0.3	58.5	55.0	-1.2
23	Lithuania	824.2	784.9	-1	23.9	23.6	-0.2
24	Luxembourg	245.0	260.6	1.2	54.1	54.2	0.1
25	Malta	208.3	241.1	3	52.4	59.2	2.5
26	Monaco	33.5	*35.0*	0.9	103.6	*107.0*	0.6
27	Montenegro	...	*362.0*	...	...	*58.2*	...
28	Netherlands	7'846.0	7'317.2	-1.4	48.5	44.3	-1.8
29	Norway	2'236.1	1'898.6	-3.2	49.0	39.8	-4
30	Poland	12'292.4	*9'674.9*	-4.7	32.1	*25.4*	-4.6
31	Portugal	4'281.1	4'110.9	-0.8	41.1	38.5	-1.3
32	Romania	4'331.6	5'036.0	3.1	19.8	23.6	3.5
33	San Marino	20.7	21.3	0.6	71.4	68.3	-0.9
34	Serbia	...	3'084.9	...	...	31.4	...
35	Slovak Republic	1'294.7	1'097.8	-3.2	24.1	20.3	-3.3
36	Slovenia	812.3	1'009.8	4.4	40.7	50.1	4.2
37	Spain	17'759.2	20'200.3	2.6	42.4	45.4	1.4
38	Sweden	5'535.4	5'323.0	-0.8	61.7	57.8	-1.3
39	Switzerland	5'323.5	4'835.0	-1.9	72.5	64.1	-2.4
40	TFYR Macedonia	525.0	457.1	-2.7	25.9	22.4	-2.9
41	Turkey	18'916.7	17'502.2	-1.5	27.3	23.7	-2.8
42	United Kingdom	34'550.3	33'209.2	-0.8	57.9	54.2	-1.3
	Europe	**272'777.90**	**259'948.50**	-1.2	46.42	**42.45**	**-1.7**

Note: For data comparability and coverage, see the technical notes. Figures *in italics* are estimates.
Source: ITU World Telecommunication/ICT Indicators Database.

2. Mobile cellular subscriptions

		Mobile cellular subscriptions			Mobile cellular subscriptions per 100 inhabitants		
		(000s)		CAGR (%)			CAGR (%)
		2003	2008	2003-2008	2003	2008	2003-2008
1	Albania	1'100	3'141	23.4	35.64	99.93	22.9
2	Andorra	52	64	4.3	69.95	76.06	1.7
3	Austria	7'274	10'816	8.3	89.42	129.73	7.7
4	Belgium	8'606	11'822	6.6	83.45	111.63	6
5	Bosnia and Herze-govina	1'075	3'179	24.2	28.41	84.26	24.3
6	Bulgaria	3'501	10'500	24.6	44.65	138.3	25.4
7	Croatia	2'537	5'880	18.3	56.93	132.95	18.5
8	Cyprus	552	1'017	13	67.53	117.89	11.8
9	Czech Republic	9'709	13'780	7.3	95.37	133.54	7
10	Denmark	4'767	6'854	7.5	88.49	125.57	7.3
11	Estonia	1'050	2'524	19.2	77.64	188.2	19.4
12	Finland	4'747	6'830	7.5	91.07	128.76	7.2
13	France	41'702	57'972	6.8	69.24	93.45	6.2
14	Germany	64'800	105'523	10.2	78.72	128.27	10.3
15	Greece	8'936	13'799	9.1	81.08	123.9	8.9
16	Hungary	7'945	12'224	9	78.42	122.09	9.3
17	Iceland	280	343	4.1	97.07	108.64	2.3
18	Ireland	3'500	5'357	8.9	87.05	120.74	6.8
19	Israel	6'618	8'982	6.3	102.55	127.38	4.4
20	Italy	56'770	90'341	9.7	98	151.57	9.1
21	Latvia	1'220	*2234*	12.9	52.55	*98.9*	13.5
22	Liechtenstein	25	*34*	6.3	73.51	*95.43*	5.4
23	Lithuania	2'102	5'023	19	60.87	151.24	20
24	Luxembourg	539	707	5.6	118.92	147.11	4.3
25	Malta	290	386	5.9	72.97	94.64	5.3
26	Monaco	15	*22*	7.8	46.65	*67.25*	7.6
27	Montenegro	...	*735*	-	...	*118.1*	...
28	Netherlands	13'200	20'627	9.3	81.66	124.8	8.9
29	Norway	4'061	5'251	5.3	88.91	110.16	4.4
30	Poland	17'401	*43'926*	20.3	45.45	*115.28*	20.5
31	Portugal	10'003	14'910	8.3	95.99	139.64	7.8
32	Romania	7'040	24'467	28.3	32.25	114.54	28.9
33	San Marino	17	24	7.3	58.36	76.96	5.7
34	Serbia	...	9'619	-	...	*97.76*	...
35	Slovak Republic	3'679	5'520	8.5	68.35	102.23	8.4
36	Slovenia	1'739	2'055	3.4	87.21	101.97	3.2
37	Spain	37'220	49'678	5.9	88.89	111.67	4.7
38	Sweden	8'801	10'988	4.5	98.12	119.38	4
39	Switzerland	6'189	8'897	7.5	84.34	117.97	6.9
40	TFYR Macedonia	776	*2'502*	26.4	38.26	*122.56*	26.2
41	Turkey	27'888	65'824	18.7	40.22	89.05	17.2
42	United Kingdom	54'256	77'361	7.4	90.93	126.34	6.8
	Europe	**58.9**	**721'737**	**10.5**	**73.52**	**117.86**	**10**

