Connectivity
Broadband market developments in the EU

Europe's Digital Progress
Report 2017

The Digital Economy and Society Index (DESI) is a composite index that summarises relevant indicators on Europe's digital performance and tracks the progress of EU Member States in digital competitiveness.

Denmark, Finland, Sweden and the Netherlands have the most advanced digital economies in the EU followed by Luxembourg, Belgium, the UK and Ireland.

Whereas, Romania, Bulgaria, Greece and Italy have the lowest scores on the index.

The five dimensions of the DESI

1 Connectivity	Fixed Broadband, Mobile Broadband, Broadband speed and prices
2 Human Capital	Basic Skills and Internet Use, Advanced skills and Development
3 Use of Internet	Citizens' use of Content, Communication and Online Transactions
4 Integration of Digital Technology	Business digitisation and eCommerce
5 Digital Public Services	eGovernment

Digital Economy and Society Index (DESI) 2017 ranking

European Commission
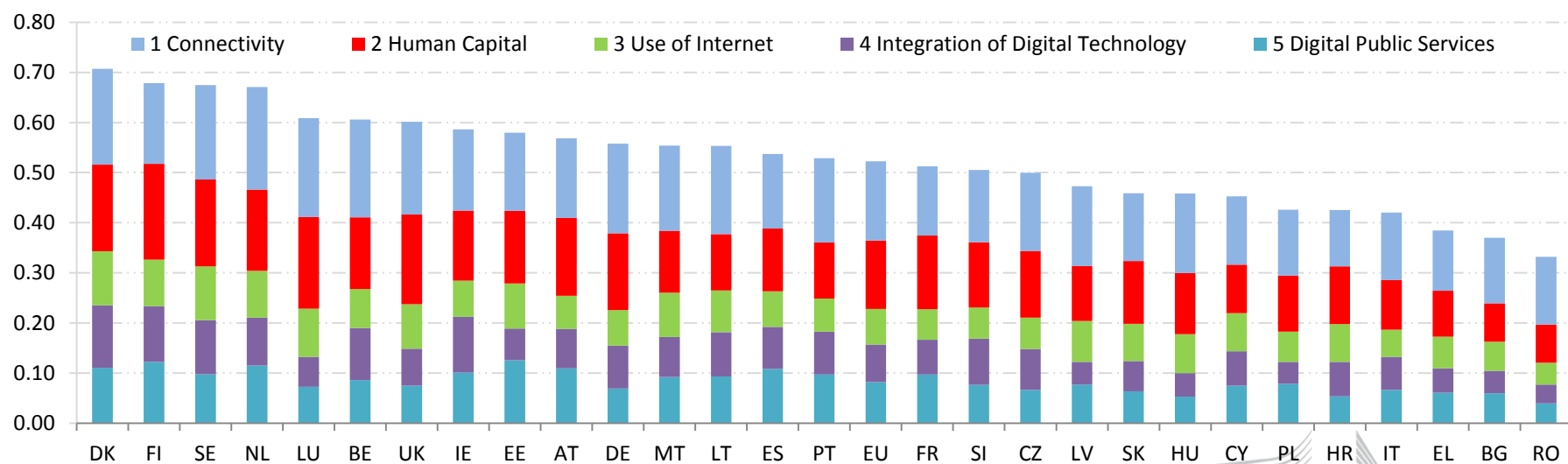
As for **Connectivity**, the highest score was registered by the Netherlands followed by Luxembourg and Belgium. Croatia, Bulgaria and Poland had the weakest performance in this dimension of the DESI.

The Connectivity score looks at both the demand and the supply side of fixed and mobile broadband. Under fixed broadband it assesses the availability as well as the take-up of basic and high-speed next-generation access (NGA) broadband and also considers the affordability of retail offers. On mobile broadband, the availability of 4G, radio spectrum and the take-up of mobile broadband are included.

A comparative assessment of fixed broadband across countries shows Luxembourg, Netherlands and the UK as the strongest performers. In contrast, Poland, Romania, Slovakia and Latvia are shown to be among the weakest performers. NGA subscriptions are particularly advanced in Belgium, Romania, the Netherlands and Portugal.

As for mobile broadband, the Nordic countries (Finland, Sweden and Denmark) lead Europe along with Estonia and Poland, while the lowest scores were registered by Bulgaria, Malta and Croatia.

Connectivity Indicators in DESI 2017	EU
1a1 Fixed Broadband Coverage	**98%**
% households	2016
1a2 Fixed Broadband Take-up	**74%**
% households	2016
1b1 Mobile Broadband Take-up	**84**
Subscriptions per 100 people	June 2016
1b2 4G coverage	**84%**
% households (average of operators)	2016
1b3 Spectrum	**68%**
% of the target	2016
1c1 NGA Coverage	**76%**
% households	2016
1c2 Subscriptions to Fast Broadband	**37%**
% subscriptions >= 30Mbps	June 2016
1d1 Fixed Broadband Price	**1.2%**
% income	price 2016, income 2015

Digital Economy and Society Index (DESI) 2017, Connectivity

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European Commission
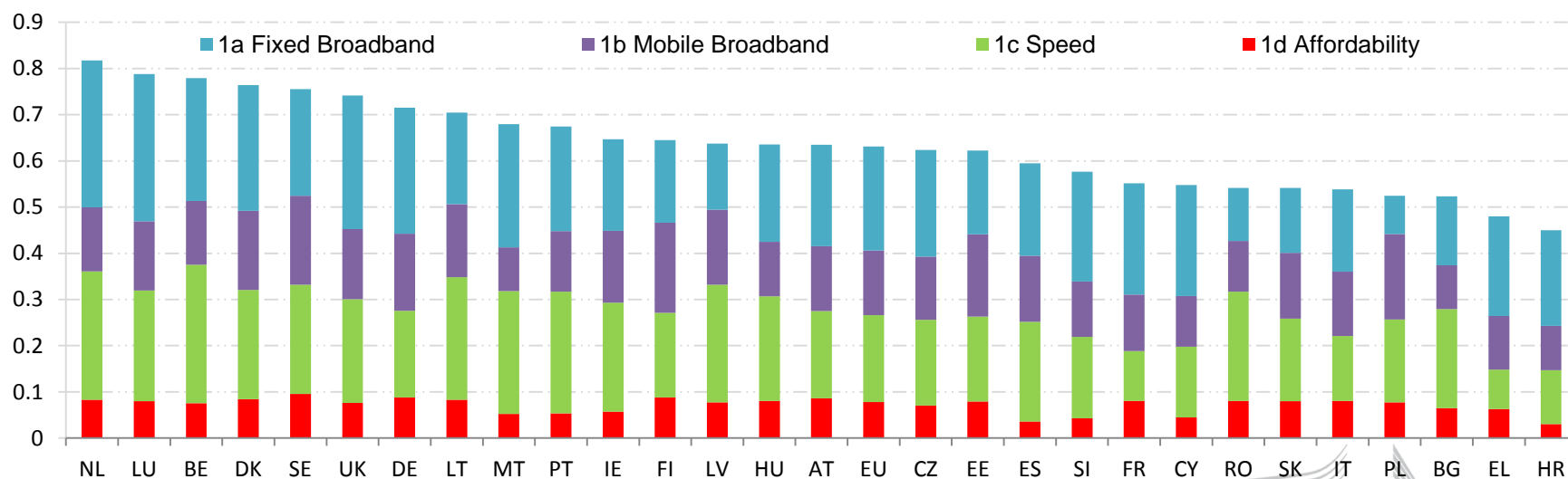
Total telecom services revenues have declined by 6 % in Europe since 2013. **Mobile and fixed voice revenues** have decreased by 23 % since 2013. An increase in **mobile data and internet services** was not enough to offset the major decline in voice services.

Telecom operators in Europe generated less revenue than the US operators. Revenues went down from EUR 233 bn in 2013 to EUR 220 bn in 2016 in Europe. At the same time, the US revenues also slightly declined from EUR 308 bn to EUR 295 bn, which is higher than Europe despite its smaller population.

Note: this analysis is based on detailed figures from 26 Member States, which covered about 98% of the total EU market (total telecom carrier services).

Total Telecommunication revenues per region, billion €, 2013-2017

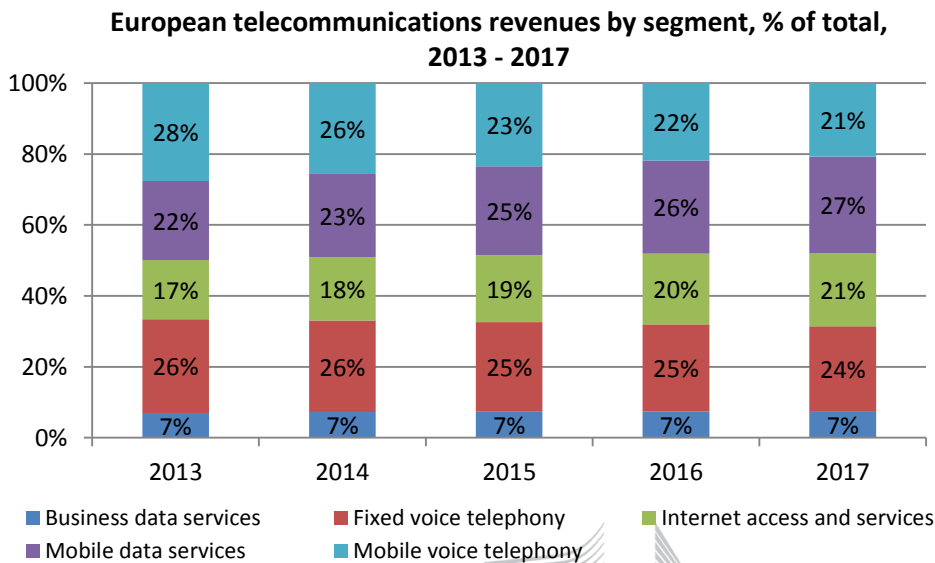Legend: EU26 — JAPAN — CHINA — US — Brazil
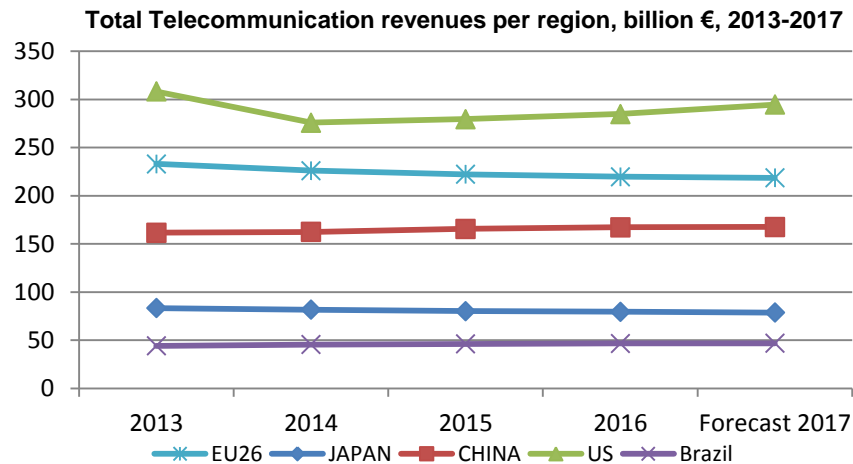
Analysis of telecommunications revenues (carrier services) by segment shows a decline in voice services (both fixed and mobile) revenues. Fixed voice services have fallen by 15.3 % since 2013, compared to 29.9 % for mobile services over the same period. Together, fixed and mobile voice services will represent 48 % of total telecom revenues in 2017, compared with 54 % in 2013.

Mobile data services will represent 27% of total revenues, up from 22 % in 2013. The growth in mobile data services could not, however, compensate for the major decline in voice services.

Note: this analysis is based on figures from 7 Member States, Belgium, France, Germany, Italy, Spain, Greece, Spain and the UK, which covered about 70% of the total EU market (total telecom carrier services).

Source: 2016 EITO in collaboration with IDC.

European telecommunications revenues by segment, % of total, 2013 - 2017

Segment	2013	2014	2015	2016	2017
Mobile voice telephony	28%	26%	23%	22%	21%
Mobile data services	22%	23%	25%	26%	27%
Internet access and services	17%	18%	19%	20%	21%
Fixed voice telephony	26%	26%	25%	25%	24%
Business data services	7%	7%	7%	7%	7%

Legend: Business data services — Fixed voice telephony — Internet access and services — Mobile data services — Mobile voice telephony

In 2016, M&A activity among European telco operators decreased, especially when it comes to in-market consolidation. In-market consolidation of large networks continued to raise competition concerns, unlike the combination of large mobile and fixed networks.

Large* telco mergers and acquisitions 2014-2016, value and number of deals announced

Legend:
- Horizontal
- Other (or mixed)
- Convergence
- Number of deals announced
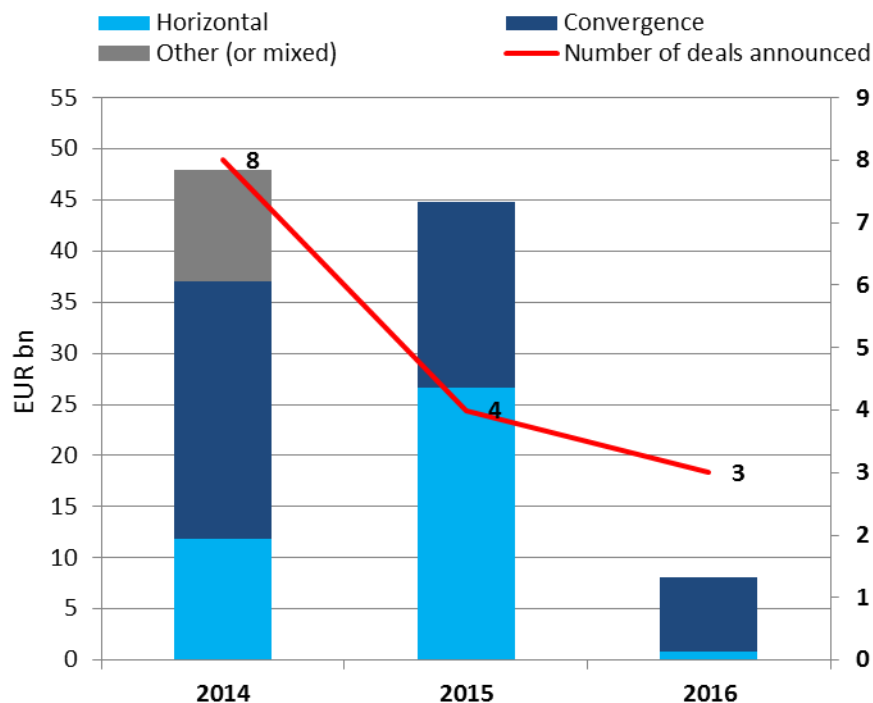
Source: EC, based on company statements and press reports*

*Mergers valued at EUR 500 million or higher

**In the case of Joint Ventures (JV) the reported Enterprise Value (EV) of one of the merging parties (with the higher EV) was used as a proxy. When not reported, the EV was estimated.

Unlike in 2014 and 2015, no large-scale mergers were agreed in 2016 which would have led to the integration of large networks in the same market. Whilst Orange and Bouygues were in talks for an acquisition of Bouygues, no agreement has been reached.

The largest telco merger announced in 2016 was the merging of Vodafone`s and Liberty Global`s Dutch operations, creating a converged fixed-mobile player. In Spain, Masmovil, a fixed and virtual mobile operator, acquired the smallest mobile network, Yoigo. With this acquisition it becomes the fourth fixed-mobile player in a market characterised by a high level of fixed-mobile convergence. In Italy, Enel Open Fibre acquired joint control over Metroweb - both provide wholesale broadband access services through fiber networks.

The European Commission continued to identify competition concerns stemming from the combination of large networks in the same markets (prohibition of Hutchison`s proposed acquisition of O2 in the UK and approval of Hutchison/VimpelCom JV in Italy conditional on the divestment of sufficient assets that will allow a new operator to enter the market).

However, no competition concerns were raised due specifically to the combination of fixed and mobile networks, even if these were large networks (e.g. Liberty Global/Base in Belgium).

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Broadband coverage: Basic broadband is available to everyone in the EU, while **fixed technologies** cover 98 % of homes. **Next generation access (NGA)** covers 76 %, up from 71 % six months ago. Deployment of **4G** mobile continued to increase sharply. Rural coverage improved substantially in 4G and NGA.

Basic broadband is available to all in the EU, when considering all major technologies (xDSL, cable, fibre to the premises - FTTP, WiMax, HSPA, LTE and Satellite). Fixed and fixed-wireless technologies cover 98 % of EU homes.

NGA technologies (VDSL, Cable Docsis 3.0 and FTTP) capable of delivering at least 30 Mbps download are available to 76 %.

4G mobile (LTE) coverage increased by seven percentage points and reached 96 % (of homes with covered by at least one operator).

