

EU4Digital: supporting digital economy and society in the Eastern Partnership

EU BEST PRACTICE REPORT

Promoting competitive broadband





Table of Contents

Table of Contents	1
List of Acronyms & Abbreviations.....	2
Executive summary	3
1 Introduction.....	5
1.1 Context of the report.....	5
1.2 What is broadband?.....	5
1.3 Aim and scope of this report.....	6
2 Key European Union policy documents.....	7
2.1 Digital Compass.....	7
2.2 Digital Decade	8
2.3 European Union`s national trajectories and roadmaps	9
2.4 Chapter conclusions	10
3 European Union legislative documents	11
3.1 European Electronic Communications Code.....	11
3.2 Broadband Cost Reduction Directive	12
3.3 Chapter conclusions	15
4 Instruments for broadband rollout facilitation	16
4.1 Facilitation of competition – market analysis.....	16
4.2 Public investment.....	17
4.3 Adequate internet access service.....	19
4.4 Chapter conclusions	20
5 EU Best practice examples on broadband facilitation policies	21
5.1 Approach for selection and analysis of EU best practice examples.....	21
5.2 German case study.....	22
5.3 French case study	23
5.4 Lithuanian case study.....	24
5.5 Romanian case study	25
5.6 Portuguese case study	26
5.7 Chapter conclusions	28
Annex 1: Digital targets as set forth by the Digital Compass policy programme 2030	29
Annex 2: Broadband market analysis methodology.....	30

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List of Acronyms & Abbreviations

Abbreviations	Definition
BCRD	Broadband Cost Reduction Directive
BEREC	the Body of European Regulators for Electronic Communications
DESI	Digital Economy and Society Index
Digital Compass	2030 Digital Compass: the European way for the Digital Decade
DSL	Digital Subscriber Line
DOCSIS	Data Over Cable Service Interface Specification
EaPeReg	Eastern Partnership Electronic Communications Regulators Network
Eastern partner countries	Armenia, Azerbaijan, Georgia, Republic of Moldova and Ukraine
EECC	European Electronic Communications Code
EU MS	European Union Member State
EU4Digital Facility, EU4Digital	EU4Digital: supporting digital economy and society in the Eastern Partnership – Phase II
ERDF	European Regional Development Fund
FTTA	Fibre to the Apartment
FTTH	Fibre to the Home
FTTO	Fibre to the Office
FTTP	Fibre to the Premises
FTTX	Fibre to the x
Kbps	Kilobits per second
LAN	Local Area Network
KPI	Key Performance Indicator
Mbps	Megabits per second
NRA	National Regulatory Authorities
PI	Public establishment “Placiajuostis Internetas”
PRIP	“Broadband infrastructure development in rural areas” project implemented by PI
RAIN	Rural Area Information Technology Broadband Network project
SMP	Significant market power



Executive summary

Building on the “2030 Digital Compass: the European way for the Digital Decade”¹ (henceforth – Digital Compass) ambition to cover all European households by a Gigabit network through secure and sustainable digital infrastructure, the EU4Digital Facility commenced this EU best practice report on means of promoting access to competitive broadband. The report consists of four key parts to illustrate the EU’s roadmap to broadband facilitation:

- Review of key EU’s policy documents;
- Review of EU’s legislative documents;
- Analysis of instruments for broadband rollout policy facilitation;
- EU Best practice examples on broadband facilitation policies.

Review of key EU’s policy documents

In the EU, broadband facilitation is driven by the Digital Compass ambitions and supported by the Digital Decade policy programme. It sets forth EU’s ambitions and goals of digital economy to be achieved by 2030. Connectivity is recognised as one of the critical elements to develop and implement digital technologies and services, thus providing benefits to citizens, businesses and governments. The EU Member States (MSs) build their national trajectories and roadmaps to plan the achievement of Digital Compass ambitions.

Review of EU’s legislative documents

The policy documents are supported by legislation, namely, European Electronic Communications Code (EECC) and Broadband Cost Reduction Directive (BCRD). The EECC sets forth the EU’s legal regulatory framework for electronic communications networks and services and harmonises regulatory approach across the EU. The BCRD considers the urban/rural divide and gives guidance on ways to facilitate and reduce the cost of rolling out high-speed electronic communications networks. Both documents are directives, meaning, that while all their measures have to be legally transposed in the EU MSs, the exact form of transposition and practical implementation is under EU MSs discretion.

Analysis of instruments for broadband rollout policy facilitation

There are three main instruments to facilitate broadband connectivity:

- Facilitation of competition through market analysis;
- Public funding;
- Adequate internet access.

The market analysis identifies whether the services, offered by electronic communications markets, are competitive and benefit the consumers. In case the analysis deems market conditions not competitive, the National Regulatory Authorities (NRAs) can apply necessary measures to steer the markets towards effective competition.

Public investment, as it may fall within the scope of state aid is strongly scrutinised and is only permissible under a few conditions. Due to considerable differences between the establishment of broadband infrastructure in urban and rural areas, the public investment can be provided to promote regional development, thus narrowing the urban/rural divide. The state support measures, investment models and organisation of network facilitating connectivity are selected by the country.

The universal service framework assures that citizens have adequate internet access, regardless of their location or income level. The services to be supported are described in the EECC.

Notably, all three instruments can be applied individually or simultaneously based on the country’s needs and resources.

EU best practice examples on broadband facilitation policy

While the EU sets uniform policy targets, legislation and instruments for broadband facilitation, its implementation differs in the EU MSs. Through the analysis of broadband facilitation policies of Germany, France, Lithuania, Romania and Portugal, the report illustrates the impact of historic background on national

¹ https://commission.europa.eu/system/files/2023-01/cellar_12e835e2-81af-11eb-9ac9-01aa75ed71a1.0001.02_DOC_1.pdf



broadband plans and investments. The different stages of broadband development of the analysed EU MSs are summarised by country below:

- **Germany:** there is limited initiative from the incumbent to facilitate fibre development not only in rural, but also populated cities as current German Digital Subscriber Line (DSL) network correspond to existing broadband demands. Due to limited interest from the private parties triggered by perceived sufficiency of existing broadband transmission capacities, state-led development is expected as a way forward for Germany to facilitate fibre connectivity.
- **France:** France has only recently been increasing fibre development in populated areas. To address the urban/rural divide, the French government and market participants have taken active steps to expand the connectivity in rural areas.
- **Lithuania:** due to strong focus on fibre development, a large part of populated areas has access to fibre networks in Lithuania. While development of broadband in rural and remote areas was supported by several EU projects, administrative challenges continue to hinder further improvements.
- **Romania:** similarly to Lithuania, Romania historically focused on fibre development and has covered substantial territories with fixed broadband. However, to further cover rural and remote areas, Romania has to secure further funding, invest in developing citizens` digital skills and foster competition among mobile operators.
- **Portugal:** early development of fibre infrastructure by the incumbent operator resulted in substantial private investments for populated areas, while rural and remote areas were covered with fibre infrastructure with the support of targeted public subsidies.