Note: For data comparability and coverage, see the technical notes. Figures in italics are estimates.
Source: ITU World Telecommunication/ICT Indicators Database.

2. Mobile cellular subscriptions (continuation)

		Mobile cellular subscriptions			Mobile broadband subscriptions		
		Prepaid subscribers (%)	Population coverage (%)	As % of total telephone subscribers	(000s)		Per 100 inhabitants
		2008	2008	2008	2003	2008	2008
1	Albania	93.6	99.3	90.8	-	-	-
2	Andorra	40.3	99.0	63.2	-	11.2	13.2
3	Austria	32.8	99.0	76.7	...	3'561.0	42.7
4	Belgium	56.3	99.9	72.6	-	368.6	3.5
5	Bosnia and Herzegovina	89.7	99.3	75.5	-	-	-
6	Bulgaria	47.7	100.0	82.7	-	183.5	2.4
7	Croatia	74.8	100.0	75.8	-	158.5	3.6
8	Cyprus	59.5	100.0	72.3	-	221.2	25.6
9	Czech Republic	52.9	99.7	85.9	-	276.7	2.7
10	Denmark	15.7	113.9	73.3	3.4	1'033.7	18.9
11	Estonia	58.4	100.0	83.5	-	200.0	14.9
12	Finland	10.4	99.5	80.5	-	1'291.3	24.3
13	France	32.3	99.0	62.4	-	14'626.2	23.6
14	Germany	57.7	99.0	67.2	-	17'900.0	21.8
15	Greece	63.0	99.9	69.8	-	919.1	8.3
16	Hungary	61.2	99.0	79.8	-	343.6	3.4
17	Iceland	41.2	99.0	63.9	-	-	-
18	Ireland	69.9	99.0	70.9	-	308.9	7.0
19	Israel	25.3	100.0	73.6	-	2'428.1	34.4
20	Italy	87.5	99.8	81.0	425.0	29'095.3	48.8
21	Latvia	73.4	98.8	77.6	-	143.5	6.4
22	Liechtenstein	19.5	95.0	63.4	-	8.9	24.9
23	Lithuania	64.7	100.0	86.5	-	137.7	4.1
24	Luxembourg	39.5	99.9	73.1	-	397.0	82.6
25	Malta	86.4	100.0	61.5	...	45.8	11.2
26	Monaco	3.9	100.0	38.6	-	2.9	8.8
27	Montenegro	79.6	99.0	67.0	-	*51.9*	8.3
28	Netherlands	41.9	98.0	73.8	-	4'133.3	25.0
29	Norway	27.8	...	73.4	-	997.8	20.9
30	Poland	55.7	99.0	82.0	-	2'395.6	6.3
31	Portugal	74.1	99.0	78.4	-	4'319.8	40.5
32	Romania	60.6	98.0	82.9	-	860.0	4.0
33	San Marino	37.5	98.0	53.0	...	2.5	8.0
34	Serbia	70.3	93.2	75.7	...	750.0	7.6
35	Slovak Republic	41.8	99.8	83.4	...	567.5	10.5
36	Slovenia	35.5	99.6	67.1	...	446.9	22.2
37	Spain	40.9	99.0	71.1	-	17'314.4	38.9
38	Sweden	45.6	98.0	67.4	18.0	3'266.0	35.5
39	Switzerland	43.0	100.0	64.8	-	2'133.9	28.3
40	TFYR Macedonia	88.0	99.9	84.6	-	10.0	0.5
41	Turkey	79.6	100.0	79.0	...	17.7	-
42	United Kingdom	61.3	99.8	70.0	210.0	20'732.4	33.9
	Europe	**58.9**	**99.4**	**73.5**	**656.4**	**131'662.3**	**21.5**