Rural 4G coverage went up from 36 % in 2015 to 80 % in 2016. NGA is available in 40 % of rural homes, compared with 30% a year ago.
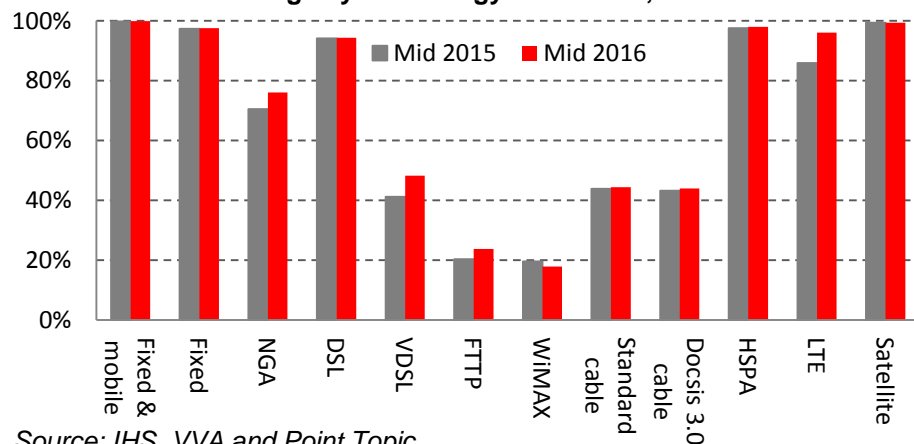
Our Target (Digital Agenda for Europe)

Basic broadband for all by 2013: 100 % in 2016
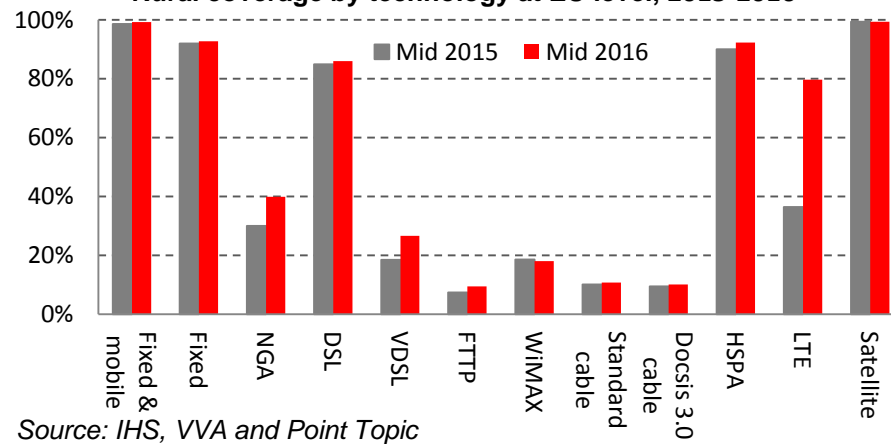**Fast broadband (>30Mbps) for all by 2020: 76 % in 2016**

Total coverage by technology at EU level, 2015-2016

Source: IHS, VVA and Point Topic


Rural coverage by technology at EU level, 2015-2016

Source: IHS, VVA and Point Topic

European Commission

Coverage of fixed broadband increased slightly to 98 %. In about half of the Member States more than 99 % of homes are covered. At the same time, Poland, Slovakia and Romania are lagging behind with less than 90 %.
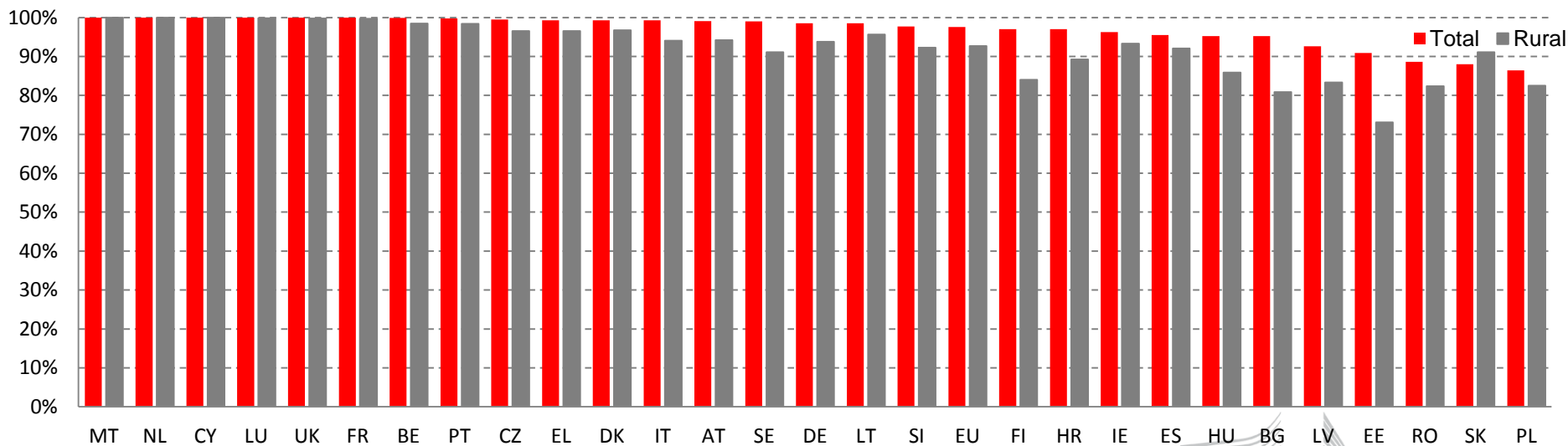
Primary internet access at home is provided mainly by fixed technologies. Among these technologies, xDSL has the largest footprint (94 %) followed by cable (44 %) and WiMAX (18 %). Fixed coverage is the highest in the Member States with well-developed DSL infrastructures, and is over 90% in all but three Member States.

Overall coverage of fixed broadband has only marginally increased since 2011, but rural coverage improved by 13 percentage points. Developments have slowed down, as Member States have diverted their focus to NGA and wireless technologies.

Fixed broadband coverage in the EU, 2011-2016

Source: IHS, VVA and Point Topic
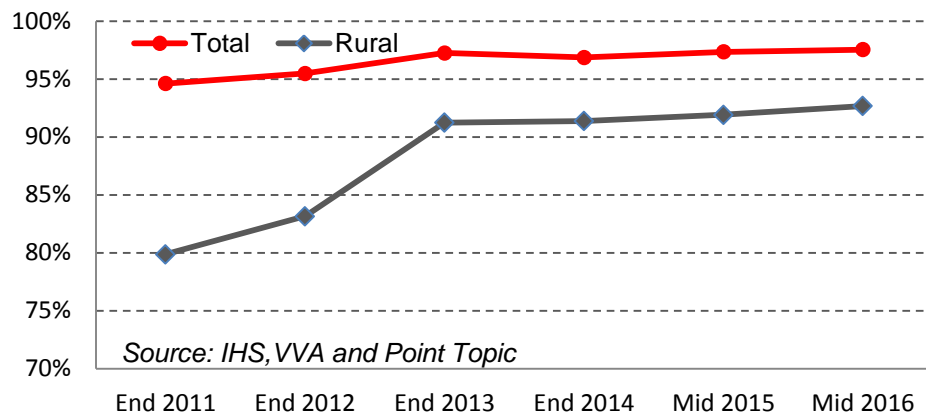
Fixed broadband coverage, June 2016

Source: IHS and Point Topic

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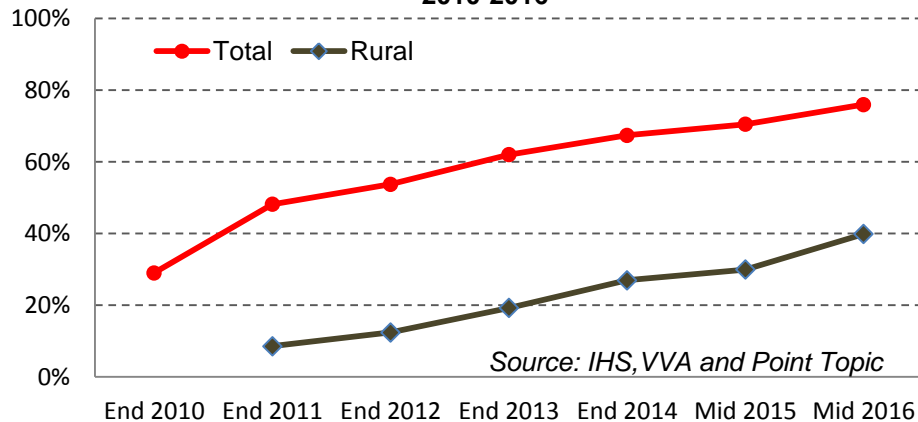
Coverage of next generation access (NGA) technologies continued to increase and reached 76 %. NGA is getting more widespread in rural areas, covering 40% of homes.
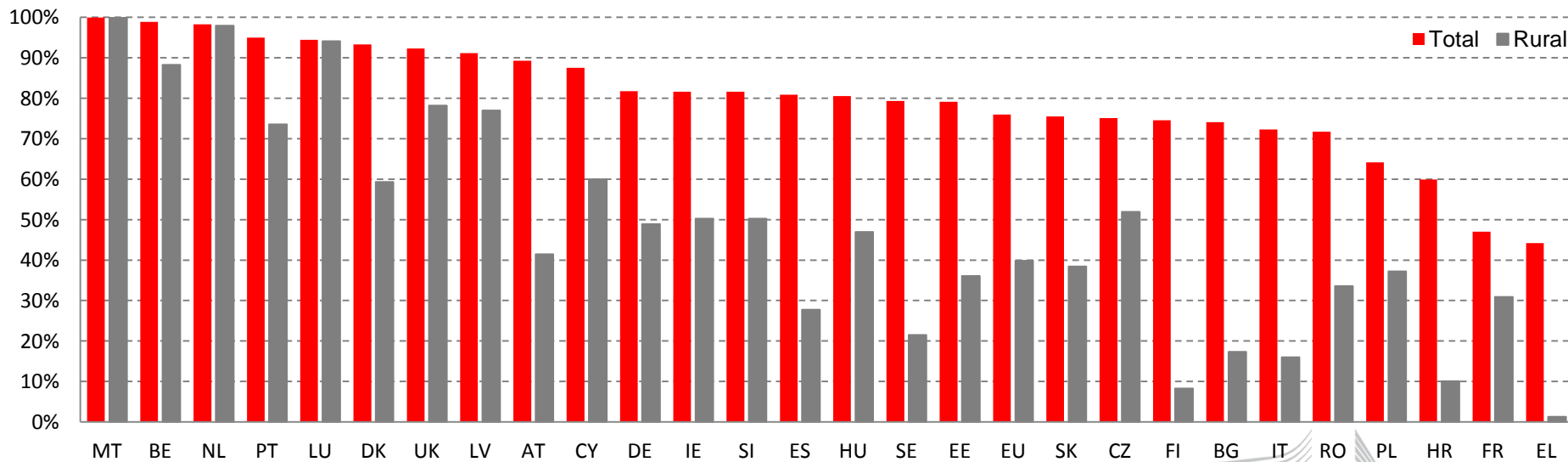
For the purpose of this report, Next Generation Access includes VDSL, Cable Docsis 3.0 and FTTP. At mid-2016, VDSL had the largest NGA coverage at 48 %, followed by Cable (44 %) and FTTP (24 %). Most of the upgrades in European cable networks had taken place by 2011, while VDSL coverage is now 2.5 times larger than four years ago. VDSL increased most in Italy last year, growing from 41% to 72%. There was a remarkable progress also in FTTP (from 10 % in 2011 to 24 % in 2016), but FTTP coverage is still low.

Rural NGA coverage went up by 10 percentage points, reaching 40 % of homes. NGA in rural areas is provided mainly by VDSL.

Next Generation Access (NGA) broadband coverage in the EU, 2010-2016

Source: IHS,VVA and Point Topic

Next Generation Access (FTTP, VDSL and Docsis 3.0 cable) coverage, June 2016

Source: IHS and Point Topic   *Data not available for Lithuania*

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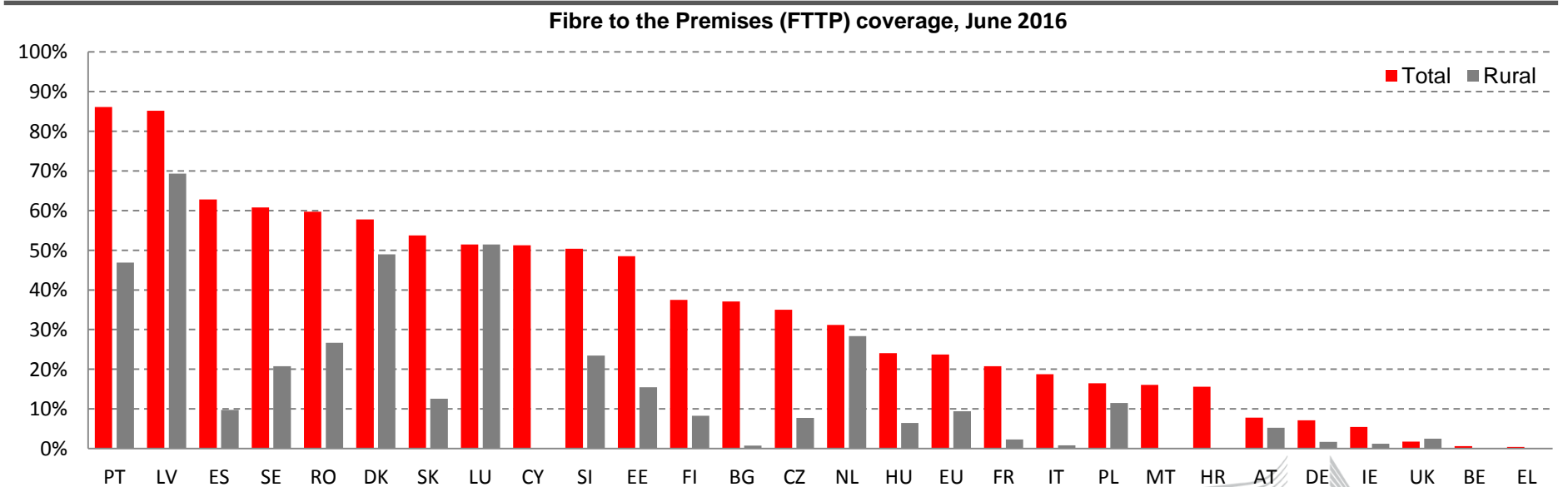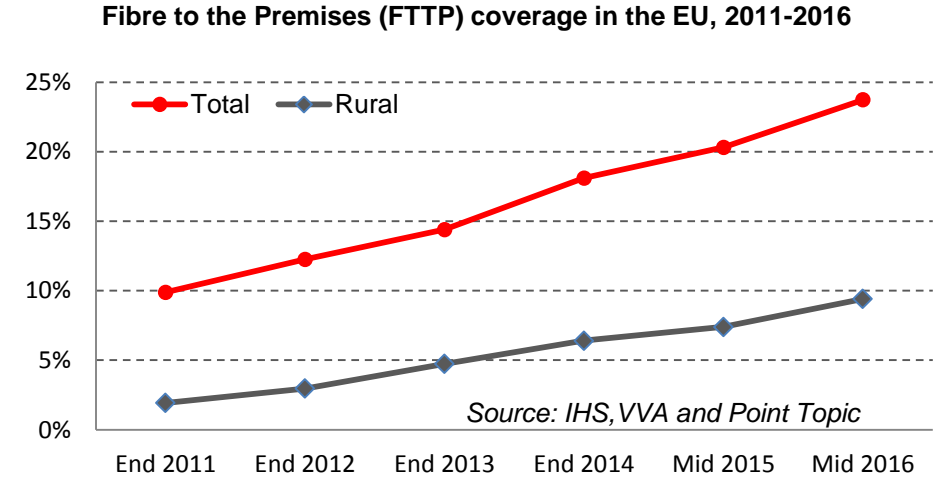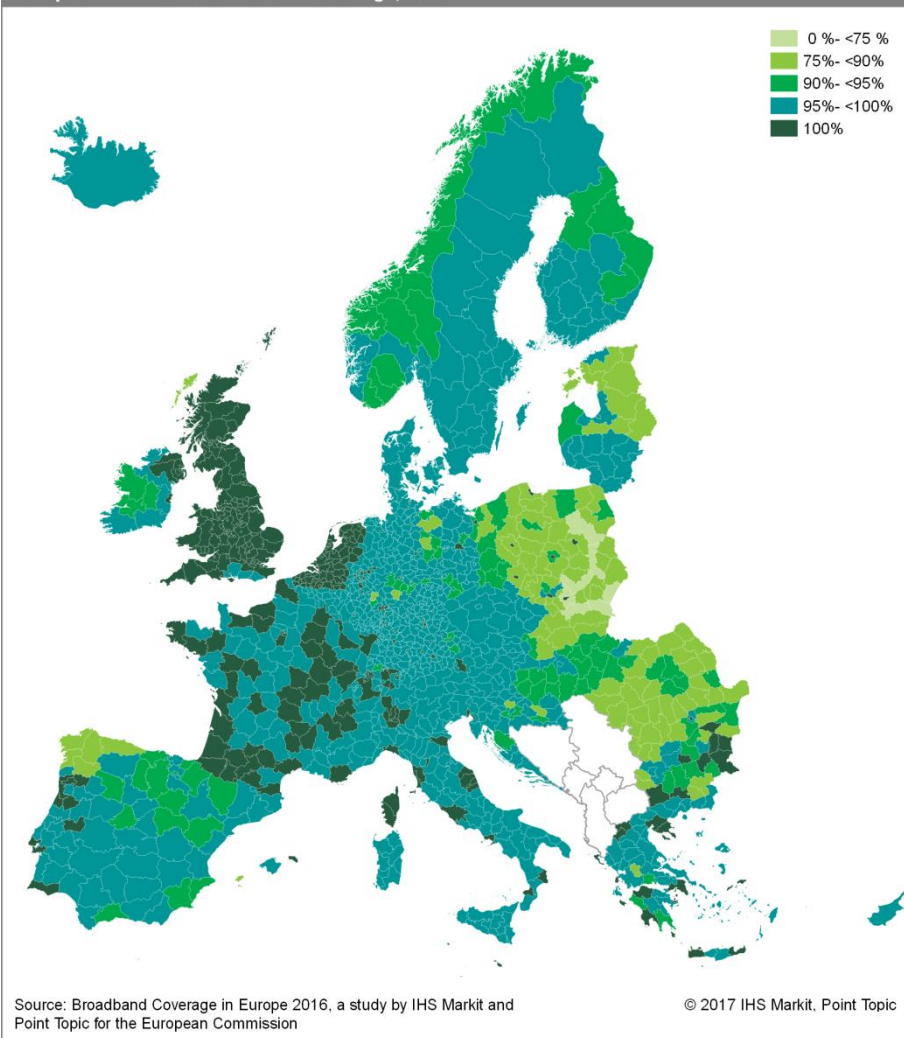
Coverage of fibre to the premises (FTTP) grew from 10 % in 2011 to 24 % in 2016, while it remains a primarily urban technology. Portugal and Latvia are the leaders in FTTP in Europe.

FTTP is catching up in Europe, as coverage for homes more than doubled since 2011. However, the FTTP footprint is still significantly lower than that of cable Docsis 3.0 and VDSL. In Portugal and Latvia more than 80 % of homes can already subscribe to FTTP services, while in Greece, Belgium, UK, Ireland, Germany and Austria less than 10 % can do so. FTTP increased the most in the Czech Republic last year (from 17 % to 35 %). FTTP services are available mainly in urban areas with the exception of Latvia, Denmark, Luxembourg, Romania and Netherlands, where more than 25 % of rural homes also have access to it.

Fibre to the Premises (FTTP) coverage in the EU, 2011-2016

Source: IHS,VVA and Point Topic

Fibre to the Premises (FTTP) coverage, June 2016

Source: IHS and Point Topic   Data not available for Lithuania
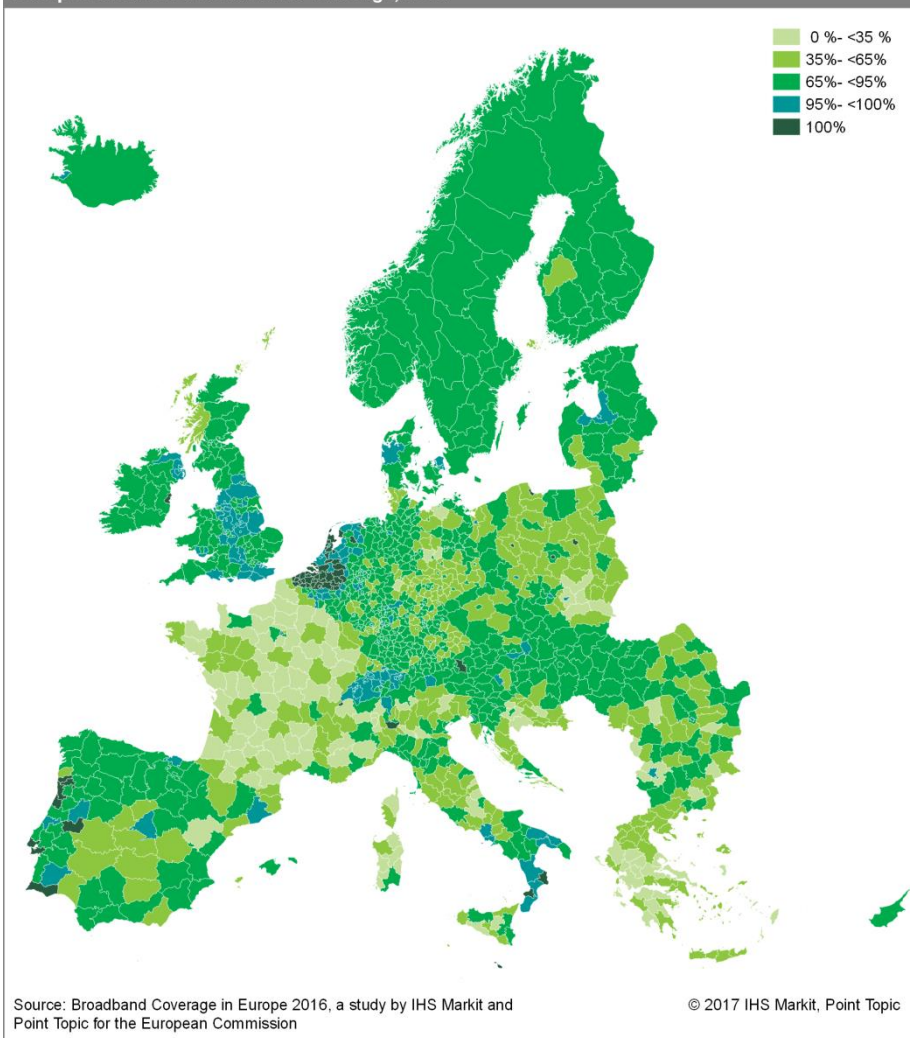
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Overall fixed broadband and NGA broadband coverage by region.