Applicability and relevance for Eastern partner countries

#	Policy recommendation	Relevance
1	Establish a broadband as-is baseline and monitor market developments	<p>Setting up a framework which ensures availability of up-to-date market information enabling evidence-based decision making by policy makers, regulatory authorities and stakeholders.</p> <p>May cover but not limited to:</p> <ul style="list-style-type: none"> • Regular data collection and reporting; • Mapping of broadband connectivity, quality and pricing.
2	Adopt and implement broadband policies	<p>The as-is situation differs from one Eastern partner country to another. There is limited opportunity for one-size-fits-all approach but there is room for a harmonised approach to setting common targets.</p> <p>Setting target and taking stock of the state-of-play situation leads to situation when a policy decision may be taken on selecting most appropriate intervention to facilitate roll-out broadband networks.</p> <p>The report suggests the following complimentary scenarios for adapting and implementing broadband policies:</p> <ul style="list-style-type: none"> • Build on existing market situation and facilitate competition for the good of end-users and regulating competitive bottlenecks; • Explore opportunities of using other non-electronic communications infrastructures for facilitating of roll-out of broadband; • Review possibilities of public investment into broadband; • Ensure availability of adequate internet access service.



1 Introduction

1.1 Context of the report

In 2021, the European Commission published a document “*2030 Digital Compass: the European way for the Digital Decade*”² (henceforth – Digital Compass) that establishes digital ambitions, a monitoring system and key milestones for the EU’s digital transformation. The Digital Compass acknowledges that fast and secure connectivity is a prerequisite for businesses and citizens to take advantage of digital opportunities. Thus, one of the ambitions includes covering all European households by a Gigabit network through secure and sustainable digital infrastructure.

In 2022, linked to the Digital Compass, the EU4Digital Facility Phase II has been launched to continue support the Eastern partner countries in key policy areas of the digital economy and society one of which is the Telecom Rules area. Under the Telecom Rules stream of activities, EU4Digital will support Eastern partner countries by facilitating roaming prices reduction, secure 5G connectivity as well as promoting access to fast broadband internet.

The latter activity is aimed at promoting competitive market conditions for broadband internet services in line with EU legislation and best practices in order to improve households’ access to affordable high-speed internet. This report was prepared to contribute to this aim as one of the deliverables of EU4Digital Facility.

1.2 What is broadband?

The European Commission describes broadband as “*high-speed telecommunications systems, i.e. those capable of simultaneously supporting multiple information formats such as voice, high-speed data services and video services on demand*”.³ In other words, broadband technology allows citizens and businesses to use online services and applications. It also builds a foundation for accessible and reliable online public services, for instance, e-health and e-commerce applications. From a technical point of view, in the EU a system can be defined as broadband if it has a capacity equal or higher than 144 kilobits per second (Kbps) while other countries might apply different criteria. It has to be noted that a capacity of 144 Kbps is only likely for newly established broadband, as it advances the capacity gradually increases.

There are two types of broadband networks: fixed, (typically wired) and mobile (wireless). While the latter delivers broadband in a permanent location where it is originally installed, mobile network transmits data wirelessly with typically no location restrictions through a portable modem, telephone or other device.

Fixed broadband consists of three high-speed transmission technologies:

- **Digital Subscriber Line (DSL):** DSL is a broadband technology that provides connection through **copper pairs**, otherwise known as copper telephone access lines. The speed of data transmission depends on the distance between the Central Office and the end user. In most countries, DSL was the first technology deployed for broadband connection purposes. However, due to increasing broadband demand, if there are multiple signals transmitted at the same time, classic DSL cables can encounter signal interference. Also, DSL technology requires high energy consumption for its performance. Lastly, copper cables require investments for their upgrade to be comparable with fibre-based technologies.
- **Co-axial cables:** similarly to DSL technology, co-axial cables transmit signal through **copper pairs** and originally were deployed for TV cable connection. To offer broadband connection, co-axial cables use Data Over Cable Service Interface Specification (DOCSIS) technology. However, since their lines are made from copper, they impose similar disadvantages as DSL technology.
- **Fibre:** fibre technology uses glass infrastructure and uses the glass as a medium by transmitting the data via **laser** light. Due to technical specificities, it does not encounter electromagnetic interference. As a result, it offers less restricted transmission capacity and symmetric transmission⁴. Additionally, it requires less energy consumption to deliver connection, thus corresponding to sustainability goals. As per current practice, copper pairs are replaced with fibre lines where the connection meets the end user to achieve strong connection and low latency, known as Fibre to the X (FTTX). Fibre can be laid all the way to the whole building (e.g., home (FTTH), premises (FTTP), etc.) or only a part of the building (e.g., building (FTTB) or to a concentration point higher in a network hierarchy (cabinet (FTTC)), apartment

² https://commission.europa.eu/system/files/2023-01/cellar_12e835e2-81af-11eb-9ac9-01aa75ed71a1.0001.02_DOC_1.pdf

³ <https://digital-strategy.ec.europa.eu/en/policies/broadband-glossary>

⁴ https://www.ofcom.org.uk/_data/assets/pdf_file/0016/111481/WIK-Consult-report-The-Benefits-of-Ultrafast-Broadband-Deployment.pdf



(FTTA), etc.). Depending on the termination point of the fibre network, the network can be further rolled out by or maintained as is with copper, co-axial and/or ethernet cables.