Note: For data comparability and coverage, see the technical notes. Figures in italics are estimates.
Source: ITU World Telecommunication/ICT Indicators Database.

3. Internet users

		Internet users			Internet users per 100 inhabitants		
		(000s)		CAGR (%)			CAGR (%)
		2003	2008	2003-2008	2003	2008	2003-2008
1	Albania	30	750	90.4	0.97	23.86	89.7
2	Andorra	10	59.1	42.5	13.55	70.04	38.9
3	Austria	3'337.30	5'936.70	12.2	41.02	71.21	11.7
4	Belgium	5'153.00	7'292.30	7.2	49.97	68.86	6.6
5	Bosnia and Herzegovina	150	1'307.60	54.2	3.97	34.66	54.3
6	Bulgaria	944.3	2'647.10	22.9	12.04	34.86	23.7
7	Croatia	1'014.00	1'879.60	13.1	22.75	42.5	13.3
8	Cyprus	245.8	334.4	6.3	30.09	38.78	5.2
9	Czech Republic	2'849.30	6'027.70	16.2	27.99	58.41	15.9
10	Denmark	3'822.00	4'578.60	3.7	70.94	83.89	3.4
11	Estonia	613.1	888.1	7.7	45.32	66.21	7.9
12	Finland	3'436.50	4'382.70	5	65.93	82.62	4.6
13	France	21'765.00	42'315.40	14.2	36.14	68.21	13.5
14	Germany	44'191.20	61'973.10	7	53.68	75.33	7
15	Greece	1'791.40	4'253.40	18.9	16.25	38.19	18.6
16	Hungary	2'190.70	5'873.10	21.8	21.63	58.66	22.1
17	Iceland	233.9	285.7	4.1	81.19	90.56	2.2
18	Ireland	1'229.20	2'774.90	17.7	30.57	62.54	15.4
19	Israel	1'264.50	3'500.00	22.6	19.59	49.64	20.4
20	Italy	16'524.80	24'991.50	8.6	28.53	41.93	8
21	Latvia	626.2	1'369.60	16.9	26.98	60.63	17.6
22	Liechtenstein	20	23	2.8	58.81	64.55	1.9
23	Lithuania	844.4	1'761.90	15.8	24.45	53.05	16.8
24	Luxembourg	239.3	387	10.1	52.8	80.53	8.8
25	Malta	125.7	198.8	9.6	31.64	48.79	9
26	Monaco	16	22	6.6	49.49	67.25	6.3
27	Montenegro	-	294	...	...	47.24	...
28	Netherlands	10'400.70	14'304.60	6.6	64.35	86.55	6.1
29	Norway	3'411.60	4'235.80	4.4	74.7	88.86	3.5
30	Poland	9'522.00	18'679.10	14.4	24.87	49.02	14.5
31	Portugal	2'673.20	4'475.70	10.9	25.65	41.92	10.3
32	Romania	1'941.90	6'132.20	25.9	8.9	28.71	26.4
33	San Marino	14.5	17	3.3	50	54.52	1.7
34	Serbia	-	3'300.00	...	...	33.54	...
35	Slovak Republic	2'316.60	3'566.50	9	43.04	66.05	8.9
36	Slovenia	635.2	1'125.70	12.1	31.85	55.86	11.9
37	Spain	15'338.40	25'240.00	10.5	36.63	56.74	9.1
38	Sweden	6'890.70	8'085.50	3.2	76.82	87.84	2.7
39	Switzerland	4'696.80	5'739.30	4.1	64	76.1	3.5
40	TFYR Macedonia	386.8	847.9	17	19.07	41.54	16.8
41	Turkey	8'550.30	25'405.40	24.3	12.33	34.37	22.8
42	United Kingdom	36'291.80	46'683.90	5.2	60.82	76.24	4.6
	Europe		**353'946.00**	**10.2**	**36.72**	**57.8**	**9.7**