Europe: Overall fixed broadband coverage, 2016

	0 %- <75 %
	75%- <90%
	90%- <95%
	95%- <100%
	100%

Source: Broadband Coverage in Europe 2016, a study by IHS Markit and Point Topic for the European Commission

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Europe: Overall NGA broadband coverage, 2016

	0 %- <35 %
	35%- <65%
	65%- <95%
	95%- <100%
	100%

Source: Broadband Coverage in Europe 2016, a study by IHS Markit and Point Topic for the European Commission
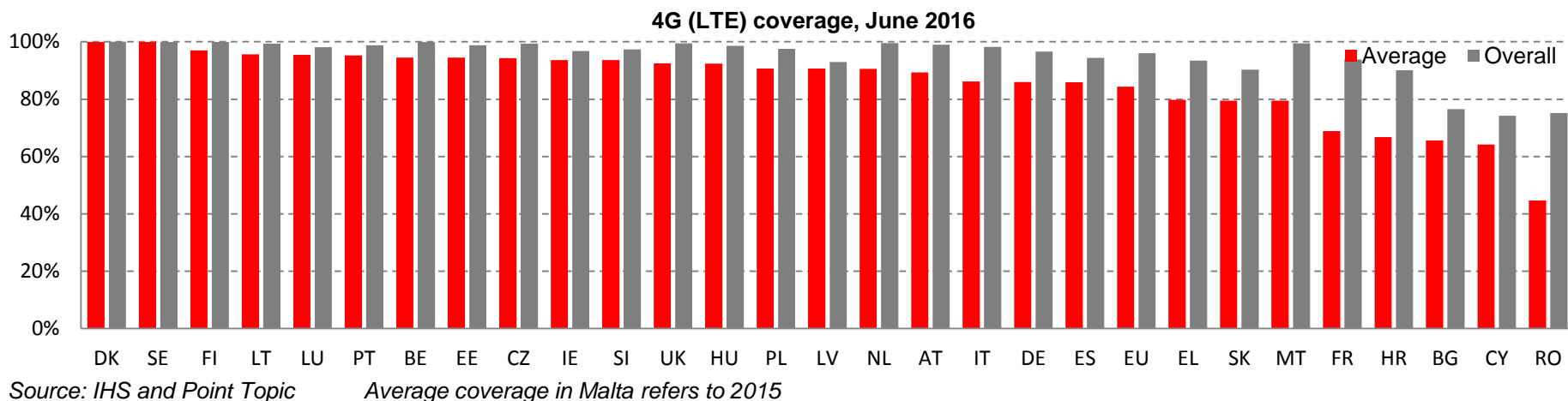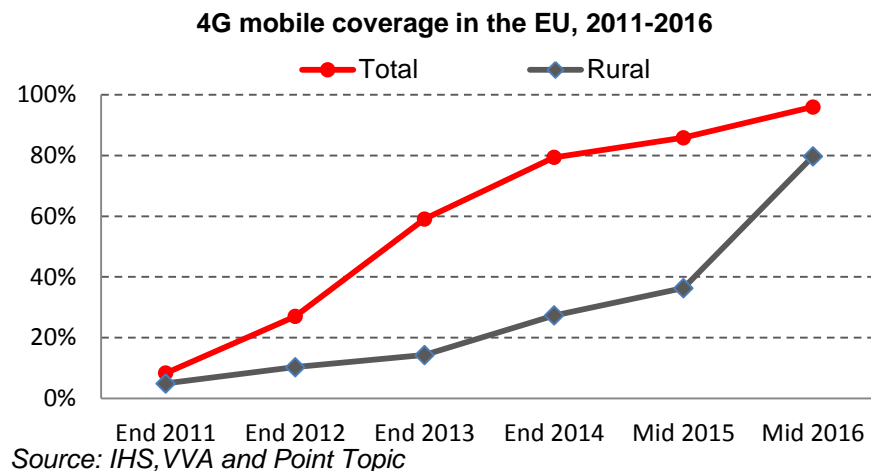
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4G mobile coverage: 96% of homes are covered by at least one operator in Europe (overall coverage), up from 86% a year ago. Rural coverage went up from 36% in 2015 to 80% in 2016. Average 4G availability* stands at 84%.

In 2016, deployment of 4G (LTE) continued and focused mainly on rural areas: overall coverage went up to 96 % of homes. In rural areas, already 80% of homes are covered by at least one operator.

Average 4G availability (calculated as the average of each operator's coverage) falls somewhat below the overall coverage and stands at 84%.

Average 4G coverage is above 90% in about half of the Member States, and is the lowest in Romania at 45%

4G mobile coverage in the EU, 2011-2016

Source: IHS,VVA and Point Topic

4G (LTE) coverage, June 2016

Source: IHS and Point Topic   Average coverage in Malta refers to 2015
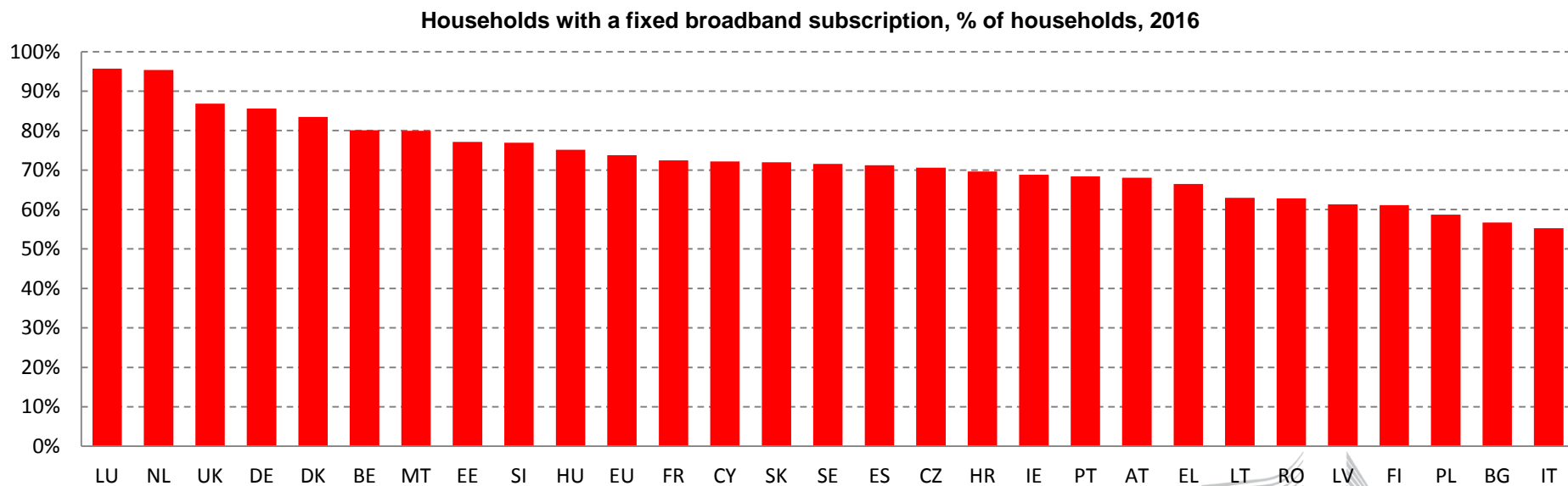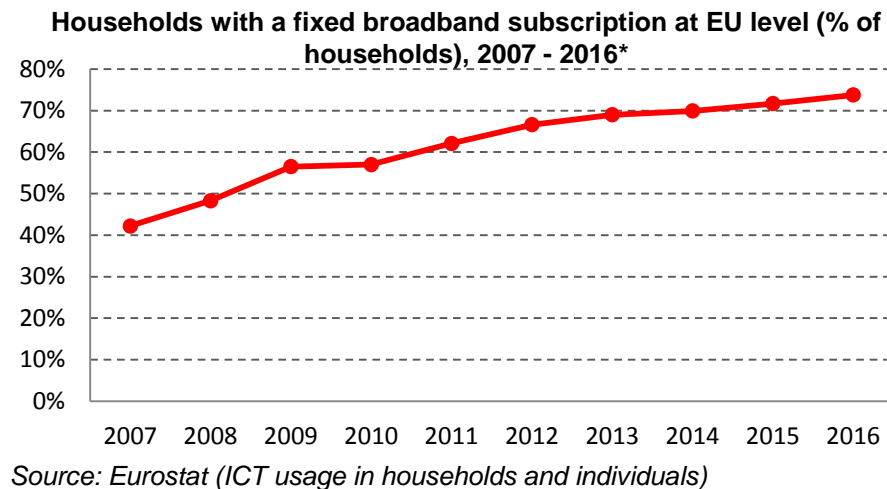
* This is a new indicator measuring the average of mobile telecom operator's coverage within each country. A different indicator was used to measure 4G coverage in previous versions of the Digital Scoreboard. The old 4G indicator measured the overall coverage of operators, and it showed higher figures than the new indicator.

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74 % of EU homes had a fixed broadband subscription in 2016. Luxembourg, the Netherlands and the UK registered the highest figures in the EU, while Italy, Bulgaria and Poland had the lowest take-up rates.

Although fixed broadband is available to 98 % of EU homes, 26 % of homes do not have a subscription. Growth in take-up was very strong until 2009, but then slowed down in the last few years, partially due to fixed-mobile substitution.

At Member State level, take-up rates ranged from only 55 % in Italy to 96 % in Luxembourg.

* Note: Penetration figures include also mobile subscriptions until 2009.

Households with a fixed broadband subscription at EU level (% of households), 2007 - 2016*

Source: Eurostat (ICT usage in households and individuals)

Households with a fixed broadband subscription, % of households, 2016

Source: Eurostat (Eurostat (ICT usage in households and individuals)

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European Commission

66 % of rural homes had a fixed broadband subscription across the EU in 2016. Luxembourg, the Netherlands, the UK and Germany registered the highest figures, while in four Member States, less than half of the homes subscribed.

There is a substantial gap between rural and national penetration rates, although the gap has closed over the last six years, from 11 percentage points in 2010 to 7 percentage points in 2016.

In Luxembourg, Netherlands, Germany, Belgium, Denmark, Austria, Croatia and Slovenia, rural and national penetration rates are almost identical. However, in Portugal, Bulgaria, Greece and Romania, where rural take-up is among the lowest in Europe, there are significant gaps of 15-17 percentage points compared to the national take-up.

Households having a fixed broadband connection per area at EU level (% of households), 2010 - 2016
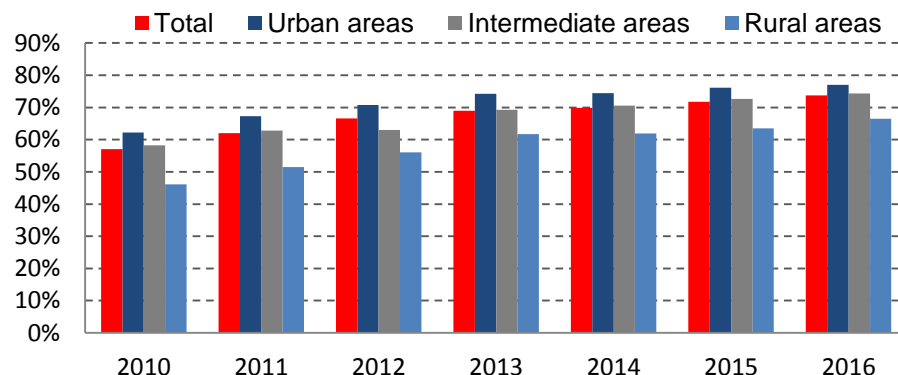
Source: Eurostat (ICT usage by households and individuals)

**Household fixed broadband penetration rural/total (% of households), 2016**

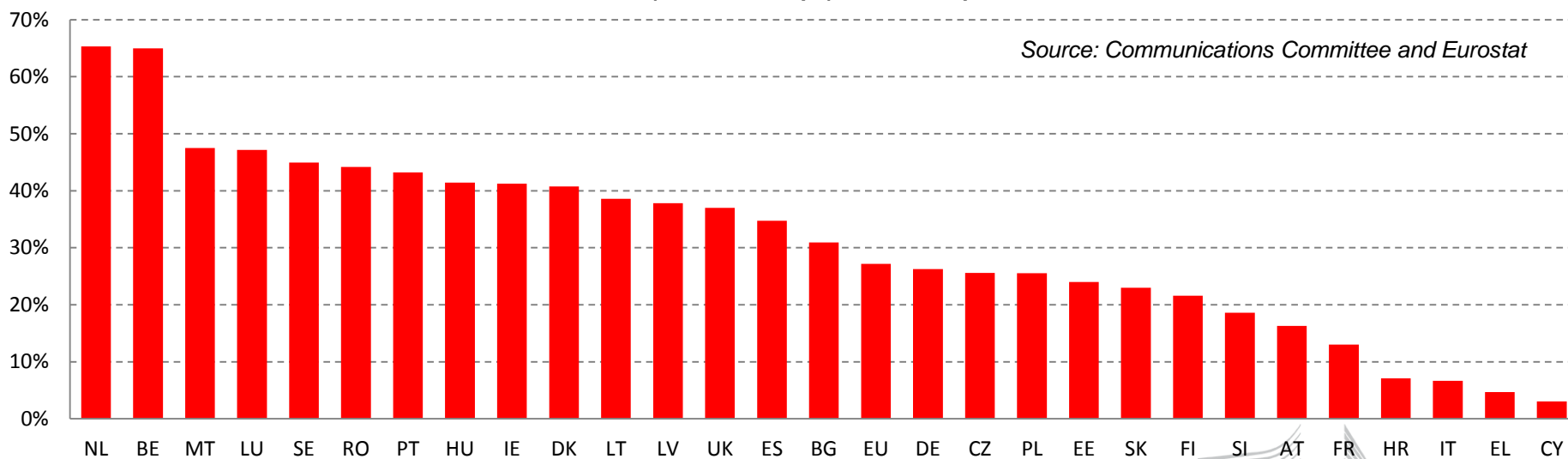*Source: Eurostat (ICT usage by households and individuals)*

European Commission
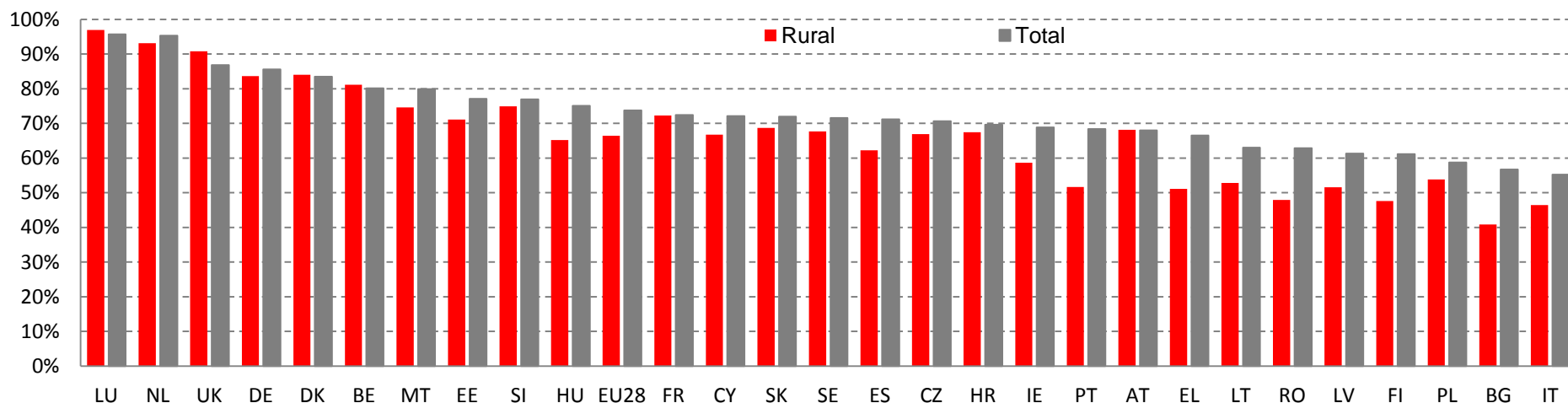
27 % of European homes subscribe to fast broadband access of at least 30 Mbps. There has been a significant increase since 2010. Belgium and the Netherlands are the leaders in Europe in fast broadband take-up.

There has been a sharp upward trend in the take-up of fast broadband in the EU since 2010, triggered also by continuous deployment of infrastructure. Most cable subscriptions were migrated to high-speed plans, and high-speed VDSL and fibre services are also catching up. In Belgium and the Netherlands two thirds of homes already subscribe to fast broadband, while in Croatia, Greece, Italy and Cyprus, high-speed services still remain marginal.