- **Ethernet:** Ethernet is a broadband technology that connects devices in a local area network (LAN). Essentially, it is a wired protocol that defines the way data is transmitted over a network, including the format of data packets and the rules for transmitting and receiving those packets. It transmits connection through twisted pair cable (such as Cat5 or Cat6) and Ethernet over fibre optic cable. Ethernet supports a range of transmission speeds and while different devices on the network can communicate at different speeds, all devices on the same network must be configured to use the same speed.
- **Mobile broadband** refers to wireless technologies for digital cellular networks, including third generation (3G), fourth generation (4G) and fifth generation (5G) comprised of various mobile technologies (i.e. HSPA, LTE, NR etc.).

Due to EU's 2025 Gigabit society goals on uninterrupted 5G coverage and 100 Mbps networks for all households⁵, establishing 5G mobile broadband has become a key focus area. 5G connectivity requires base stations to be established by short distance from each other to achieve better speed, capacity and latency.

With the broadband demand increasing and requiring larger capacity, the base stations will have to be in higher spectrum ranges and located closer to the end-users. The main synergy between fixed and mobile connections is that in cases where high traffic from 5G networks has to be offloaded, fibre lines can be deployed to transmit data.

1.3 Aim and scope of this report

The aim of this report is to review and analyse EU's policy and regulatory documents as well as best practices of the selected EU Member States (EU MS) in terms of promoting access to competitive broadband internet services, taking into account the potential activities the Eastern Partner countries may implement to facilitate access to very high-speed broadband.

The report consists of the following parts:

1. Analysis of the key EU's policy documents:
 - Digital Compass and Digital Decade programmes;
 - EU MS' national trajectories and roadmaps;
2. Analysis of the key EU's regulatory documents:
 - European Electronic Communications Code (EECC);
 - Broadband Cost Reduction Directive (BCRD);
 - Topic-relevant documents from the Body of European Regulators for Electronic Communications (BEREC) documents.
3. Review of the instruments for broadband rollout facilitation in regard to:
 - Market analysis;
 - Public investment, including state aid aspects;
 - Adequate internet access service.
4. Description of broadband facilitation policies of selected EU MSs (Germany, France, Lithuania, Romania and Portugal).

⁵ <https://5gobservatory.eu/category/gigabit-society/>



2 Key European Union policy documents

The EU's digital policy is a set of initiatives and regulations aimed at promoting the growth of the digital economy and ensuring that the benefits of digital technology are shared by all citizens. It covers a wide range of areas, including data protection, cybersecurity, digital skills, and the development of new technologies such as cloud and cloud storage, artificial intelligence and the Internet of Things.

Important aspect of the EU's digital policy is its efforts to build and strengthen a Single Digital Market, which aims to remove barriers to the free flow of data and to make it easier for businesses to operate across borders within the EU. This includes initiatives to harmonize regulations, strengthen internal market and promote cross-border activities.

The EU is also investing in digital infrastructure and digital skills, to ensure that all citizens have access to fast and reliable broadband and the skills they need to participate in the digital economy. The EU's digital policy is aimed at creating a digital environment that is safe, secure, and inclusive, and that supports the growth of the digital economy while protecting the rights and freedoms of citizens.

2.1 Digital Compass

The EU's Digital Compass is a strategy⁶ for shaping Europe's digital future. It was presented by the European Commission in 2020 as part of the broader European Green Deal and Digital Single Market initiatives.

The Digital Compass sets out a vision for a more digital, sustainable, and inclusive Europe, and outlines a number of key priorities for the EU's digital policy. These include:

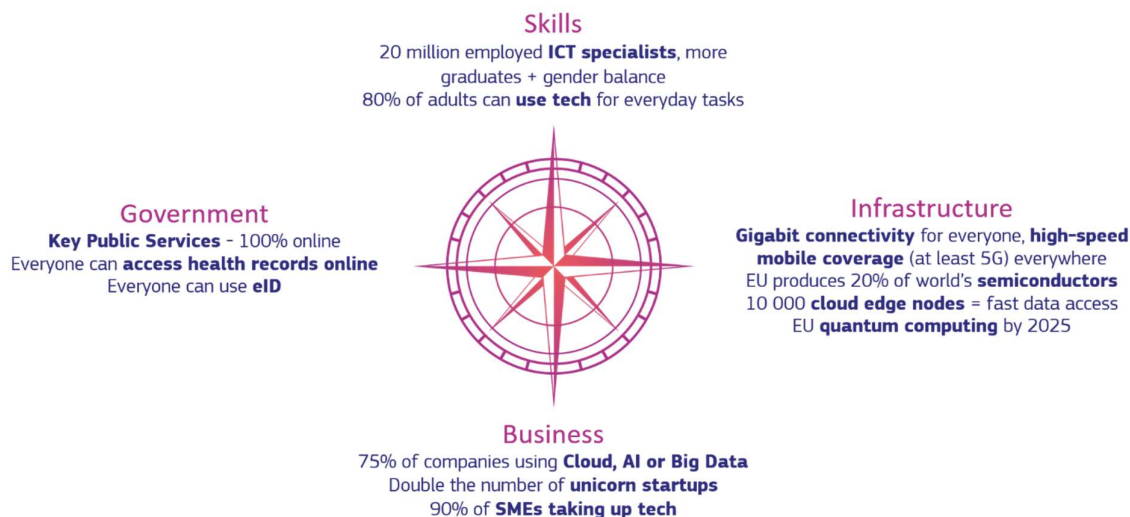
1. **Developing digital skills:** ensuring that 80% of Europeans have the digital skills they need to participate in the digital economy and society;
2. **Digital transformation of businesses:** businesses using cloud computing, big data and artificial intelligence. Emphasis on innovation, growing scale-ups and supporting potential Unicorns;
3. **Digitalisation of public services:** all public services digitalised and available online, digitalisation of medical records and substantial presence of digital ID;
4. **Secure and sustainable digital infrastructures:** very high-speed connectivity for everyone, double EU market share in semiconductor production, secure edge and quantum computing.

The Digital Compass is a beacon of the EU's broader digital strategy and a key element shaping digital policies including of electronic communications in the Europe over the coming years. Covering all dimensions of daily digital lives, the goal is to create a digital environment that is safe, secure, and inclusive, and that supports the growth of overall economy while ensuring the rights and freedoms of citizens.

The Digital Compass has set the following goals to be achieved in the EU by 2030, linked with digital infrastructure (please see Picture 1 below):

- The gigabit connectivity for everyone;
- High-speed mobile coverage with at least 5G coverage.