Note: For data comparability and coverage, see the technical notes.
Source: ITU World Telecommunication/ICT Indicators Database.

4. International Internet bandwidth

		International Internet bandwidth					
		Mbps		CAGR (%)	Bits/s per Internet user		CAGR (%)
		2003	2008	2003-2008	2003	2008	2003-2008
1	Albania	12	688	175.2	400	1'461	38.2
2	Andorra	188	1'380	49.0	18'708	23'340	4.5
3	Austria	45'000	168'700	39.1	13'484	30'369	22.5
4	Belgium	84'099	265'058	33.2	16'320	37'702	23.3
5	Bosnia and Herzegovina	34	2'200	130.2	227	1'683	49.3
6	Bulgaria	189	140'293	275.1	200	53'000	205.2
7	Croatia	395	14'992	148.2	390	8'900	118.6
8	Cyprus	245	1'370	53.8	997	4'209	43.4
9	Czech Republic	22'206	73'118	34.7	7'794	14'641	17.1
10	Denmark	118'559	188'455	12.3	31'020	42'534	8.2
11	Estonia	1'600	170'000	154.3	2'610	191'418	136.1
12	Finland	18'056	91'075	49.9	5'254	21'798	42.7
13	France	200'000	1'818'279	73.6	9'189	46'351	49.9
14	Germany	384'848	2'110'482	53.0	8'709	35'394	42.0
15	Greece	4'480	50'781	83.5	2'501	13'681	52.9
16	Hungary	10'000	60'000	43.1	4'565	10'216	17.5
17	Iceland	510	2'200	44.1	2'180	7'943	38.2
18	Ireland	20'139	66'491	34.8	16'384	26'775	13.1
19	Israel	2'497	14'379	54.9	1'975	4'310	21.5
20	Italy	119'794	611'655	50.3	7'249	26'940	38.8
21	Latvia	510	8'050	99.3	814	6'395	67.4
22	Liechtenstein	...	150	...	...	6'522	...
23	Lithuania	463	32'745	134.4	548	18'585	102.3
24	Luxembourg	1'469	3'500'000	373.6	6'139	9'043'063	330.2
25	Malta	310	3'110	58.6	2'466	15'644	44.7
26	Monaco	100	...	...	6'250	...	...
27	Montenegro	...	750	...	...	2'819	...
28	Netherlands	253'831	1'280'328	49.9	24'405	92'184	39.4
29	Norway	33'930	126'695	39.0	9'945	31'451	33.4
30	Poland	5'454	104'737	109.3	573	6'225	81.6
31	Portugal	8'543	50'819	56.2	3'196	12'053	39.4
32	Romania	2'478	196'000	139.7	1'276	31'962	90.4
33	San Marino	155	8'000	120.1	10'704	470'588	113.1
34	Serbia	...	33'122	...	...	10'037	...
35	Slovak Republic	9'931	33'000	27.1	4'287	9'253	16.6
36	Slovenia	2'510	13'561	52.5	3'951	12'658	33.8
37	Spain	81'413	494'030	57.0	5'308	21'559	42.0
38	Sweden	126'270	455'829	37.8	18'325	62'175	35.7
39	Switzerland	69'000	222'100	33.9	14'691	40'877	29.2
40	TFYR Macedonia	34	...	...	88	...	...
41	Turkey	2'200	206'504	148.0	257	8'128	99.5
42	United Kingdom	534'814	2'418'726	45.8	14'737	55'259	39.2
	Europe	**2'166'266**	**15'039'886**	**47.3**	**10'042**	**45'103**	**35.3**