Households with a fast broadband (at least 30Mbps) subscription, 2010 - 2016

Source: Communications Committee and Eurostat
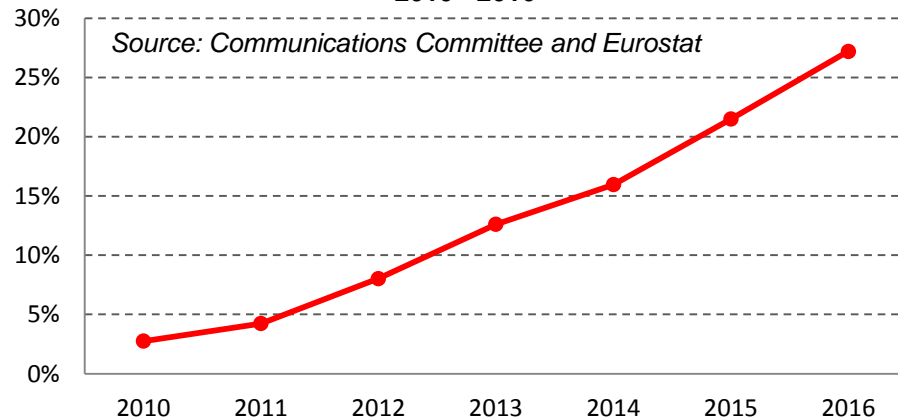
Fast broadband (at least 30Mbps) household penetration, 2016
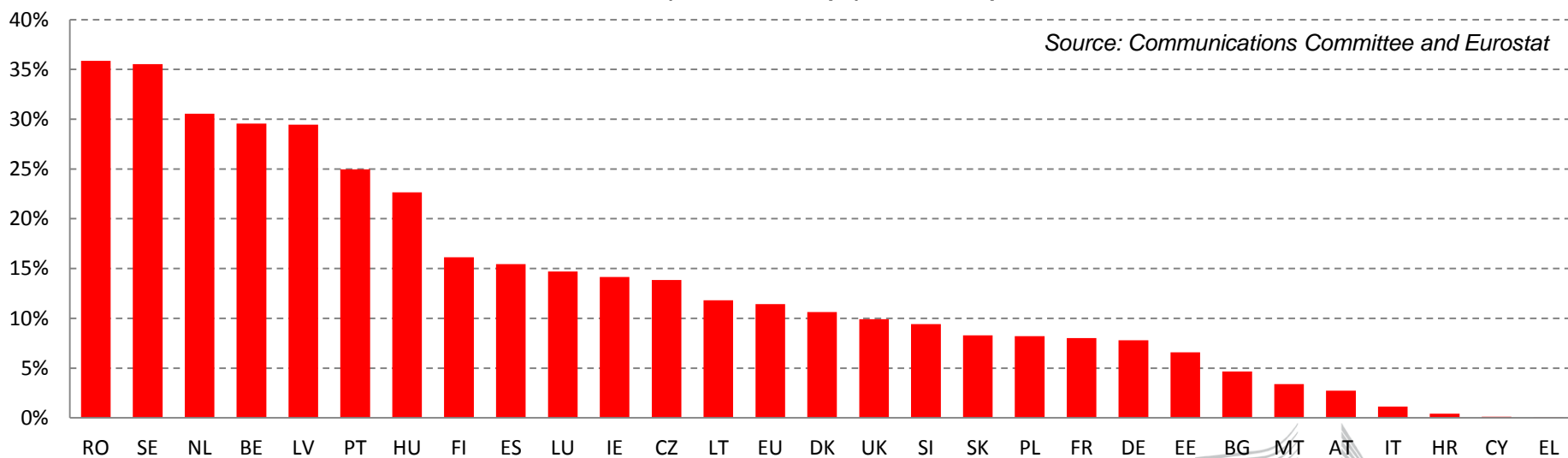
Source: Communications Committee and Eurostat

11 % of European homes currently subscribe to ultrafast broadband (at least 100 Mbps), a marked improvement from 0.3 % six years ago. Romania, Sweden, the Netherlands and Latvia are the most advanced in ultrafast broadband adoption.

The Digital Agenda for Europe set the objective that at least 50 % of homes should subscribe to ultrafast broadband by 2020. In June 2016, 49 % of homes were covered by networks capable of providing 100 Mbps. As service offerings are emerging, take-up is growing sharply. The penetration is the highest in Romania and Sweden with over one third of homes subscribing to at least 100 Mbps. In Greece, Italy and Croatia take-up is low primarily due to the lack of superfast infrastructure. However, there may also be other factors involved as in Cyprus, where the infrastructure is available for many homes, take-up also continues to be slow.

Households with an ultrafast broadband (at least 100Mbps) subscription, 2010 - 2016

Source: Communications Committee and Eurostat

Ultrafast broadband (at least 100Mbps) household penetration, 2016

Source: Communications Committee and Eurostat

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European Commission

At EU level, 92 % of companies have a fixed broadband subscription. However, only 32 % benefit from fast broadband (at least 30Mbps). While almost all large companies use broadband, 8 % of small enterprises are not yet connected.

While the vast majority of European businesses use broadband, only one third of companies and 27 % of private homes subscribed to fast broadband in 2016. The penetration of fast broadband varies greatly between companies of different size. While 62 % of large companies benefit from broadband speed of at least 30 Mbps, only 29% of small enterprises do so. Nevertheless, the penetration of fast broadband went up from 24 % to 32 % among all enterprises during the last two years.

**Enterprises having a fixed broadband connection at EU level, 2014-2016**
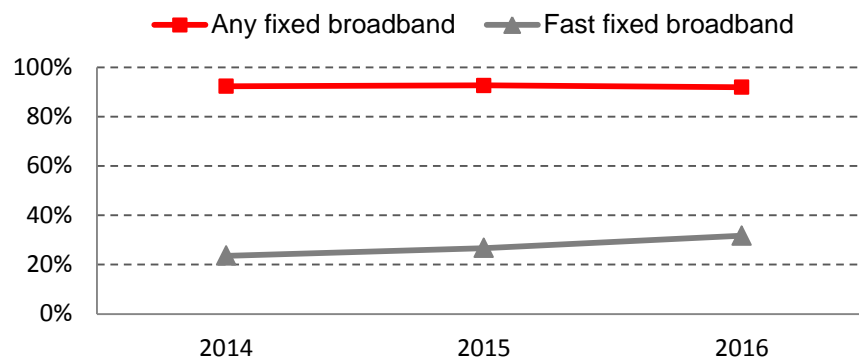
Source: Eurostat (ICT usage and eCommerce in enterprises)

Percentage of enterprises having any fixed broadband connection, by Enterprise size at EU level, 2014 - 2016
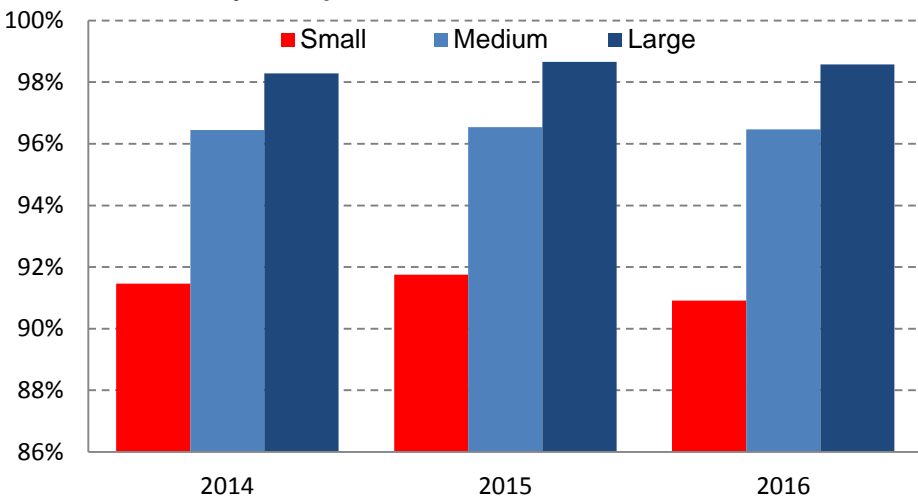
Source: Eurostat (ICT usage and eCommerce in enterprises)

Percentage of enterprises having a fast fixed broadband connection, by Enterprise size at EU level, 2014-2016

*Source: Eurostat (ICT usage and eCommerce in enterprises)*

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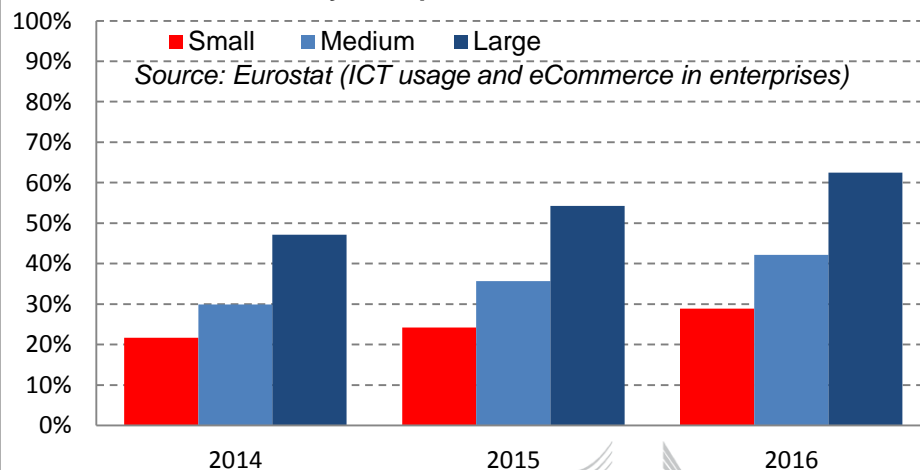
67 % of subscriptions are xDSL, although xDSL is slightly losing market share. Cable is second with 19 % of the market. Fibre to the Home/Building is emerging.

Although DSL is still the most widely used fixed broadband technology, its market share declined from 80 % in 2009 to 67 % in 2016. The second half of 2016 was the first time, when the number of xDSL subscriptions declined. The main challenger — cable — increased slightly its share during the same time period, but most of the gains were posted by alternative technologies, such as FTTH/B.
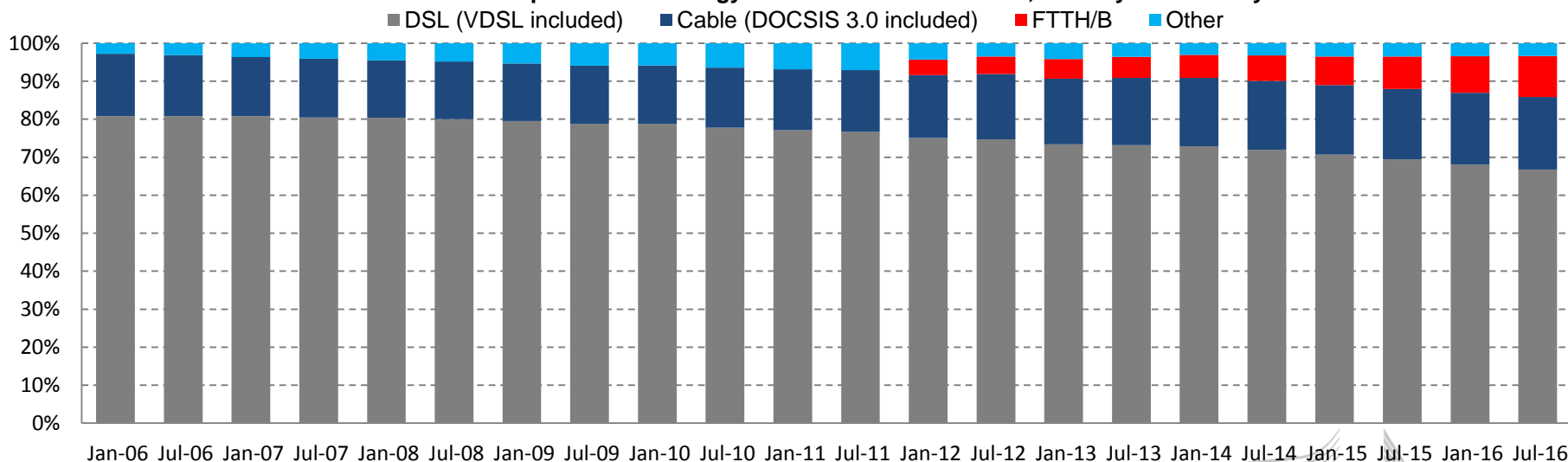
Nevertheless, DSL continues to be predominant, and its market share can be strengthened thanks to the increasing VDSL coverage.

Fixed broadband net adds by technology at EU level, 2006-2016
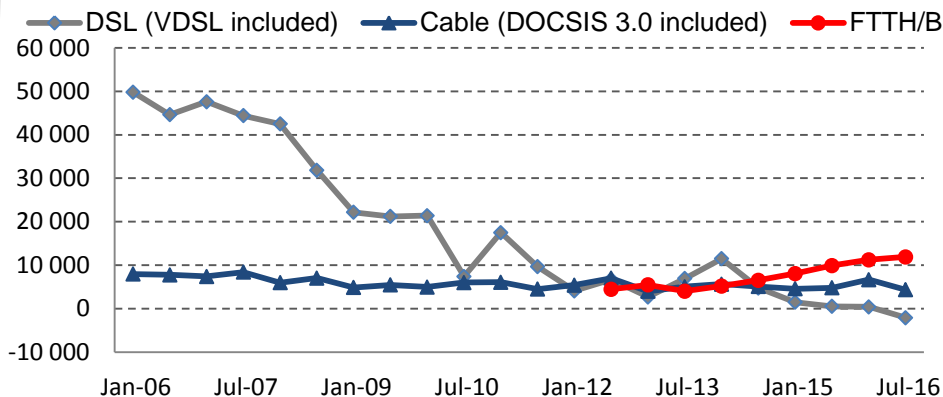
Source: Communications Committee

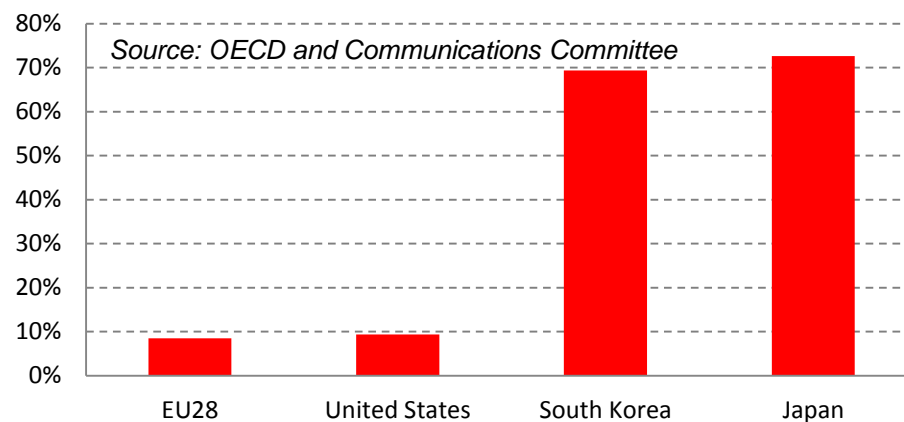**Fixed broadband subscriptions - technology market shares at EU level, January 2006 to July 2016**

Source: Communications Committee

xDSL is particularly important in Greece and Italy, and has the lowest market share in Bulgaria, Lithuania and Romania. Cable has a very high market share in Belgium, Hungary, Malta and the Netherlands. FTTH/B is the most widely used technology in Lithuania, Latvia, Romania, Bulgaria and Sweden.

The share of xDSL ranges from 12 % in Bulgaria to 100 % in Greece. DSL is generally less dominant in Eastern Europe. Looking at alternative technologies, cable is present in all but two Member States and it is the major technological competitor of DSL in the majority of the Member States.

FTTH and FTTB together represent 11 % of EU broadband subscriptions up from 9 % a year ago. In these technologies, Europe continues to lag behind global leaders such as South Korea and Japan.

Share of fibre connections in total fixed broadband, July 2016

Source: OECD and Communications Committee

Fixed broadband subscriptions - technology market shares, July 2016

■ DSL lines % (VDSL included) ■ Cable modem % (DOCSIS 3.0 included) ■ FTTH/B % ■ Other %

Source: Communications Committee

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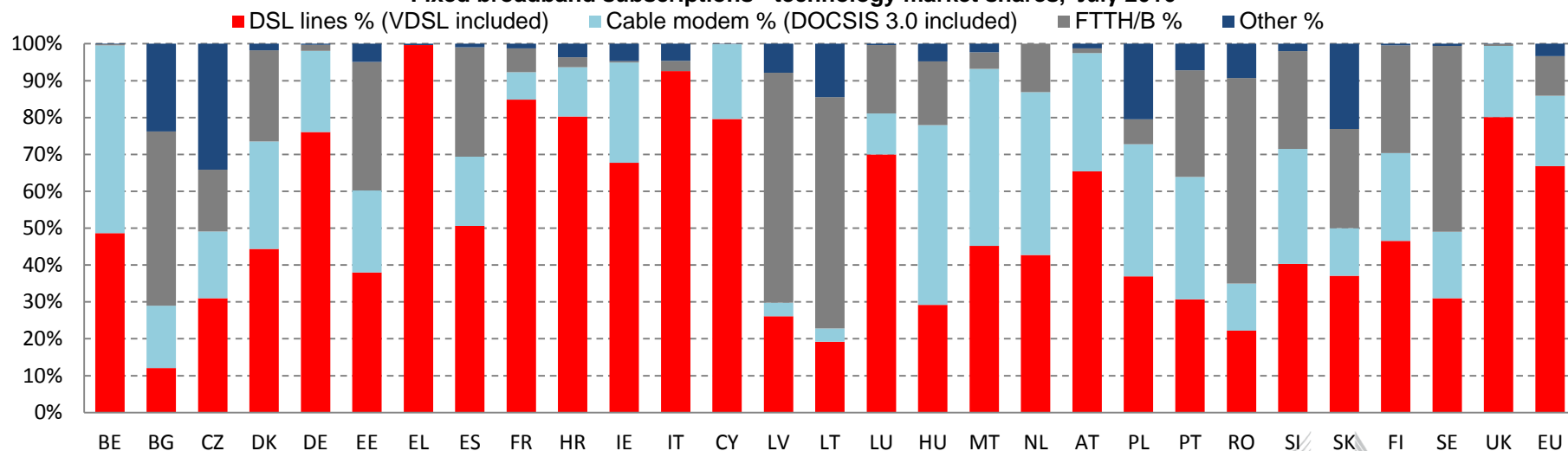
NGA subscriptions went up sharply by 20 million in the last two years, and already 42 % of all subscriptions are NGA. In Belgium, Romania and the Netherlands, over three quarter of fixed broadband subscriptions are NGA, while the same ratio is less than 10 % in Greece and Cyprus.

NGA subscriptions in the EU doubled during the last three years and account for 42 % of all EU fixed broadband subscriptions.

At least two thirds of broadband subscriptions are NGA in Belgium, Romania, the Netherlands, Bulgaria, Latvia, Sweden, Portugal and Denmark. Whereas, Cyprus, Greece, Italy, Austria and France are lagging behind all other Member States.