⁶ <https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52021DC0118>



Picture 1: The Digital Compass (Source: European Commission)

2.2 Digital Decade

Building on the Digital Compass is the Digital Decade policy programme⁷. The programme is a 10-year initiative aimed at harnessing the power of digital technology to create a more sustainable, inclusive, and democratic society. The Digital Decade was launched in 2021 as part of the European Green Deal and the Digital Single Market initiatives.

The Digital Decade has a number of key priorities:

1. **Building a data-driven economy:** encouraging the sharing and reuse of data to support innovation and growth, while ensuring the protection of personal data and the security of critical data.
2. **Fostering digital innovation:** promoting research and innovation in areas such as artificial intelligence, quantum technologies, and cybersecurity.
3. **Closing the digital skills gap:** ensuring that all Europeans have the digital skills they need to participate in the digital economy and society.
4. **Building a sustainable digital society:** promoting the responsible use of digital technology to create a more sustainable and inclusive society.
5. **Ensuring digital sovereignty:** ensuring that Europe remains a leader in shaping the development of digital technology, and that it has control over its own data and digital infrastructure.

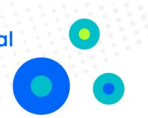
The Digital Decade is a long-term initiative aimed at shaping of the development of digital environment within the European Union over the upcoming 10 years. Its goal is to create a digital environment that supports sustainable and inclusive growth, and that ensures the rights and freedoms of citizens. The EU is closely cooperating with the MSs, businesses, and other stakeholders to achieve these goals and to build a digital environment that works for benefit of citizens and business.

The general objective for the digital infrastructure is the following: *“Ensuring that digital infrastructure and technologies, including their supply chains, become more sustainable, resilient, and energy- and resource-efficient, with a view to minimising their negative environmental and social impact, and contributing to a sustainable circular and climate-neutral economy and society in line with the European Green Deal, including by promoting research and innovation which contribute to that end and by developing methodologies for measuring the energy and resource efficiency of the digital space”⁸.*

The Programme sets forth clear and measurable targets to be achieved within the EU by 2030. In the domain of digital connectivity, the following target is defined to reflect secure, resilient, performant and sustainable digital infrastructures: *“All end users at a fixed location are covered by a gigabit network up to the network termination*

⁷ <https://eur-lex.europa.eu/eli/dec/2022/2481/oj>

⁸ https://www.europarl.europa.eu/doceo/document/TA-9-2022-0414_EN.html



point, and all populated areas are covered by next-generation wireless high-speed networks with performance at least equivalent to that of 5G, in accordance with the principle of technological neutrality”⁹.

Further digital targets beyond the connectivity element may be found in the Annex 1 of this report.

The Digital Decade programme mandates the European Commission to review the digital targets and the relevant definitions by 30 June 2026. As a result of monitoring exercise, the European Commission shall submit a report to the European Parliament and to the Council regarding the outcome of the review. Additionally, it shall submit a legislative proposal to amend the digital targets where it is necessary to address technical, economic or societal developments in order to achieve a successful digital transformation of the EU.

The monitoring exercise itself shall be completed on annual basis and the specific Key Performance Indicators (KPIs) shall be set out by the European Commission. The exercise will also be based on the data collected by the EU’s Digital Economy and Society Index (DESI) – a yearly published index that monitors EU MSs digital performance and their progress in the area. Importantly, the KPIs shall be related to the DESI indicators already monitored but shall not be limited to. For this purpose, the European Commission shall adopt an implementing act. The Digital Decade policy programme cooperation cycle is demonstrated in Picture 2 (please see below).



Picture 2: Digital Decade policy programme cooperation cycle (Source: European Commission)

2.3 European Union’s national trajectories¹⁰ and roadmaps

A two-layer approach to coordination of efforts and co-operation is foreseen by the decision:

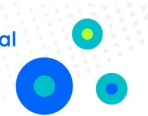
1. The EU’s projected trajectory whereby the European Commission in in close cooperation with the EU MSs, shall establish the EU level projected trajectories for each of the digital targets;
2. National projected trajectories, whereby the MSs shall develop and set forth their national trajectories contributing to achieving the relevant digital targets that are measurable at national level.

The national trajectories are part of national roadmaps which shall be submitted to the European Commission by 9 October 2023. Apart from the trajectories, the roadmap shall cover:

1. The main planned, adopted and implemented policies, measures and actions that contribute to achieving the general objectives and the digital targets;
2. The timing and expected impact on achieving the general objectives and the digital targets, of the planned, adopted and implemented policies, measures and actions referred to in point (a).

⁹ https://www.europarl.europa.eu/doceo/document/TA-9-2022-0414_EN.html

¹⁰ means the projected path per digital target until 2030, to achieve the digital targets set out in Article 4, on the basis of historical data where available, Art.2 (5)



When designing their roadmaps, the EU MSs shall estimate the investments and resources needed to contribute to the general objectives and digital targets. Also, it shall include a general description of the sources of public or private investments, and, where applicable, the planned use of the EU's programmes and instruments. The national roadmaps may include proposals for multi-country projects.

The EU MSs are also encouraged to act on the implementation of targets on a regional scale. The process shall be supported by the European Commission by providing guidance in preparation of their national roadmaps.

In a situation where progress in achieving one or more of the digital targets is regarded to be insufficient by:

1. The European Commission and the EU MSs;
2. Where significant gaps and shortages have been identified on the basis of the results of the Report on the Digital Decade.

The European Commission and EU MSs shall cooperate with each other to identify ways to address the shortcomings.

In terms of timing for co-operation two milestones are being identified:

1. Within 2 months of the publication of an annual report (first report shall be prepared by 9 January 2024), the European Commission and the EU MSs shall endeavour to discuss the EU MSs preliminary observations, in regard to policies, measures and actions recommended by the European Commission in its report;
2. Within 5 months of the publication of the second report and every second year thereafter, the EU MSs concerned shall submit to the European Commission adjustments to their national roadmaps consisting of policies, measures and actions they intend to undertake.

If, however, an EU MS considers that no action is required and that its national roadmap does not require updating, it shall provide its reasons to the European Commission.

2.4 Chapter conclusions

The connectivity aspect is recognised as critical element of the EU digital policy by EU level policy documents. It enables the development and implementation of digital technologies and services that benefit citizens, businesses, and governments. The EU also recognises that high-quality connectivity, such as high-speed internet and 5G mobile networks, is essential for ensuring that all Europeans can fully participate in the digital economy and society.