Note: For data comparability and coverage, see the technical notes.
Source: ITU World Telecommunication/ICT Indicators Database.

5. Fixed broadband Internet subscribers

		Fixed broadband Internet subscribers			Fixed broadband Internet subscribers per 100 inhabitants		
		(000s)		CAGR (%)			CAGR %
		2003	2008	2003-2008	2003	2008	2003-2008
1	Albania	-	64	...	-	2	...
2	Andorra	3.6	20.7	41.8	4.9	24.5	*38.2*
3	Austria	589	1'729.00	24	7.2	20.7	*23.4*
4	Belgium	1'242.90	2'962.40	19	12.1	28	*18.3*
5	Bosnia and Herzegovina	1.5	188.5	162.9	-	5	*163.1*
6	Bulgaria	-	821.2	...	-	10.8	...
7	Croatia	3.4	524.7	174	0.1	11.9	*174.4*
8	Cyprus	10	135	68.2	1.2	15.7	*66.4*
9	Czech Republic	34.7	1'759.60	119.3	0.3	17.1	*118.7*
10	Denmark	718.3	2'021.40	23	13.3	37	*22.7*
11	Estonia	90.3	317.9	28.6	6.7	23.7	*28.8*
12	Finland	491.1	1'618.00	26.9	9.4	30.5	*26.5*
13	France	3'569.40	17'691.00	37.7	5.9	28.5	*36.9*
14	Germany	4'470.00	22'600.00	38.3	5.4	27.5	*38.3*
15	Greece	10.5	1'506.60	170.1	0.1	13.5	*169.6*
16	Hungary	264.3	1'750.00	45.9	2.6	17.5	*46.3*
17	Iceland	41.6	103.7	20.1	14.4	32.9	*17.9*
18	Ireland	41.8	891.2	84.4	1	20.1	*80.8*
19	Israel	633.1	1'684.00	21.6	9.8	23.9	*19.5*
20	Italy	2'250.00	11'283.00	38.1	3.9	18.9	*37.3*
21	Latvia	19.5	200	59.2	0.8	8.9	*60.1*
22	Liechtenstein	1.5	14	74.8	4.4	39.6	*73.1*
23	Lithuania	66.8	590.1	54.6	1.9	17.8	*55.8*
24	Luxembourg	15.4	143.2	56.3	3.4	29.8	*54.5*
25	Malta	22.7	98.8	34.2	5.7	24.2	*33.5*
26	Monaco	6.5	12.3	17.1	20.2	37.7	*16.9*
27	Montenegro	...	*25.8*	...	...	*4.2*	...
28	Netherlands	1'988.00	5'807.00	23.9	12.3	35.1	*23.4*
29	Norway	398.8	1'586.00	31.8	8.7	33.3	*30.7*
30	Poland	195.8	4'790.90	89.6	0.5	12.6	*89.7*
31	Portugal	502	1'634.40	26.6	4.8	15.3	*26*
32	Romania	196.1	2'510.00	66.5	0.9	11.8	*67.2*
33	San Marino	0.6	4.9	52.2	2.1	15.7	*50*
34	Serbia	...	451.2	...	...	4.6	...
35	Slovak Republic	22.5	604.7	93.2	0.4	11.2	*93.1*
36	Slovenia	58	426.6	49.1	2.9	21.2	*48.7*
37	Spain	2'121.90	8'995.40	33.5	5.1	20.2	*31.9*
38	Sweden	1'095.00	2'905.00	21.5	12.2	31.6	*20.9*
39	Switzerland	783.9	2'575.40	26.9	10.7	34.2	*26.2*
40	TFYR Macedonia	-	181	...	-	8.9	...
41	Turkey	199.3	5'749.90	95.9	0.3	7.8	*93.4*
42	United Kingdom	3'113.70	17'276.00	40.9	5.2	28.2	*40.1*
	Europe	**25'273.50**	**126'254.70**	**37.8**	**4.3**	**20.6**	**37.2**

Note: For data comparability and coverage, see the technical notes. Figures *in italics* are estimates.
Source: ITU World Telecommunication/ICT Indicators Database.