Evolution of NGA (FTTH, FTTB, VDSL, Cable Docsis 3.0 and other NGA) subscriptions (in millions) in the EU, 2012-2016

Source: Communications Committee
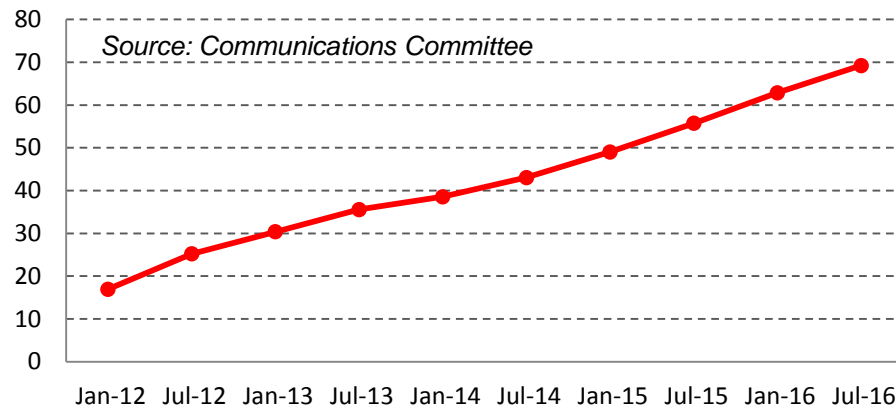
NGA (FTTH, FTTB, VDSL, Cable Docsis 3.0 and other NGA) subscriptions as a % of total fixed broadband subscriptions, July 2016

Source: Communications Committee

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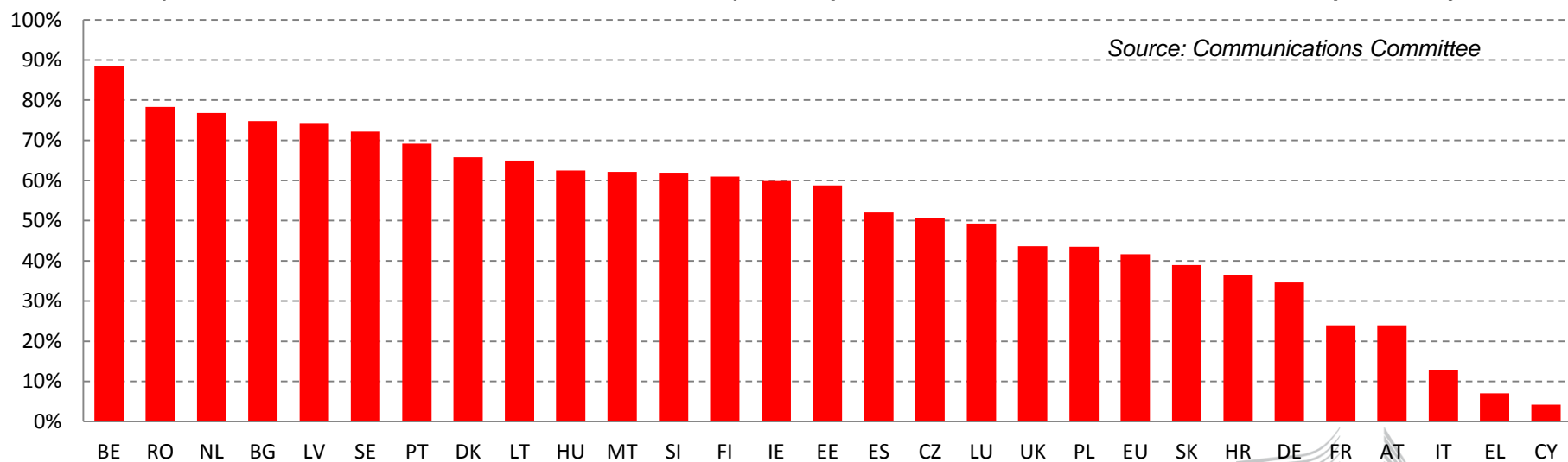
Cable Docsis 3.0 is currently the most widespread NGA technology in the EU both in coverage and take-up. **VDSL** subscriptions went up by 47% in the last twelve months.

39 % of NGA subscriptions are Docsis 3.0, which is relatively high give cable broadband in total represents only 19 % of all EU fixed broadband subscriptions. While almost all the cable networks have been upgraded to NGA, only 51 % of the xDSL network is VDSL-enabled. Nevertheless, VDSL coverage went up by 17 % and the number of subscriptions by 47 % in the last twelve months. FTTH and FTTB have a 16 % and 10 % share in total NGA subscriptions, respectively.

Share of different NGA technologies in total NGA subscriptions, July 2016

Source: Communications Committee
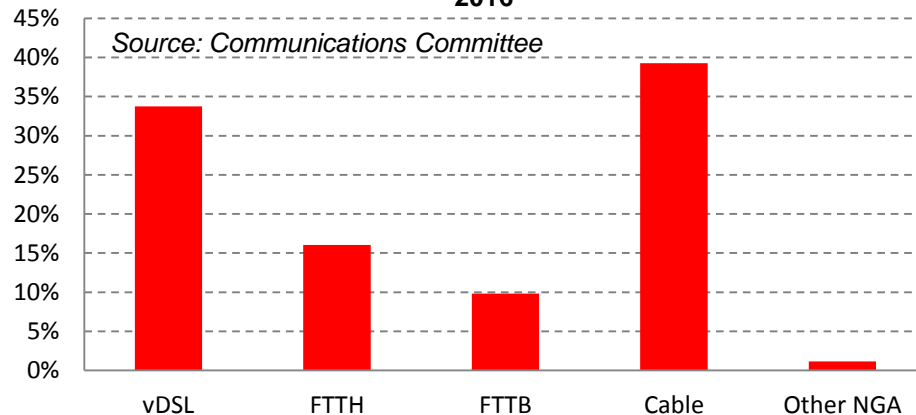
NGA subscriptions (millions) by technology at EU level, January 2012 - July 2016

Source: Communications Committee

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European Commission
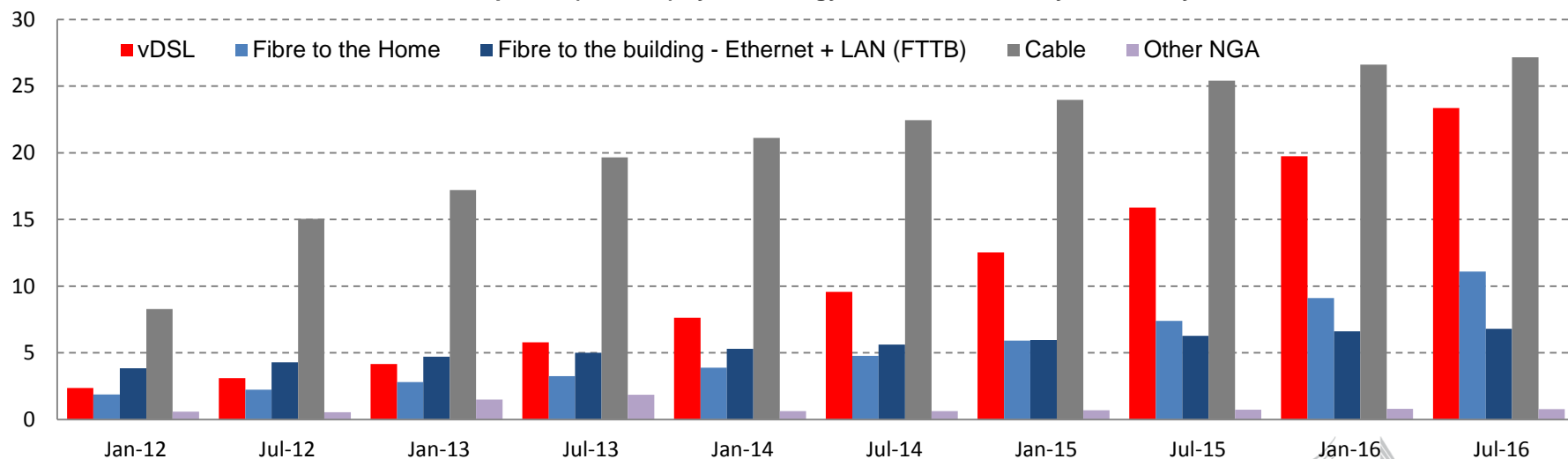
Competition in the fixed broadband market: new entrant operators are continuously gaining market share, but incumbents still control 41 % of subscriptions.

Incumbent operators are market leaders in almost all Member States, although their market share is decreasing gradually. During the last 10 years, new entrant operators have consistently posted higher net gains then the incumbents in each year, although a reverse in this trend has been observed over the last six months. Overall, market share of incumbents in the EU has decreased by 10 percentage points since 2006.*

* Break in series in July 2010 due to modification of historical data.

Fixed broadband subscriptions - operator market shares at EU level, January 2006 - July 2016

Source: Communications Committee
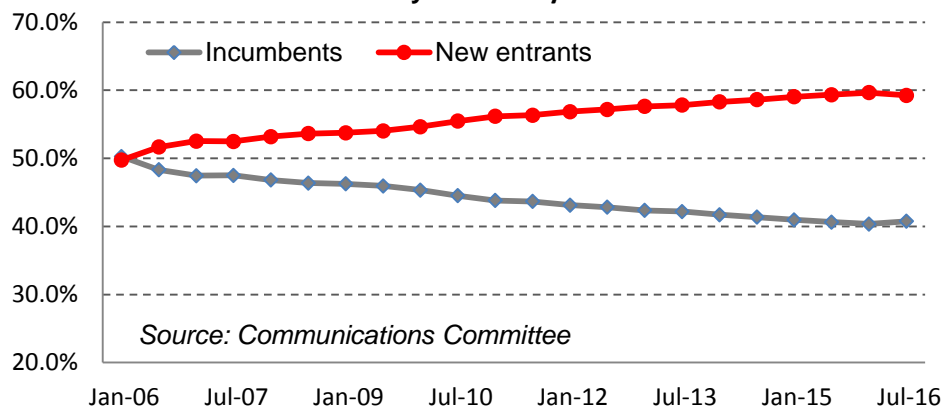
Fixed broadband subscriptions growth per day by operator at EU level, January 2006 - July 2016

Source: Communications Committee
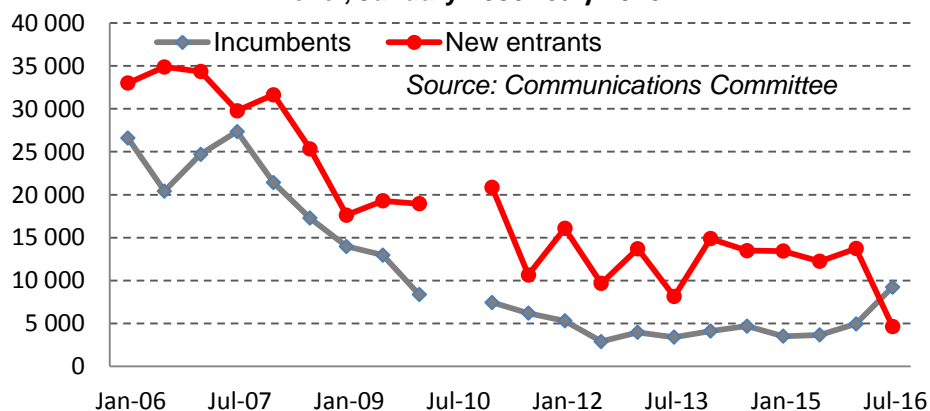
Fixed broadband subscriptions growth per day by operator at EU level % of total, January 2006 - July 2016

Source: Communications Committee

European Commission
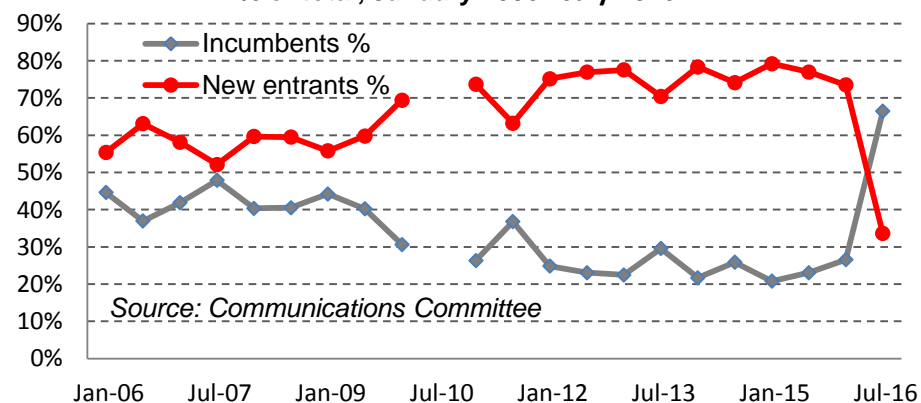
Market shares of incumbents are shown to have large differences across Europe. In 7 out of the 28 Member States, at least half of the subscriptions are provided by incumbent operators.

Market shares are calculated at national level for incumbents and new entrants. However, broadband markets are geographically fragmented suggesting that a large number of homes are served by only one provider (most likely by the incumbent operator in this case).

Incumbents have the highest subscription market share in Luxembourg and Cyprus, where the small market size may favour concentration. In contrast, incumbents are the weakest in Europe in Romania, Bulgaria, the Czech Republic and Poland. In all these four Member States, most subscribers use technologies other than xDSL.

Fixed broadband subscriptions - operator market shares, July 2016

■ Incumbents ■ New entrants

Source: Communications Committee

European Commission
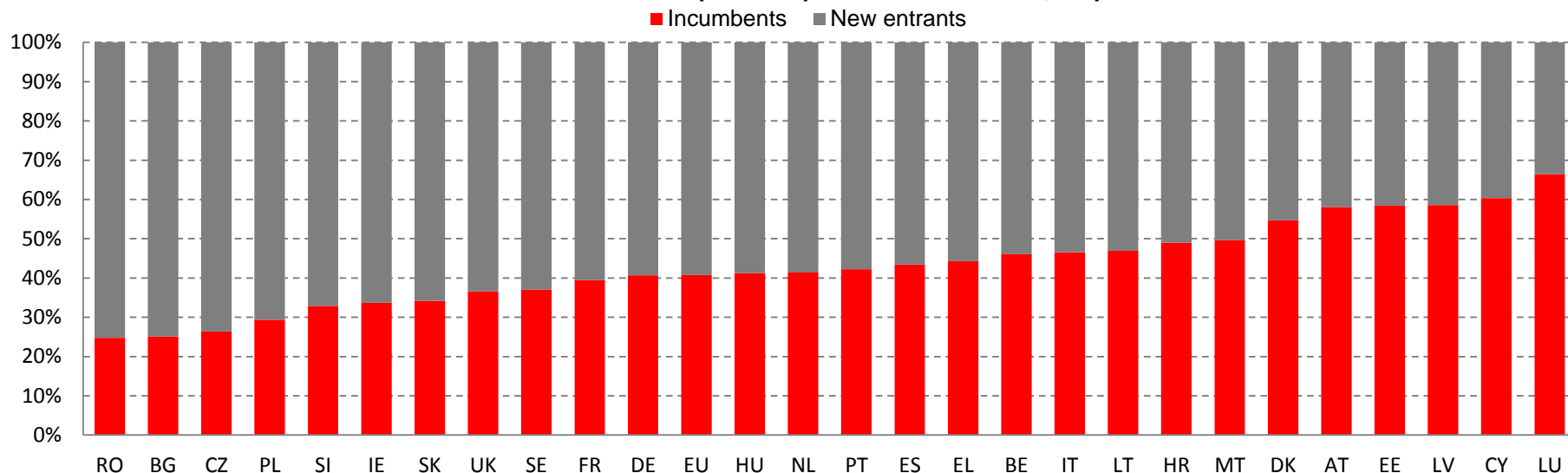
In the **DSL** market, unbundling reduced the dominance of incumbents, but in **VDSL** incumbents hold 66 % of subscriptions. Nevertheless, **NGA** is provided mainly by new entrants because of the high share of **cable.**

New entrant operators can compete with incumbents by using either the incumbent's network or their own network to offer internet access. In Greece, competition is entirely based on regulated access to the incumbent's access network, while in Italy and France over 80 % of subscriptions are DSL. In Eastern European Member States, competition is rather based on competing infrastructures. This applies also to Belgium, Malta, Portugal and the Netherlands.

Market share of incumbents by technology (% of subscriptions) at EU level, July 2016

Source: Communications Committee
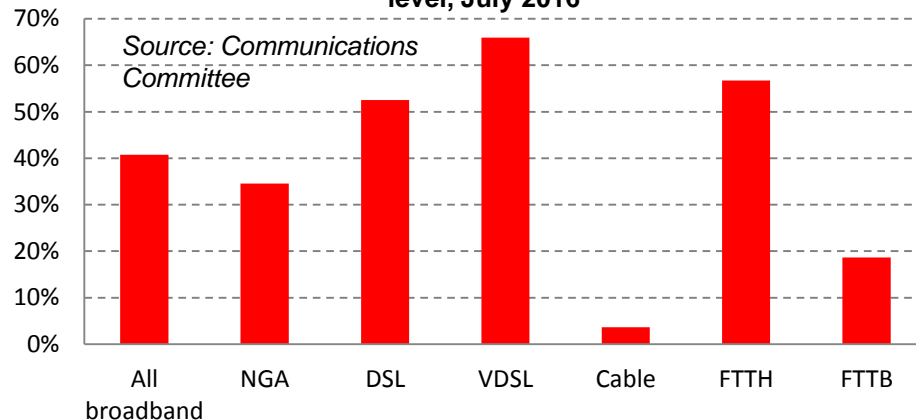
New entrants' subscriptions - using own infrastructure or the incumbent's network (% of total), July 2016

■ New entrant subscriptions using the incumbent's infrastructure   ■ New entrant subscriptions using own infrastructure

Source: Communications Committee

Europe's Digital Progress Report 2017 – Connectivity

European Commission
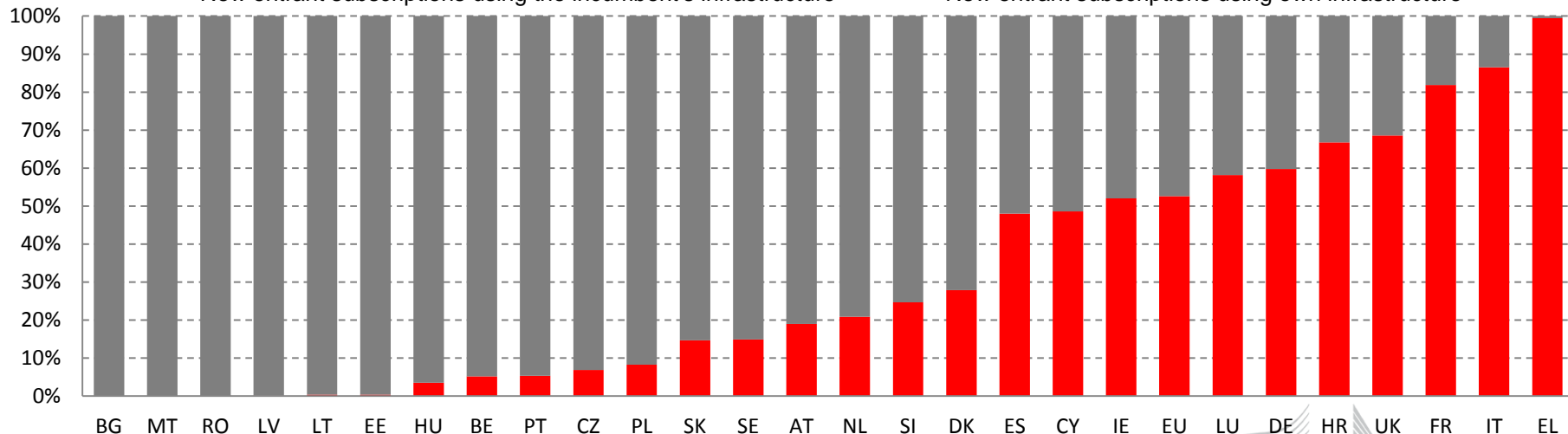
53 % of DSL subscriptions belong to incumbents. New entrants mainly use Local Loop Unbundling to sell DSL. In six Member States, the new entrants' presence in the DSL market is marginal.

In Bulgaria, Romania, Malta, Latvia, Estonia and Lithuania, there is literally no competition in the DSL market. These Member States, however, have strong platform competition. Alternatively, in France, Greece, the UK, Spain, Ireland and Italy new entrants account for the majority of xDSL subscriptions. In all these Member States, competition is tight due to the possibility of entry via DSL subscriptions provided through Local Loop Unbundling, although in Italy bitstream is also important.