One of the primary goals of the EU's digital policy is to ensure that all citizens have access to affordable, reliable, and high-quality connectivity. This includes both fixed and mobile networks, as well as other forms of connectivity such as Wi-Fi hotspots and satellite broadband, meaning – the approach shall meet the principle of technological neutrality, as long as the relevant KPIs are met.

Implementation and monitoring of EU level connectivity targets are further supported by number of legislative documents, enabling certain mechanisms further reviewed in this document.



3 European Union legislative documents

3.1 European Electronic Communications Code

In 2018 the EU adopted the European Electronic Communications Code (EECC)¹¹ in form of a Directive. The EECC sets forth the EU's legal regulatory framework for electronic communications networks and services and harmonises regulatory approach across the EU.

The EECC codifies previously existing separate directives into a consolidated regulatory framework. It is aimed at laying out forward-looking and simplified rules that facilitate the provision of very high quality, secure, and affordable telecommunication services throughout Europe.

The provisions of the EECC covers a variety of areas related to regulation of electronic communications networks and services within the EU:

- Regulatory governance;
- Market entry;
- Consumer protection;
- Management of scarce resources;
- Symmetric and asymmetric regulation;
- Universal service;
- Other relevant areas related to facilitation of connectivity.

From a regulatory and legislative perspective, the EECC considers latest technological and market developments and provides guidance through binding provisions on achieving policy targets via a harmonised process. In 2025, the European Commission is planning to publish a review of implementation and functioning of the EECC.

Scope: electronic communications networks and services

As opposed to previous iteration of the EU regulatory framework, the EECC also covers market players. Previously, they were not deemed to be participants of electronic communications market.

When it comes to networks¹², considering the overall policy target, a particular type is recognised – very high-capacity network¹³.

When it comes to services¹⁴, three subservices are identified:

1. Internet access service;
2. Interpersonal communications service;
3. Services consisting wholly or mainly in the conveyance of signals.

The interpersonal communications service is further broken down into:

1. Number-based interpersonal communications service¹⁵;

¹¹ <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1547633333762&uri=CELEX%3A32018L1972>

¹² transmission systems, whether or not based on a permanent infrastructure or centralised administration capacity, and, where applicable, switching or routing equipment and other resources, including network elements which are not active, which permit the conveyance of signals by wire, radio, optical or other electromagnetic means, including satellite networks, fixed (circuit- and packet-switched, including internet) and mobile networks, electricity cable systems, to the extent that they are used for the purpose of transmitting signals, networks used for radio and television broadcasting, and cable television networks, irrespective of the type of information conveyed.

¹³ either an electronic communications network which consists wholly of optical fibre elements at least up to the distribution point at the serving location, or an electronic communications network which is capable of delivering, under usual peak-time conditions, similar network performance in terms of available downlink and uplink bandwidth, resilience, error-related parameters, and latency and its variation; network performance can be considered similar regardless of whether the end-user experience varies due to the inherently different characteristics of the medium by which the network ultimately connects with the network termination point.

¹⁴ service normally provided for remuneration via electronic communications networks, which encompasses, with the exception of services providing, or exercising editorial control over, content transmitted using electronic communications networks and services, the following types of services: (a) internet access service' as defined in point (2) of the second paragraph of Article 2 of Regulation (EU) 2015/2120; (b) interpersonal communications service; and (c) services consisting wholly or mainly in the conveyance of signals such as transmission services used for the provision of machine-to-machine services and for broadcasting.

¹⁵ an interpersonal communications service which connects with publicly assigned numbering resources, namely, a number or numbers in national or international numbering plans, or which enables communication with a number or numbers in national or international numbering plans.



2. Number-independent interpersonal communications service¹⁶.

Facilitation of connectivity: competition and universal service

Under Article 3 of the EECC, it is aimed at four key targets:

1. **Promote connectivity** and access to, and take-up of, very high-capacity networks, including fixed, mobile and wireless networks, by all citizens and businesses of the EU;
2. **Promote competition** in the provision of electronic communications networks and associated facilities, including efficient infrastructure-based competition, and in the provision of electronic communications services and associated services;
3. **Contribute to the development of the internal market** by removing remaining obstacles to, and facilitating convergent conditions for, investment in, and the provision of, electronic communications networks, electronic communications services, associated facilities and associated services, throughout the EU, by developing common rules and predictable regulatory approaches, by favouring the effective, efficient and coordinated use of radio spectrum, open innovation, the establishment and development of trans-European networks, the provision, availability and interoperability of pan-European services, and end-to-end connectivity;
4. **Promote the interests of the citizens of the EU**, by ensuring connectivity and the widespread availability and take-up of very high-capacity networks, including fixed, mobile and wireless networks, and of electronic communications services, by enabling maximum benefits in terms of choice, price and quality on the basis of effective competition, by maintaining the security of networks and services, by ensuring a high and common level of protection for end-users through the necessary sector-specific rules and by addressing the needs, such as affordable prices, of specific social groups, in particular end-users with disabilities, elderly end-users and end-users with special social needs, and choice and equivalent access for end-users with disabilities.

Besides the provisions directly aimed at ensuring rights of the customers, the EECC provides a framework to support facilitation of competition as means of ensuring consumer benefit in the EU MSs. Through ensuring sustainable competition, the EECC expects the electronic communications networks and services to bring to Europe the Gigabit Society benefits with electronic communications at its core.

The EECC also identifies a minimum set of digital services that shall be made available to all or specific users of electronic communications services through universal service provision framework.

The market analysis process, relevant for the Eastern Partnership Electronic Communications Regulators Network (EaPeReg) within the context of the EU4Digital Facility Phase II activities is reviewed in Chapter 4 of this report.

3.2 Broadband Cost Reduction Directive

Directive 2014/61/EU of the European Parliament and of the Council of 15 May 2014 on measures to reduce the cost of deploying high-speed electronic communications networks¹⁷.

An initiative under the Europe 2020 Strategy called Digital Agenda for Europe underlines the importance of broadband connectivity for European growth and innovation for social inclusion and employment. The Digital Agenda sets ambitious coverage and speed targets and requires EU MSs to take measures, including legal provisions, to facilitate broadband investment.