Technical Notes

General methodology

The compound annual growth rate (CAGR) is computed by the formula:

$[(P_v / P_0)^{(1/n)}]-1$

where P_v = Present value
P_0 = Beginning value
n = Number of periods

The result is multiplied by 100 to obtain a percentage.

Regional aggregates are either *totals* or weighted *averages* depending on the indicator. For example, for main (fixed) telephone lines, the total number of *main (fixed) telephone lines* is shown, while for *main (fixed) lines per 100 inhabitants* the weighted average is shown. Growth rates generally refer to countries for which data are available for both years.

1. Main (fixed) telephone lines

Main (fixed) telephone lines refer to telephone lines connecting a customer's equipment (e.g., telephone set, facsimile machine) to the Public Switched Telephone Network (PSTN) and which have a dedicated port on a telephone exchange. Note that for most countries, main (fixed) lines also include public payphones. Many countries also include ISDN channels in main (fixed) lines (see below ISDN and ADSL). *Main (fixed) telephone lines* per 100 inhabitants is calculated by dividing the number of main (fixed) lines by the population and multiplying by 100.

2. Mobile cellular subscriptions

Mobile cellular subscriptions refers to users of portable telephones subscribing to an automatic public mobile telephone service using cellular technology that provides access to the PSTN. *Per 100* inhabitants is obtained by dividing the number of mobile cellular subscriptions by the population and multiplying by 100. *Prepaid subscriptions refers* to the percentage of mobile cellular subscriptions using prepaid cards. *Population coverage* measures the percentage of inhabitants that are within range of a mobile cellular signal whether or not they are subscribers. This is calculated by dividing the number of inhabitants within range of a mobile cellular signal by the total population and multiplying by 100. *Mobile broadband subscriptions refers* to the number of subscriptions to mobile cellular networks with access to data communications (e.g. the Internet) at broadband speeds (greater than or equal to 256 kbit/s in one or both directions) such as WCDMA, HSDPA, CDMA2000 1xEV-DO, CDMA 2000 1xEV-DV etc. *Per 100 inhabitants* is obtained by dividing the number of mobile broadband subscriptions by the population and multiplying by 100

3. Internet users

Internet users is based on nationally reported data. In some cases, surveys have been carried out that give a more precise figure for the number of Internet users. However, surveys differ across countries in the age and frequency of use they cover. The reported figure for Internet users – which may refer to only users above a certain age – is divided by the total population and multiplied by 100 to obtain *Internet users per 100 inhabitants*. Countries that do not have surveys generally base their estimates on derivations from reported Internet Service Provider subscriber counts, calculated by multiplying the number of subscribers by a multiplier.

4. International Internet bandwidth

International Internet bandwidth refers to the amount of international Internet bandwidth measured in Mega Bits Per Second (Mbps). Data for Internet bandwidth originate from ITU's annual questionnaire supplemented with data from TeleGeography. *Bits/s per Internet* user is calculated by dividing the international Internet bandwidth (in bits/s) by the number of Internet users.

5. Fixed broadband Internet subscribers

Fixed broadband Internet subscribers refers to subscribers who pay for high-speed access to the public Internet (a TCP/IP connection) at speeds equal to, or greater than, 256 kbps in one or both directions. It includes the sum of DSL, cable modem and other fixed broadband subscribers. *Fixed broadband Internet subscribers per 100 inhabitants* is calculated by dividing the number of fixed broadband Internet subscribers by the population of the country and by multiplying by 100.

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