Number of DSL subscriptions by new entrants at EU level, given different types of access (VDSL excluded), 2013-2016

Legend: Own network, Full ULL, Shared access, Bitstream, Resale

Source: Communications Committee
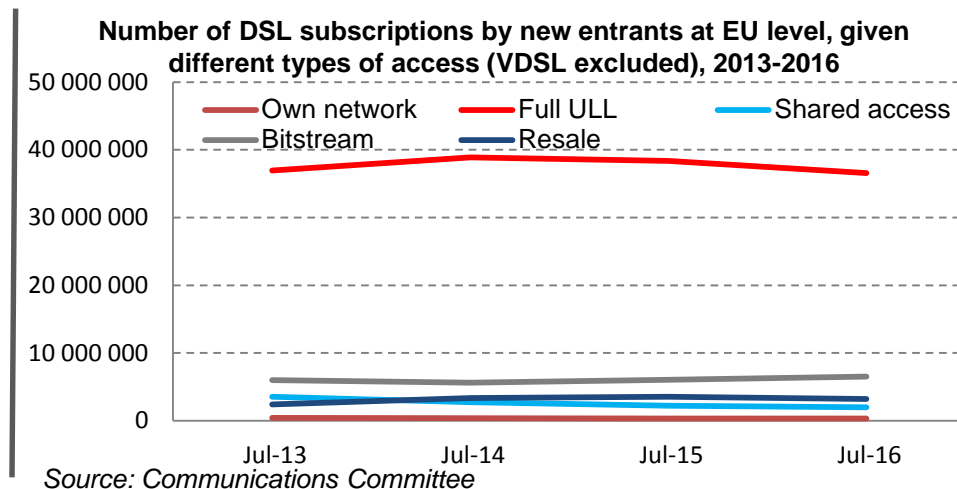
DSL subscriptions - operator market shares (VDSL included), July 2016

Legend: Incumbent, New entrants

Source: Communications Committee

Europe's Digital Progress Report 2017 – Connectivity

European Commission
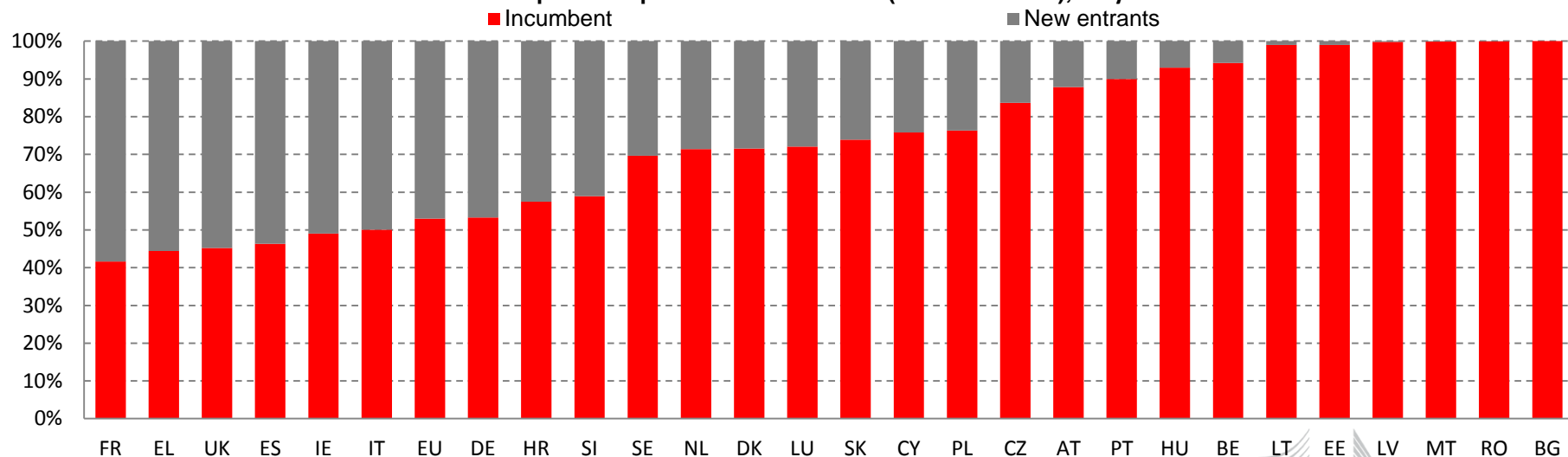
Average connection speed ranges from 7 Mbps to 20 Mbps in Europe. Sweden, Finland, the Netherlands and Latvia are among the top countries in Europe and worldwide.

South-Korea is the world leader in average internet connection speed at 26.3 Mbps, followed by Norway and Sweden at 20 Mbps.

The EU has an average speed of 13 Mbps, which is well below the preceding leading countries, Japan (18Mbps) and also USA (16Mbps).

While five Member States have higher speeds than the US, the slower speeds in the EU can be explained by a lower usage of FTTH technology and less coverage of cable.

The worst performing countries include Cyprus, Greece, Croatia, Italy and France with speeds of less than 10 Mbps. With the exception of Cyprus, all these countries have a relatively low coverage of fast broadband technologies (NGA).

Average connection speed (Mbps) by country, 2016

Source: Akamai, Q3 -2016

Europe's Digital Progress Report 2017 – Connectivity

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European Commission
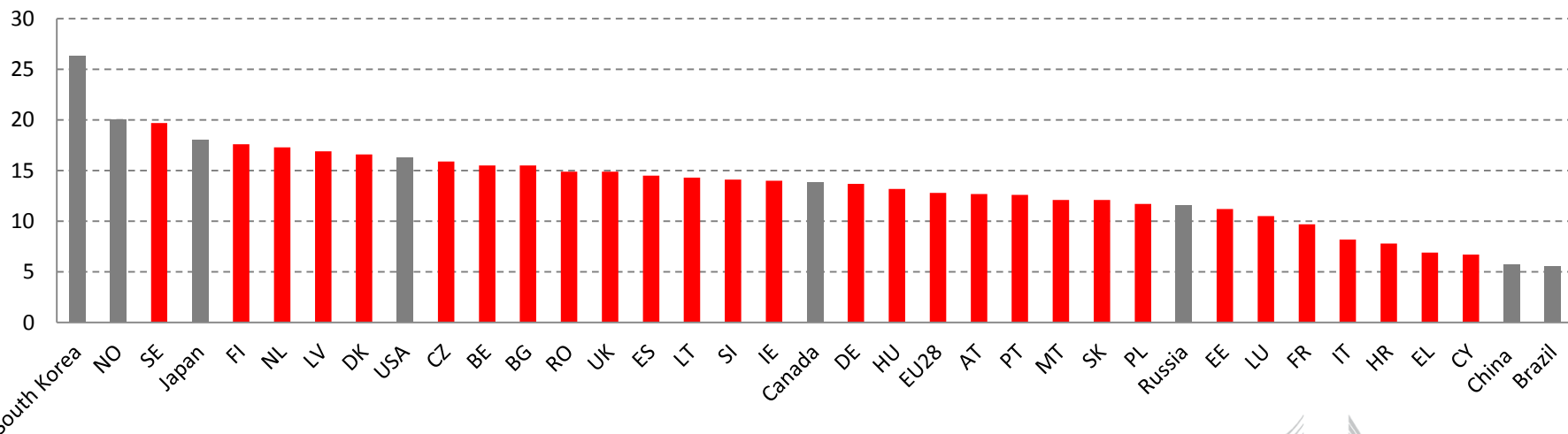
There are 84 active mobile broadband SIM cards per 100 people in the EU, up from 34 four years ago. The growth was linear over the last four years with over 40 million new subscriptions added every year.

Mobile broadband represents a fast growing segment of the broadband market. More than 60 % of all active mobile SIM cards use mobile broadband.

In the Nordic countries and Estonia, Luxembourg and Poland, there are already more than 100 subscriptions per 100 people, while in Hungary and Greece the take-up rate is still below 50 %. Most of the mobile broadband subscriptions are used on smartphones rather than on tablets or notebooks.

Mobile broadband penetration at EU level, January 2009 - July 2016

Source: Communications Committee
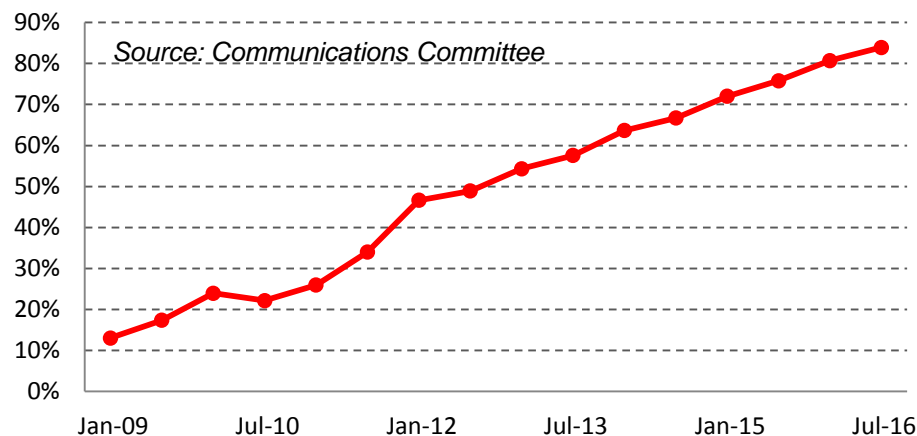
Mobile broadband penetration by country, July 2016

Source: Communications Committee

European Commission
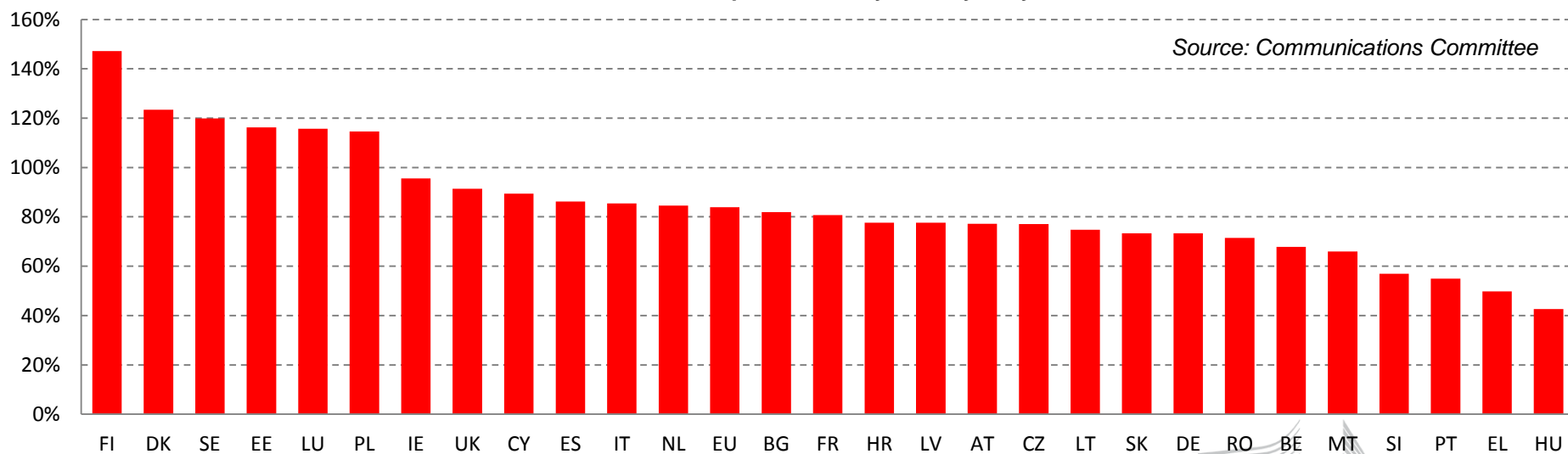
Mobile broadband is still mainly complementary to fixed broadband. In 2016, 9.1 % of EU homes accessed the internet only through mobile technologies. Finland and Italy were leaders in mobile access to internet with 30% and 22 % of homes using it in 2016.

Europeans access the internet primarily with fixed technologies at home. However, there are a growing number of homes with only mobile internet use. The percentage of homes with purely mobile broadband access grew from 4.1 % in 2010 to 9.1 % in 2016. This indicates that mobile broadband still mainly complements rather than substitutes fixed broadband.

The Netherlands was the Member State with the lowest mobile only access at less than 0.1 %.

By contrast, Finland and Italy were leaders in mobile access to internet with 30 % and 22 % of homes in 2016.

Households using inly mobile broadband at home at EU level (% of households), 2007 - 2016
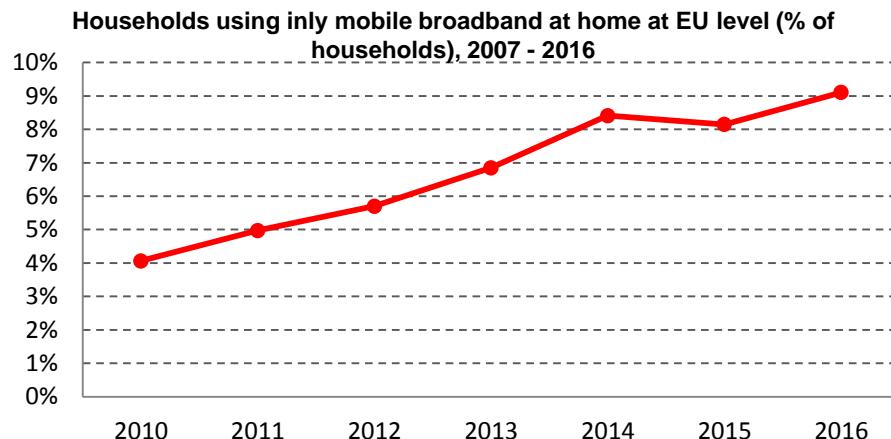
Source: Eurostat (ICT usage by households and individuals)

Households using only mobile broadband at home (% of households), 2016
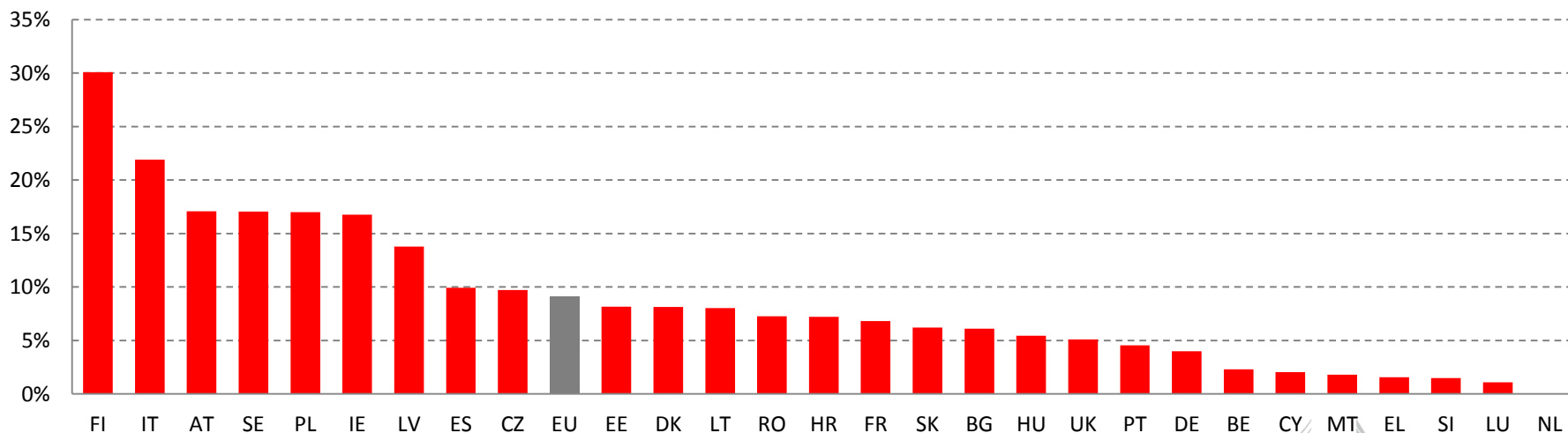
Source: Eurostat (ICT usage by households and individuals)

Internet traffic per capita in Western Europe* is currently 27 GB per month. By 2020, this figure is estimated to go up to 66.5 GB, while in the US it will be 165 GB.

IP traffic per capita (Gigabytes per month and region), 2015 - 2020
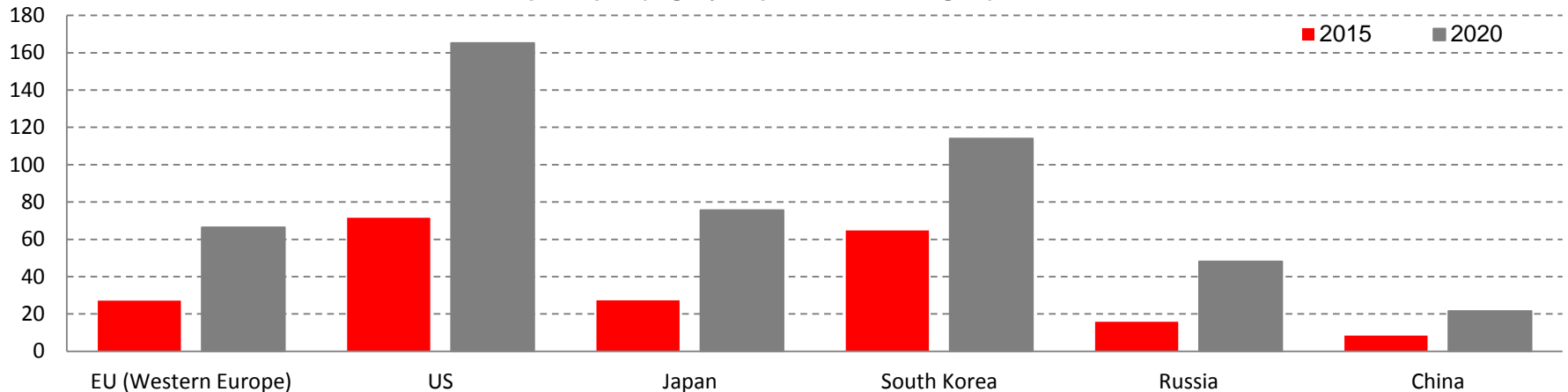
Source: Cisco, VNI Forecast Highlights

Internet traffic per capita in Western Europe* is well below those of the US and South Korea. Although, with rapid growth in recent years, it is projected to reach the current levels of US and South Korea by 2020.

Mobile data traffic is a fraction of total IP traffic, and this will remain so despite the large increase forecast by Cisco. Similarly to the overall traffic, mobile IP traffic per capita in the EU is substantially below the US and South Korea. Nevertheless, Western European traffic is estimated to be six times higher in 2020 than in 2015.

* Note: France, Germany, Italy, Spain, Sweden, United Kingdom, Denmark, Netherlands, Belgium, Ireland, Norway and Iceland.

Mobile IP traffic per capita (Gigabytes per month and region), 2015-2020

Source: Cisco, VNI Forecast Highlights

European Commission
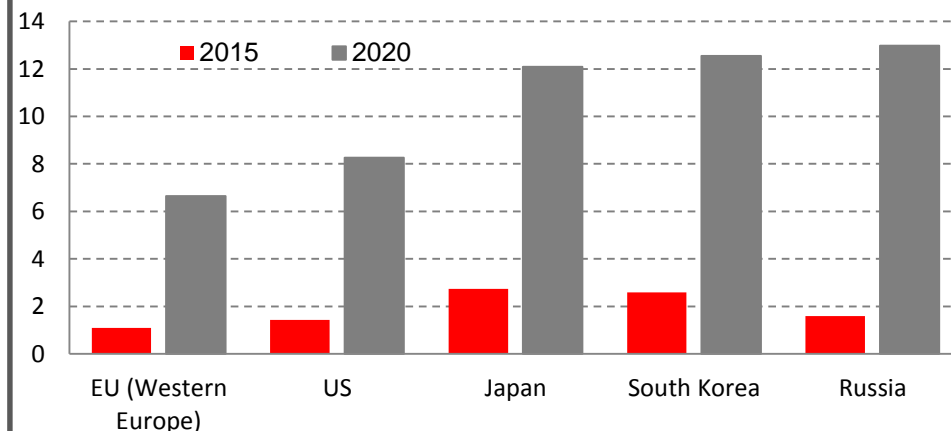
Prices* of fast broadband access tend to decrease over time but vary widely across Member States.