The achievement of Europe 2020 objectives of smart, sustainable and inclusive growth strongly depends on the availability and widespread use of the broadband. A high-quality digital infrastructure underpins virtually all sectors of a modern and innovative economy and is of a strategic importance to social and territorial cohesion. Also, it is the backbone of the Digital Single Market as the source of the EU's growth and competitiveness.

However, the digital divide becomes increasingly important in the context of high-speed broadband as citizens are deprived of not only limited access to information, but also of an entire range of internet-based digital services.

¹⁶ an interpersonal communications service which does not connect with publicly assigned numbering resources, namely, a number or numbers in national or international numbering plans, or which does not enable communication with a number or numbers in national or international numbering plans

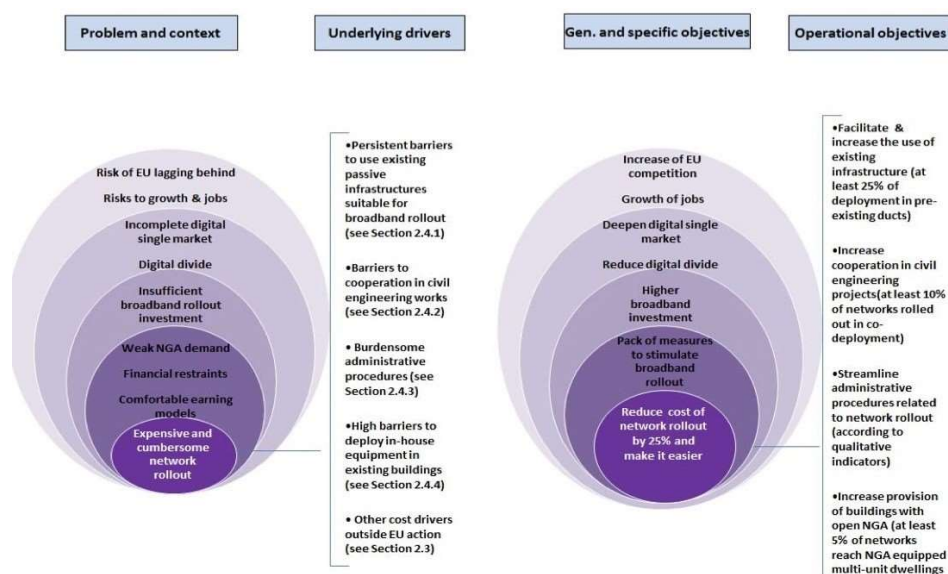
¹⁷ <https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52014DC0118>



According to the European Commission, several factors explain why investments are not occurring in Europe as fast as they do in other parts of the world.

- **Operators typically point to a lack of demand.** Moreover, the blurring boundaries between IT, telecom, broadcasting, and other media have changed the traditional telecommunications eco-system. The convergence of services means that the all internet-relevant industries need to adapt and rethink their strategies, so that value keeps flowing sustainably across the internet value chain. In this context, creation of successful European content offers could significantly contribute, among others, to bigger demand for high-speed broadband.
- **Lack of demand is often linked to a lack of awareness concerning the benefits of broadband and a lack of e-skills.** Based on DESI 2022, the EU MSs differ significantly in citizens` knowledge of basic digital skills: 79% of Finnish population has basic digital skills while in Romania the number reported is 28%. The EU`s population average is only 54%.
- On the other hand, **regions where telecom operators historically profited from well-developed networks tend to be slower in their shift towards high-speed broadband**, as compared to areas where electronic communications networks were relatively under-developed and which leapt forward.
- **The high costs of rolling out networks and the uncertainty concerning future income and returns on investment** are often quoted as factors deterring investment, especially in a climate of financial restraint. This is particularly relevant in rural and sparsely populated areas, where rollout necessarily involves higher costs.

The BCRD proposes ways to facilitate and reduce the cost of rolling out high-speed electronic communications networks. The rationale of introduction of infrastructure sharing, related to the BCRD, is illustrated in Picture 3 below.



Picture 3 – Rationale of introduction of infrastructure sharing in light of the Broadband Cost Reduction Directive

It is estimated by several studies (OECD 2008¹⁸, WIK 2008¹⁹, Francisco Caio 2008²⁰, Analysys Mason 2008²¹) that up to 80% of the costs of deploying new networks are civil engineering costs. While these costs differ in function of the technology used, similar figures have been advanced by most respondents to the public consultation. The same studies, echoed by feedback from stakeholders, show that a major part of these costs can be attributed to inefficiencies in the rollout process. Some of these inefficiencies can be eliminated and thus costs could be significantly reduced by implementing simple measures, such as a more intensive use of existing physical infrastructure, cooperation with utility companies, and improved coordination of all the actors involved in network rollout.

¹⁸ <https://www.oecd.org/sti/broadband/40629067.pdf>

¹⁹ https://www.wik-consult.com/uploads/media/ECTA_Study_Addendum_2009.pdf

²⁰ <http://www.berr.gov.uk/>

²¹ http://www.connectivityuk.org/wp-content/uploads/2012/08/http___www-broadbanduk6.pdf



Again, according to the European Commission, the implementation of the BCRD aims to create high net benefits for all EU undertakings wishing to deploy broadband. Increased transparency shall generate significant capital expenditure savings on network investments. As a result, there are more opportunities to use existing passive infrastructure, co-deploy broadband across sectors as well as plan faster, easier and cheaper deployment through streamlined permits and high-speed ready buildings.

For owners of passive infrastructure, the BCRD entails an obligation to provide information and to grant access on their infrastructures, which as such produces certain costs. Yet benefits outweigh the costs, in particular given that access would be granted following commercial negotiations, allowing for additional revenues.

While public authorities have expressed concerns regarding the high costs of the measures, there are many synergies between these measures and other measures required by national policy (e.g., disaster prevention) or EU law (e.g., INSPIRE Directive) which would reduce the overall costs.

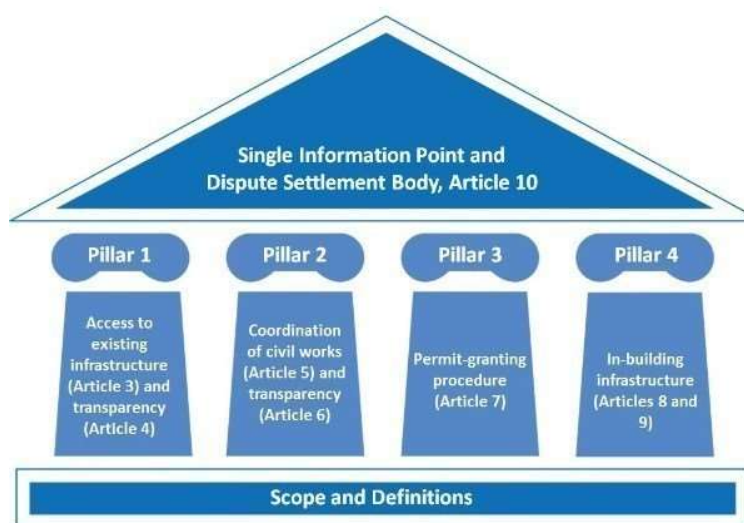
An overall significant positive impact on investment in high-speed networks can therefore be expected under BCRD, and, in consequence, a higher broadband coverage and higher competition:

- Broadband networks can reach areas which would otherwise be thought of as being commercially unattractive.
- Due to the increased network investment, positive macro-effects on the economy would become visible:
 - Spill overs to related industries (equipment manufacturers, civil works companies).
 - Increased innovation and productivity for all undertakings including SMEs.
- An overall positive effect on the EU competitiveness through faster smart grid, intelligent transportation systems deployment and related energy efficiency gains.
- Such harmonisation measures would also lower barriers to entry especially for smaller operators and would significantly reduce fragmentation in the Digital Single Market.
- As far as social impacts are concerned, the BCRD ensures significant positive impacts on investment and thus also on the labour market.
- The increased infrastructure sharing and coordination of civil works would also guarantee a reduction of public nuisance.
- Given the cross-sector character of the measure, increased synergies could lead to a significant environmental impact through faster deployment of smart grids and intelligent transportation systems and therefore to energy efficiency gains.

Overall, the BCRD covers four major areas activity facilitating broadband rollout (please see Picture 4 below):

- Pillar 1: Access to & transparency of existing physical infrastructure;
- Pillar 2: Coordination & transparency of planned civil works;
- Pillar 3: Permit granted;
- Pillar 4: In building infrastructure;

It should be noted that dispute resolution body & single information point are the areas where facilitation of activities are typical obligations of national regulatory activities.



Picture 4: The activity pillars of the Broadband Cost Reduction Directive



By supporting the implementation of the four pillars, it is expected that the EU MSs will cover the logical cycle of activities required for ensuring access to infrastructure. Thus, it can be used for deployment of what is expected to be very high-capacity broadband networks. For the EU MSs, the implementation date of the BCRD was 1 July 2016.

3.3 Chapter conclusions

The chapter discussed two prominent EU legislative documents – the EECC and the BCRD. The EECC establishes a unified legal regulatory framework for electronic communications networks and services, thus harmonising regulatory approach across the EU. Significantly, it includes market players which previously were not deemed to be participants of electronic communications market. Also, the EECC also discusses facilitation of connectivity through promotion of connectivity, competition and interests of the EU citizens as well as contribution to the development of the internal market.

Currently under review process, the BCRD is one of the available tools for the EU MSs to both facilitate rollout of electronic communications networks and strengthen the competition in electronic communications services markets. The BCRD aims to increase broadband coverage and competition among market participants.

Since both of these documents are directives, the EU MSs use discretion when transposing and implementing them in their national legal settings. While the EECC lays down provisions targeted at ensuring rights of the customers and fostering sustainable competition, the decision on broadband rollout facilitation instrument is under the EU MS discretion. In case of the BCRD, the EU MS has to ensure that not only necessary legislation is adopted on national level transposing the BCRD, but also that the four pillars described above being properly implemented in practice for the BCRD to have an impact on electronic communications networks.



4 Instruments for broadband rollout facilitation

4.1 Facilitation of competition – market analysis

The EU4Digital Facility under the Phase I activities has developed guidance for the Eastern partner countries for the implementation of the market analysis process, as provided by the EU electronic communications regulatory framework. The guidance is based on:

- Analysis of existing legislative provisions covering the market analysis process (where applicable);
- Identifying legislative gaps between national and EU provisions;
- Providing recommendations and specific legislative proposals in form of draft legislation.

It is a core activity of EU4Digital Facility Phase II to complete a round of market analysis in broadband markets of the Eastern partner countries.

The market analysis itself is aimed at ensuring that the EU citizens benefit from competitive electronic communications markets. Where, however, the market conditions are not deemed to be effectively competitive, NRAs shall implement measures both facilitating competition and steering markets towards predefined situation – effective competition.

Under the EU electronic communications regulatory framework, the process itself consists of five integral elements and is cyclical in its nature, as illustrated in Figure 1 (please see below).