Broadband access prices (minimum prices, calculated on Purchasing Power Parity) vary between EUR 11 and EUR 43 for a standalone offer with a minimum download speed of 12 Mbps. The minimum prices were the lowest in Sweden (EUR 11), Bulgaria (EUR 12) and Hungary (EUR 12) and the highest in Spain (EUR 43), Slovenia (EUR 34) and Cyprus (EUR 33).

In the range of minimum download speed of 30 Mbps, European average stands at EUR 25 with a slight decrease from last year.

* Based on least expensive prices available and expressed in euros adjusted for purchasing power parity, VAT included.

Broadband retail prices (EUR PPP)* – Standalone offers at EU level, 2013 -2016

Legend: ●—12Mbps-30Mbps ◆—30Mbps-100Mbps
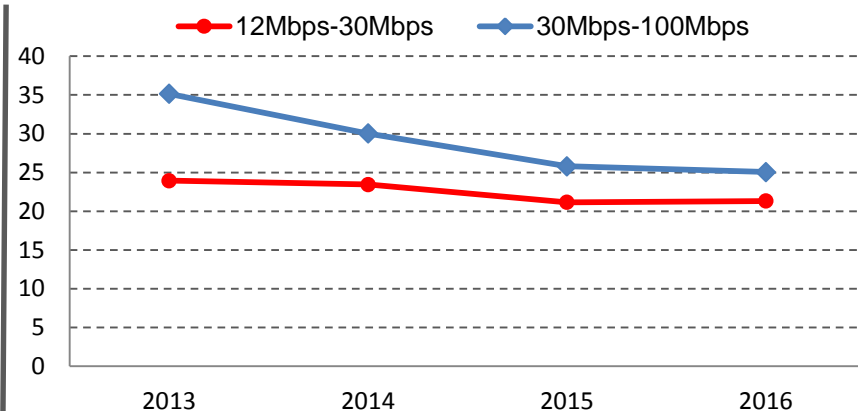
Source: Empirica and Van Dijk

Fixed broadband retail prices (EUR PPP) - Standalone offers, Autumn 2016

Legend: ■ 12Mbps-30Mbps ■ 30Mbps-100Mbps

Source: Empirica

European Commission
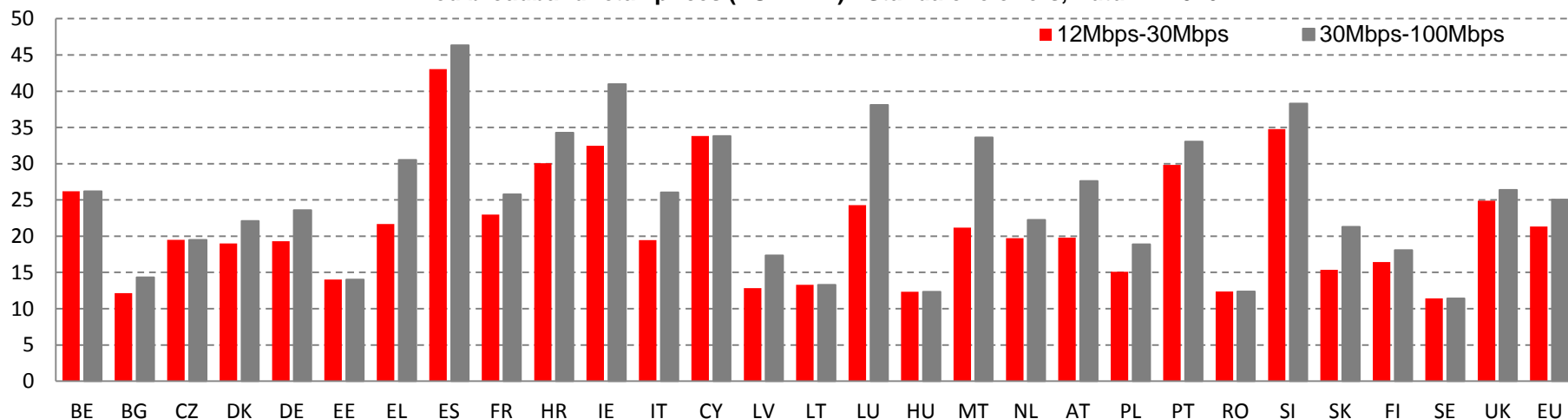
Prices* of triple play bundles including fast broadband access, fixed telephony and television went down by 27 % since 2013

The minimum prices for triple play bundles including broadband access (with a download speed between 30 and 100 Mbps), fixed telephony and television vary between EUR 18 and EUR 75 in the EU. The minimum price was the lowest in Bulgaria (EUR 18), Lithuania (EUR 21) and Sweden (EUR 22) and the highest in Ireland (EUR 75), Belgium (EUR 60), Portugal (EUR 59) and Croatia (EUR 56). Prices decreased over time, with the EU average going down from EUR 58 in 2013 to EUR 42 in October 2016.

*Based on least expensive prices available and expressed in euros adjusted for purchasing power parity, VAT included.

**No data available for Finland and Denmark.

Broadband retail prices (EUR PPP)* – Bundles including broadband, fixed telephony and television, 2013 - 2016
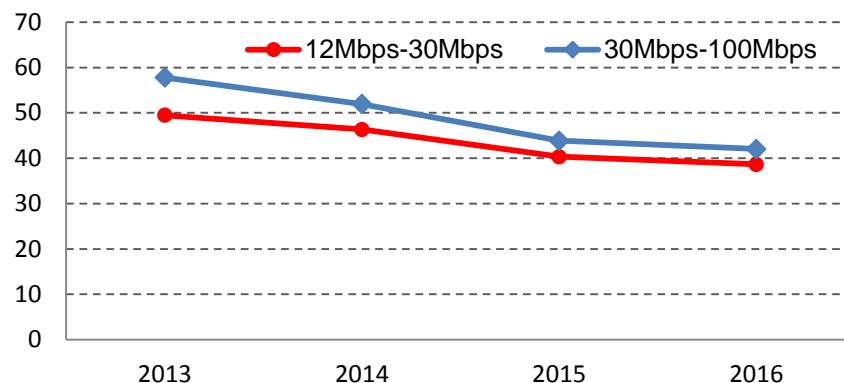
Source: Empirica and Van Dijk

Fixed broadband retail prices (EUR PPP) - Bundles including broadband, fixed telephony and television, Autumn 2016**

Source: Empirica

European Commission
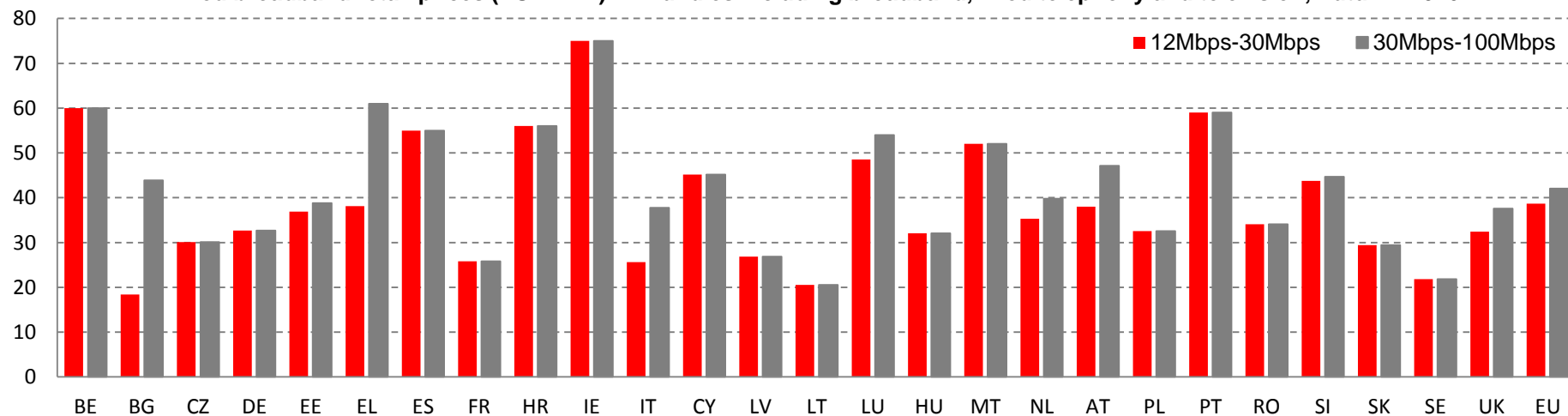
Broadband take-up tends to be lower in Member States where the **cost of broadband access** accounts for a higher share of income, but this correlation is not strong. The lowest income quartile of the EU population has a significantly lower take-up rate.

Considering overall take-up, European average is 74 % of homes with Luxembourg, the Netherlands at the highest positions and Italy, Bulgaria and Poland lagging behind.

Income plays an important role in broadband take-up. The lowest income quartile has only 54 % take-up rate of fixed broadband as opposed to 90 % in the highest income quartile.

The gap between the lowest income quartile and the national average is particularly large in Bulgaria, Romania, Hungary, Slovenia, Lithuania, Czech Republic, Croatia, Spain and Slovakia.

Fixed broadband household penetration by income quartiles, 2011-2016

Source: Eurostat

Legend: Low income — Medium low income — Medium high income — High income — Average
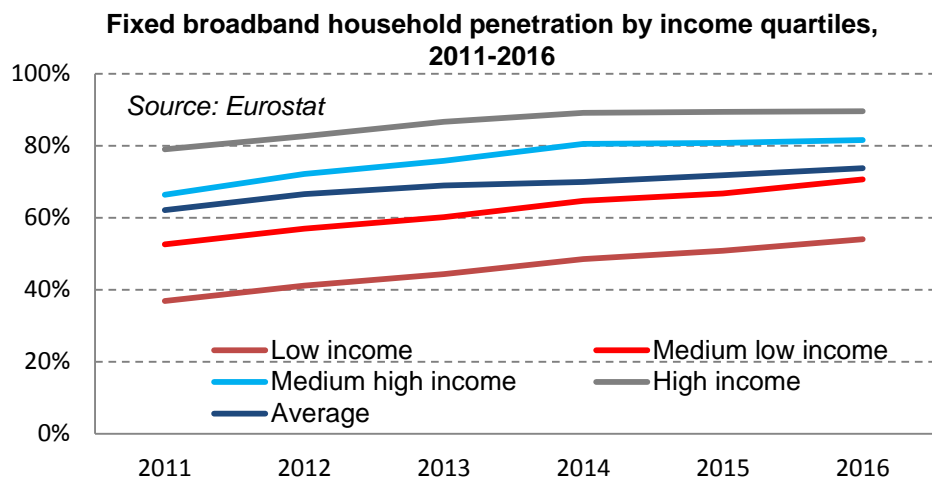
Household fixed broadband penetration and share of broadband access cost (standalone 12-30Mbps download) in disposable income, 2016
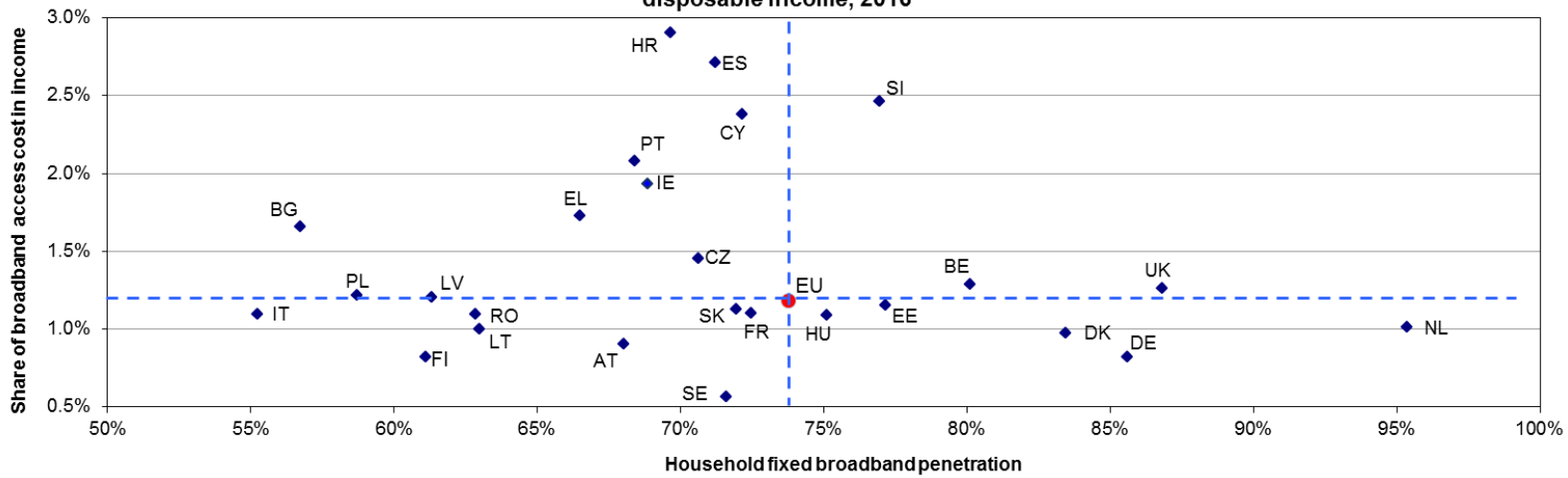
Data not available for Luxembourg and Malta.

Source: Commission services based on Eurostat and Empirica

European Commission

Member States are catching up in transposing the Broadband Cost Reduction Directive (Directive 2014/61/EU) (1/2).

Since the major source of costs in network deployment is civil engineering costs (accounting for up to 80 % of the total costs), Directive 2014/61/EU includes measures to reduce the cost of deploying high-speed electronic communication networks. The Directive includes measures:

• facilitating access to physical infrastructures of all network operators (i.e. telecom operators, as well as energy, or other utilities);

• improving coordination of civil engineering works;

• providing transparency of permit granting procedures; and

• equipping and accessing buildings with in house physical infrastructure (e.g. mini-ducts) capable of hosting high-speed networks.

The deadline for Member States to transpose this Directive expired on 1 January 2016.

The transposed measures had to apply at the latest as of 1 July 2016 except for the obligation to equip buildings with in-building physical infrastructure and with an access point which applies to new buildings or major renovation works where planning permission has been submitted after 31 December 2016.

In March 2016, the Commission opened infringement proceedings against 27 Member States (all Member States except Italy) who had not yet completed the transposition of the Directive into national law. As a second step, the Commission sent reasoned opinions to 19 Member States in September 2016, urging them to implement measures of cost reduction in deploying high-speed electronic communications networks. Infringement proceedings against seven Member States (Denmark, Ireland, Malta, Poland, Romania, Spain and Sweden) have in the meantime been closed following complete transposition of the Directive. The Commission is currently assessing further responses by Member States to reasoned opinions. As a next step, the Commission is analysing the conformity of the transposition for the countries that have notified complete transposition of the Directive. Information about national measures transposing the Directive is available [here] and ongoing infringement proceedings [here].

European Commission

Member States are catching up in transposing the Broadband Cost Reduction Directive (Directive 2014/61/EU) (2/2).

As of 31 March 2017, 16 Member States have notified to the Commission complete transposition of the Directive (Austria, Cyprus, Denmark, Estonia, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Malta, Poland, Romania, Spain, Sweden, UK). Eleven Member States have notified partial transposition of the Directive (Belgium, Bulgaria, Croatia, Finland, France, Latvia, Luxembourg, the Netherlands, Portugal, Slovakia, Slovenia) while one Member State has not notified any transposition measure so far (Czech Republic). Delays in transposing and applying the measures provided in the Directive may limit opportunities to reduce deployment costs and exploit synergies, which is particularly important in those areas where NGA coverage is lagging behind or upgrades of networks are needed.

Member State		Status of notification by MS
BE		○ ● ○
BG		○ ● ○
CZ		● ○ ○
DK		○ ○ ●
DE		○ ○ ●
EE		○ ○ ●
HR		○ ● ○
IE		○ ○ ●
EL		○ ○ ●
ES		○ ○ ●
FR		○ ● ○
IT		○ ○ ●
CY		○ ○ ●
LV		○ ● ○
LT		○ ○ ●
LU		○ ● ○
HU		○ ○ ●
MT		○ ○ ●
NL		○ ● ○
AT		○ ○ ●
PL		○ ○ ●
PT		○ ● ○
RO		○ ○ ●
SI		○ ● ○
SK		○ ● ○
FI		○ ● ○
SE		○ ○ ●
UK		○ ○ ●
		1 11 16

● communication absent
● partial transposition notified
● complete transposition notified

European Commission

Following the adoption of the 2014 Recommendation on relevant markets, a reduction of *ex ante* regulation is progressively observed as competition in the telecommunications markets across the EU develops.

Under EU telecommunications legislation, appropriate regulatory measures on operators should be imposed only following a market analysis showing that a given market is not effectively competitive. This market analysis needs to be periodically carried out by the competent national regulatory authority.

The table in the next slide shows an overview of markets which are still subject to *ex ante* regulation (red colour), have already been fully or partially deregulated (green/yellow colour), as well as the rounds of market analysis carried out since the adoption of the Regulatory Framework back in 2002. The 2014 Recommendation on relevant markets excluded from regulation two fixed telecoms markets and redefined two other markets in order to reflect market and technology developments. For markets not included in the Recommendation, *ex ante* regulation can be imposed only if a market analysis shows that the market does not tend towards effective competition.

Since the adoption of the 2014 Recommendation, the Commission observes a progressive reduction of *ex ante* regulation as the competition in the telecommunications markets across the EU developed. This trend confirms the Commission's assumption that those markets tend towards effective competition in the Member States. Most markets outside the scope of the Recommendation which are still regulated have only been reviewed once or twice since the entry into force of the Regulatory Framework and market regulation may no longer reflect the effective competitive dynamics observed since the last round. Therefore ensuring a timely review of relevant markets is key to aligning market regulation with technological and market developments.

Legend:

Colour	Meaning
Green	Effective competition - no ex ante regulation
Red	No effective competition - ex ante regulation
Yellow	Partial competition - partial ex ante regulation

	Round
1	1st round-competition/regulation
2	2nd round-competition/regulation
3	3rd round-competition/regulation
4	4th round-competition/regulation

Article 7 cases as at 30/03/2017

	2014 RECOMMENDATION					2007 REC.		2003 RECOMMENDATION								
	Call term. on fixed network	Voice call term. on mobile networks	Wholesale local access	Wholesale central access	Wholesale high-quality access	Access to PSTN for res & non-res.	Call orig. on fixed network	Local/nat. Call for res.	Internat. call for res.	Local/nat. call for non-res.	Internat. call for non-res.	Retail LL	Transit on fixed network	Trunk segments LL	Access & call orig. on mobile network	Broadcast Transmis.
	Market 1	Market 2	Market 3a	Market 3b	Market 4	ex-Mkt 1	ex-Mkt 2	ex-Mkt 3	ex-Mkt 4	ex-Mkt 5	ex-Mkt 6	ex-Mkt 7	ex-Mkt 10	ex-Mkt 14	ex-Mkt 15	ex-Mkt 18
Austria	3	4	3	3	4	3	3	3	2	4	3	4	1	2	1	3
Belgium	2	2	2	2	1	2	1	3	1	3	1	1	2	1	1	w
Bulgaria	5	3	2	2	3	2	3	2	2	2	2	1	1	1		
Croatia	1	1	1	1	1	1	1	1		1		1		1		
Cyprus	2	3	4	4	2	3	3	3	2	3	2	2	3	2	3	3
Czech Republic	4	4	3	3	3	4	4	2	2	2	1	2	1	1	1	2
Denmark	3	4	3	3	4	3	3	2	2	1	1	2	1			
Estonia	3	4	3	3	3	3	3	1	1	1	1	1	1	2	1	3
Finland	2	1	3	3	1	2	3	2	1	2	1	2	2	1	V	3
France	4	4	4	4	2	4	4	1	1	1	1	2	1	2	W	4
Germany	4	5	3	3	2	3	3	2	1	2	1	2	2	1	1	3
Greece	3	3	4	4	2	3	2	3	1	3	1	2	3	2	1	1
Hungary	3	5	3	3	3	6	3	3	3	3	3	3	2	2	2	2
Ireland	3	1	2	2	2	3	2	2	2	2	2	2	2	2	1	2
Italy	3	4	3	3	2	3	2	2	2	2	2	2	3	2	2	2
Latvia	5	4	3	3	3	1	3	4	3	4	3	3	2	1	1	1
Lithuania	4	3	3	3	2	1	2	3	2	3	2	1	2	2	1	5
Luxemburg	3	3	2	2	2	3	3	2	2	2	2	2	1	1	1	
Malta	3	3	2	2	3	3	3	2	2	2	2	3	1	2	1	1
Netherlands	4	4	5	3	3	3	3	2	2	2	2	2	2	2	1	2
Poland	2	3	2	3	1	2	2	2	2	2	2	2	1	1	2	2
Portugal	2	2	3	3	3	2	2	2	2	2	2	1	1	3		2
Romania	2	2	2	1	1	2	2	1	1	1	1		2			1
Slovakia	4	4	3	3	3	4	4	2	2	2	2	2	2	1	1	2
Slovenia	2	5	3	3	2	3	3	2	1	1	1	2	3	1	3	3
Spain	3	3	3	3	3	4	3	2	2	2	2	2	2	3	2	3
Sweden	4	4	3	3	3	3	3	1	1	1	1	2	2	1	1	4
United Kingdom	3	4	2	4	4	4	3	2	2	2	2	4	2	4	1	2

More EU harmonised spectrum underpins future spectrum needs within the EU, while assignment in national markets differs (1/2).

Following the adoption in April 2016 of Commission Implementing Decision (EU) 2016/687, harmonising the 700 MHz band, the total amount of spectrum harmonised at EU level for wireless broadband use reached 1090 MHz during the reporting year. The authorisation process for this band was already completed by three Member States (Finland, France and Germany) and the other Member States are expected to authorise the band by 2020, unless there are justified reasons* for a delay until mid 2022 at the latest.

A limited list of justified reasons is contained in the annex of the Decision of the European Parliament and the Council on the use of the 470-790 MHz band in the Union.

Moreover, with a view to reaching the target of 1200 MHz for wireless broadband set by the radio spectrum policy programme (RSPP), the Commission is working on the possible extension of the 1.5 GHz band to provide additional download capacity for 5G services representing an extension of 51 MHz.

The 800 MHz band (the 'digital dividend') is currently assigned (in two cases not entirely) in 26 Member States, 11 of which had been granted a derogation from the original deadline under Article 6(4) of the RSPP. Two Member States have not yet assigned and/or made available the 800 MHz band; while Malta asked for an extension of the derogation it had been granted, Bulgaria benefits from the exception due to incumbent military use under Article 1(3) RSPP.
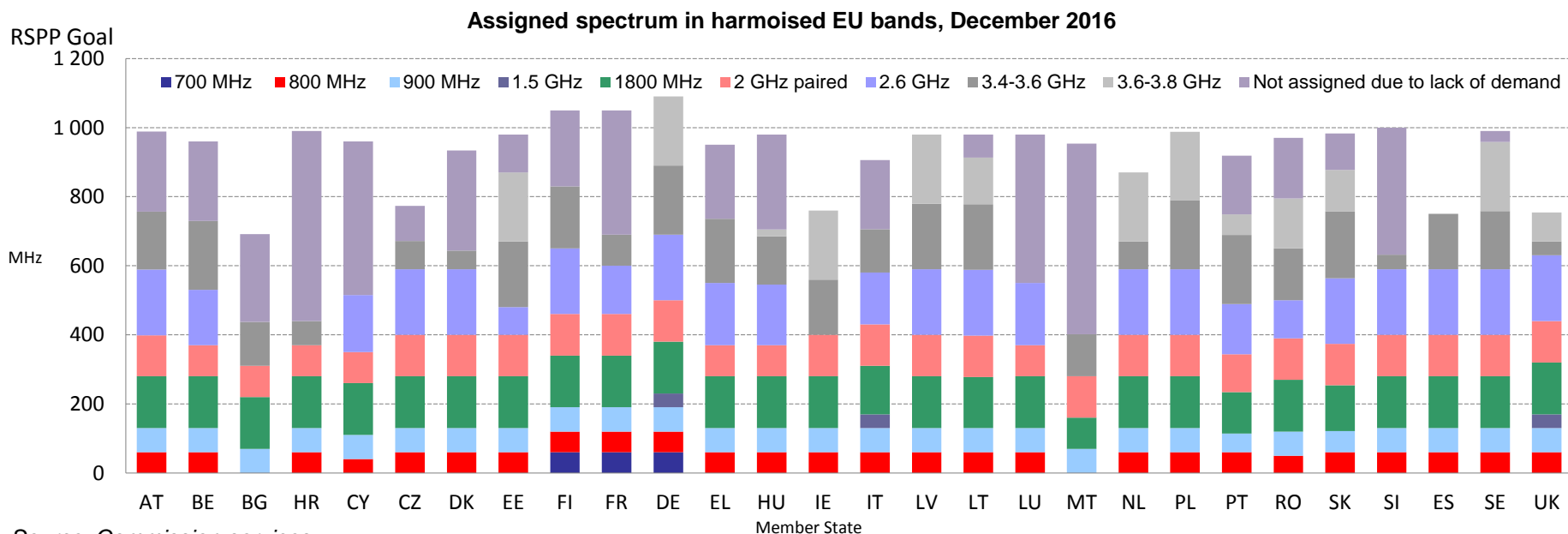
* A limited list of justified reasons is contained in the annex of the Decision of the European Parliament and the Council on the use of the 470-790 MHz band in the Union.

European Commission

More EU harmonised spectrum underpins future spectrum needs within the EU, while assignment in national markets differs (2/2).

When excluding the recently harmonised 700 MHz bands, a 4 percentage points (from 69 to 73 %) increase in the EU-harmonised spectrum assigned on average across Member States for wireless broadband use can be reported since last year. The swift assignment of the 700 MHz band in 3 Member States was a positive development which paves the way for other Member States to take the necessary measures to meet the 2020 deadline.

Bands above 1 GHz have the potential for additional capacity. Whilst these remained partly unassigned in many Member States, they will play an even more relevant role in the deployment of 5G services.

Lack of assignment may be due to different reasons depending on the circumstances in each Member States, such as delays in making the spectrum available and in the timely carrying out of assignment procedures, lack of market interest, use for defence purposes, etc.

In view of these different circumstances and regulatory conditions applicable to different bands, lack of assignment does not necessarily mean non-compliance with EU law.

Assigned spectrum in harmoised EU bands, December 2016

Legend: 700 MHz, 800 MHz, 900 MHz, 1.5 GHz, 1800 MHz, 2 GHz paired, 2.6 GHz, 3.4-3.6 GHz, 3.6-3.8 GHz, Not assigned due to lack of demand

Member State: AT, BE, BG, HR, CY, CZ, DK, EE, FI, FR, DE, EL, HU, IE, IT, LV, LT, LU, MT, NL, PL, PT, RO, SK, SI, ES, SE, UK

Source: Commission services

Note: Assigned spectrum include guard bands

European Commission

Development of national broadband plans

Since the adoption of the digital agenda for Europe (DAE) 2020 targets — i.e. coverage of 30 Mbps download for all Europeans and take-up of 100 Mbps subscriptions for at least 50 % of European households — most Member States have gradually adopted national broadband plans (NBPs). They are devised to integrate all relevant aspects of an effective broadband policy and resources enabling policy makers and public authorities to properly plan public interventions in the telecommunications sector.

At the time of writing, a large majority of Member States had already started implementing their NBPs, albeit with various time horizons ranging from 2017 to 2022. Some NBPs are integrated within broader strategic approaches, others are documents specifically dedicated to broadband deployment.
In some countries, multiple official documents drafted by different national authorities exist that specify aspects related to such broadband developments.

Content-wise, nearly all Member States' NBPs focus on reaching minimum download speeds — in most cases in terms of coverage (availability of commercial offer on a given territory) and sometimes also penetration (actual take-up in the form of internet access subscriptions). In contrast, emphasis on upload data rates is rather exceptional (e.g. Denmark, Luxembourg or Ireland). In addition, operational measures to foster demand for digital applications and high-speed internet access are relatively infrequent.

Notably, some Member States have held consultations on their draft national broadband plans. These include for instance the Czech Republic ('Digital Czech Republic'), France ('National Programme for Very High Speed Broadband') and the Slovak Republic ('National Strategy for Broadband Access in the Slovak Republic).*
Some Member States (Sweden, Germany and Austria) have already started to adapt the targets of their National Broadband Plans to the new EU broadband targets for 2025 proposed by the Commission in its September 2016 Communication "Connectivity for a Competitive Digital Single Market - Towards a European Gigabit Society".

* OECD countries with public consultation procedures prior to drafting their national broadband plans are: Canada ('Improving Canada's Digital Advantage'), Ireland ('Next Generation Broadband'), Japan ('Path of light'), and the United States ('Connecting America: The National Broadband Plan')

Broadband targets in national broadband plans

Although some NBPs do not have targets on penetration/uptake or have set targets on other features (e.g. upload speeds), the following general observations can be made:

- 11 Member States surpass the DAE-2020 targets (Austria, Belgium, Bulgaria, Denmark, Estonia, Finland, Germany, Hungary, Luxembourg, Slovenia and Sweden),

- 14 Member States are convergent with the DAE-2020 targets (Croatia, Cyprus, Czech Republic, Greece, Ireland, Italy, Latvia, Lithuania, Malta, Netherlands, Poland, Portugal, Slovakia and Spain),

- 3 Member States fall short of meeting the DAE-2020 targets (France, Romania and the United Kingdom).

Declared broadband targets in NBPs are, first and foremost, guideposts, whose practical feasibility and actual success will depend on the utilisation of appropriate means, including legal measures and financial resources. Therefore, it is important that Member States have the necessary resources and tools in place, rather than merely policy targets, to facilitate the effective rollout of broadband infrastructure on their territories.

The following figure shows a visualization of the broadband targets of the Member States in comparison to the DAE connectivity targets.

European Commission

National broadband plans

MS	NBP-Targets	MS	NBP-Targets
Austria	99 % coverage with 100 Mbps by 2020	Italy	100 % coverage with 30 Mbps by 2020. 85 % HH penetration of 100Mbps services by 2020
Belgium	50 % HH penetration with 1 Gbps by 2020	Latvia	100 % coverage with 30 Mbps by 2020. 50 % HH penetration with 100 Mbps service by 2020
Bulgaria	100 % coverage with 30 Mbps by 2020. 50 % of households and 80 % of businesses subscribing >100 Mbps by 2020	Lithuania	100 % coverage with 30 Mbps by 2020. 50 % penetration with 100 Mbps by 2020
Croatia	100 % coverage with 30 Mbps by 2020. 50 % HH penetration with 100 Mbps service by 2020	Luxembourg	100 % coverage with 1 Gbps by 2020
Cyprus	100 % coverage with 30 Mbps by 2020. 50 % HH penetration with 100 Mbps service by 2020	Malta	100 % coverage with 30 Mbps by 2020. 50 % HH penetration with 100 Mbps service by 2020
Czech Republic	100 % coverage with 30 Mbps by 2020. 50 % HH penetration with 100 MBps service by 2020	Netherlands	100 % coverage with 30 Mbps by 2020. 50 % HH penetration with 100 Mbps service by 2020
Denmark	100 % coverage with 100 Mbps download and 30 Mbps upload by 2020	Poland	100 % coverage with 30 Mbps by 2020. 50 % HH penetration with 100 Mbps service by 2020
Estonia	100 % coverage with 30 Mbps by 2020. 60 % HH penetration with 100 Mbps by 2020	Portugal	100 % coverage with 30 Mbps by 2020. 50 % HH penetration with 100 Mbps service by 2020
Finland	99 % of all permanent residences and offices should be located within 2 km of an optic fibre network or cable network that enables connections of 100 Mbps by 2019	Romania	80 % coverage with 30 Mbps by 2020. 45 % HH penetration with 100 Mbps service by 2020
France	100 % coverage with 30 Mbps by 2022	Slovakia	100 % coverage with 30 Mbps by 2020.
Greece	100 % coverage with 30 Mbps by 2020. 50 % HH penetration with 100 Mbps by 2020	Slovenia	96 % coverage with 100 Mbps, 4% coverage 30 Mbps by 2020.
Germany	100 % coverage with 50 Mbps by 2018	Spain	100 % coverage with 30 Mbps by 2020. 50 % HH penetration with 100 Mbps service by 2020
Hungary	100 % coverage with 30 Mbps by 2018. 50 % HH penetration with 100 Mbps service by 2020	Sweden	95 % coverage with 100 Mbps by 2020
Ireland	100 % coverage with 30 Mbps by 2020. 50 % HH penetration with 100 Mbps service by 2020, expecting upstream bandwidth around 17 to 21 Mbps.	United Kingdom	95 % coverage with 24 Mbps by 2017

Source: Atene KOM: Study on National Broadband Plans in the EU (SMART 2014/0077) – draft/ongoing.

European Commission

# Funding national broadband plans

In a number of cases, Member States have decided to use extensively the European Investment and Structural Funds (ESIF) — notably the ERDF and the EAFRD — for a total programmed amount of over EUR 6 billion by 2020.

Countries like Poland and Italy plan to invest more than a EUR 1 billion of ERDF each; France, the Czech Republic, Spain and Hungary are in a range of EUR 400 million to EUR 700 million of ERDF each; Croatia, Greece and Slovakia between EUR 200 million and EUR 400 million of ERDF each.

For EAFRD, Italy has programmed the biggest budget on broadband infrastructure amounting nearly EUR 273 million. Germany and Sweden have also allocated significant budget, around EUR 223 million for Germany an EUR 157 for Sweden. Investments from EAFRD planned from the remaining thirteen Member States range from EUR 65 to 0.3 million.

In addition, financial instruments, including the European Fund for Strategic investments and the forthcoming Connecting Europe Broadband Fund, aim at maximising the leverage of public funding dedicated to the roll-out the next generation of broadband networks.

ERDF investment in broadband and digital networks in ESIF Operational Programmes (million EUR)
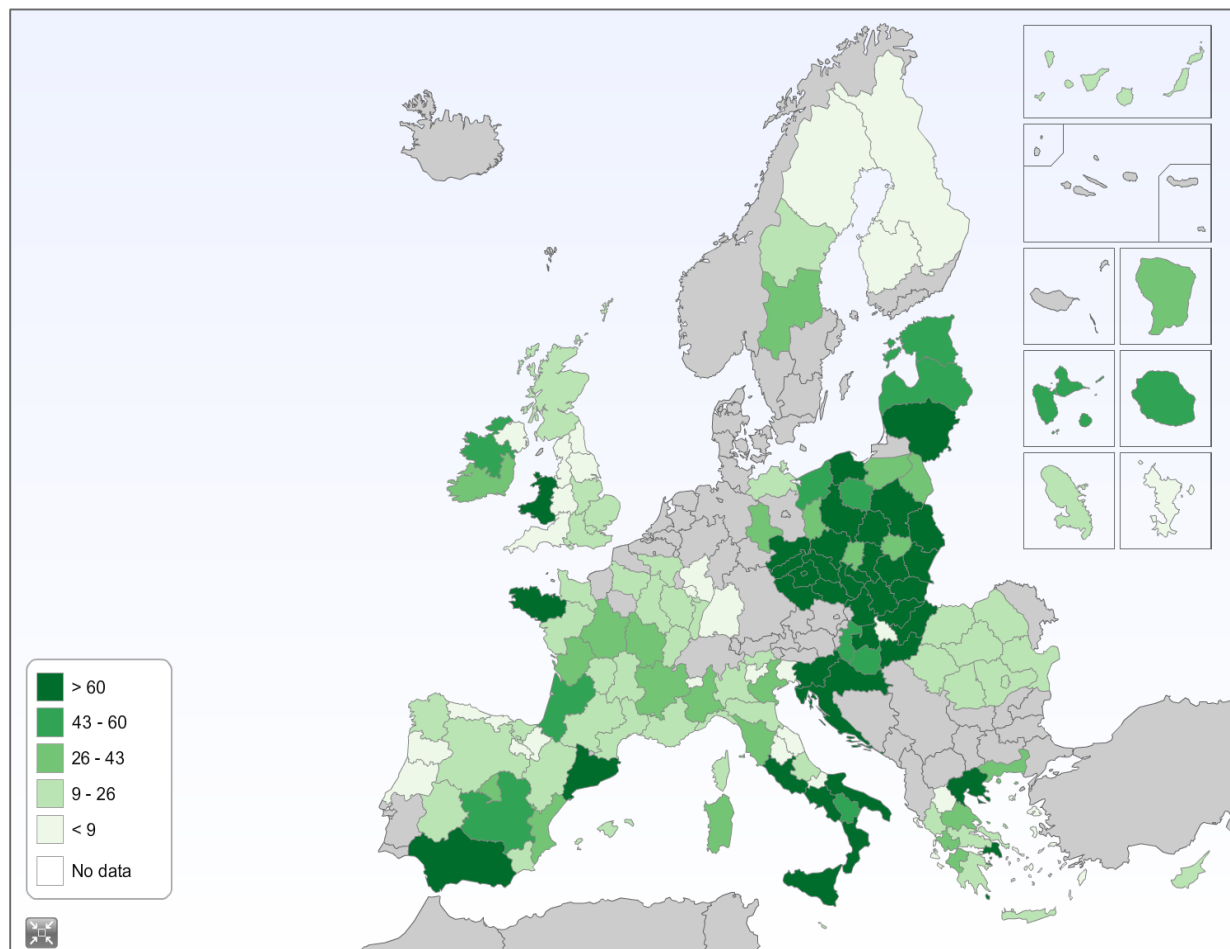
Source: European Commission, ICT monitoring Tool (http://s3platform.jrc.ec.europa.eu/ict-monitoring).

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