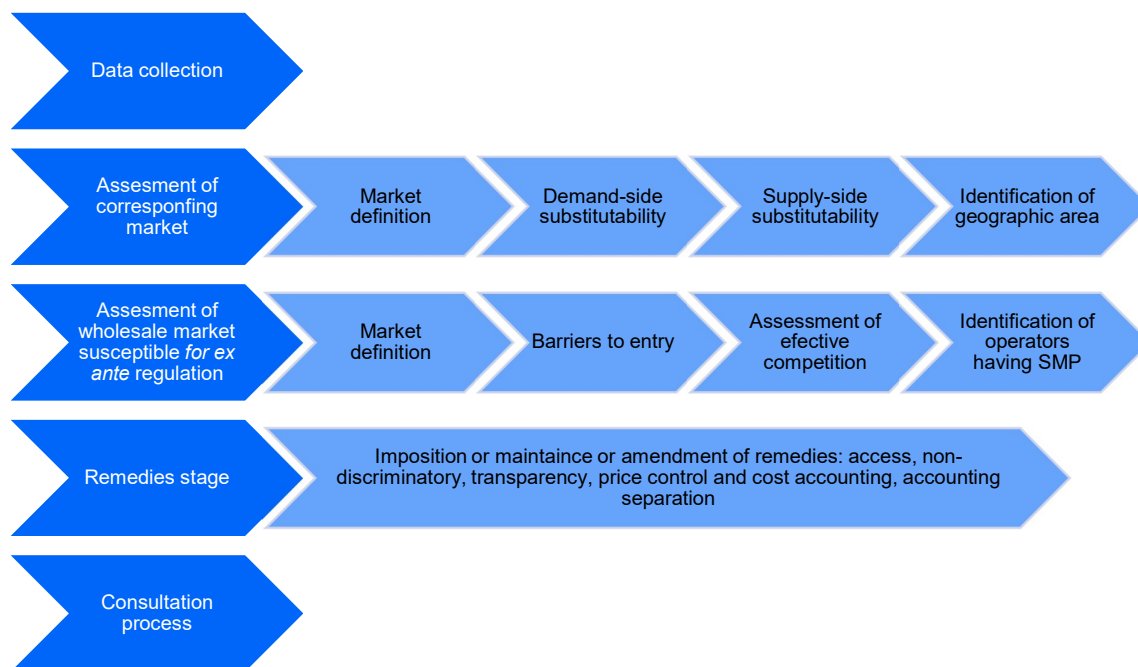


Figure 1: elements of market analysis process

The elements are linked through a sense that there is a dependability of completion and certain conditions have to be met in order to conclude the process. As part of the process, the NRA on a regular basis;

1. **Define the relevant markets**, applying the Recommendation of relevant markets as a starting point: The first step in the market analysis process is to define the relevant markets that will be analysed. This includes identifying the specific electronic communications services that are being offered within the same products and services market, as well as the geographic areas where those services are available.
2. **Identify market players**: this step identifies the market participants that are active in the relevant markets, covering various technologies of provision services.



3. **Conduct a market review:** a review of the relevant market to determine whether there are any competition issues that need to be addressed. This includes analysing market indicators such as market share, barriers to entry, and the behavioural patterns of market participants, etc.
4. **Designate companies as having significant market power** (if appropriate): if a market participant enjoys significant market power, it can designate that market as Significant Market Power (SMP) undertaking in the relevant market. This designation allows the NRA to impose certain regulatory obligations on the market participant to ensure and facilitate competition in the market.
5. **Review:** under the EU law, the impact of any regulatory measures that have been imposed on the market has to be conducted. This includes monitoring market developments over time to determine whether the regulatory measures are still necessary and may lead to either revision or repeal of imposed obligations.

For more information, please see Annex 2.

The market analysis has been highlighted by the EaPeReg as a high priority topic and is also recognised as a key tool for ensuring consumer benefit under the EU electronic communications framework. Significantly, evidence-based market decisions are both prepared and adopted through the market analysis process. It is also integral that decisions on regulatory intervention are revised on a regular basis to ensure the reflection of the latest technological and market developments and ensure that the markets are steered towards desired outcome by the least intrusive regulatory intervention.

4.2 Public investment

Member States may decide to directly or indirectly invest in infrastructure ensuring access to internet or certain parts thereof. It may, however, be the case that such funding may provide advantage of the recipient in terms of its market position and be considered state support (aid). Under the concept of state aid, provision of any state-controlled resources that provide an advantage to a specific market participant or sector and is deemed to distort competition within the European Union is deemed state aid. State aid is prohibited under the EU competition law, as it can give an unfair advantage to certain market participants over others, harm competition, customers and the Single Market.

However, there are certain circumstances in which state aid may be permissible. The European Commission has established a set of rules, known as the “European Union State Aid”, that allow EU MSs to provide aid to market participants under the following conditions:

- Promote regional development;
- Support research and development;
- Protect the environment.

In order to ensure that state aid does not distort competition or harm the single market, the European Commission closely scrutinizes any aid measures proposed by EU MSs. The European Commission evaluates whether the aid is necessary, proportionate, and well-targeted, and whether it will have a positive impact on the EU economy as a whole. If the European Commission determines that a proposed measure is not in line with the EU’s state aid rules, it may require the MS to modify or withdraw the measure.

The EU policy targets in digital infrastructure area and, in particular, the rollout of very high-capacity networks and/or bridging the urban/rural connectivity gap foresee substantial investments from both private and public sources, where appropriate. The public part of investment shall comply with the EU state-aid rules.

The European Commission has published a communication – **Guidelines on State aid for broadband networks**²² to assess whether the proposed activities are compliant with the requirements of the EU law²³,

However, the burden of proof whether a measure is compatible with state aid rules rests with the MS that provides the aid. If the MS cannot demonstrate that the aid is necessary, proportionate, and well-targeted, the aid may be deemed non-compliant with the EU state aid rules.

Consequently, the guidelines enable the EU MSs anticipating the potential reaction, if any, of the European Commission towards the proposed measure. Therefore, the EU MSs tend to apply non-discriminatory open

²² <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023XC0131%2801%29&qid=1675764915102>

²³ Articles 106(2), 107(2), point (a), and 107(3) point (c) of the Treaty of Functioning of the European Union



access to the funded broadband infrastructure as it is generally considered a prerequisite for State Aid to be consistent with competition law²⁴.

The guidelines recognise a particular role that the NRAs play within the regulatory framework. They have an in-depth understanding of market developments due to a range of responsibilities assigned under sector-specific regulation.

The policy makers (decision makers) are encouraged to liaise with the NRAs on:

- Identification of target areas (mapping and public consultation);
- Assessment of the fulfilment of the step change requirements;
- Conflict resolution mechanisms, including in the event of disputes in relation to any of those aspects.

On the other hand, there is also a requirement to consult NRAs concerning:

- Wholesale access products, conditions and pricing;
- Existing infrastructures that are subject to ex ante regulation.

It is recognised that in different EU MSs, there may be different distribution of tasks among the relevant governmental bodies. Moreover, not every NRA has competences in the area of state aid. However, if they do, the EU MS should send the NRA a detailed description of aid measures at least 2 months prior to a state aid notification to the European Commission and allow the NRA to have a reasonable period of time to provide its opinion.

National implementation of public investment for broadband facilitation

According to BEREC, almost all EU MSs have state aid schemes or umbrella schemes for broadband roll-out, with the exception of Belgium and Malta (please see Table 1 below). The latter did not qualify for a state aid approach as there is 100% penetration of very high-speed broadband.

Table 1: State support measures for broadband facilitation in the EU

#	State support measures for broadband facilitation	Available	Not available
1	State Aid scheme	AT, BG, CZ, DE, DK, EE, EL, ES, FI, FR, HR, IE, IT, LT, LV, NL, PL, PT, RO, SE, SI, SK, UK	BE, MT
2	Umbrella scheme notified to the Commission	AT, CZ, DE, EE, FI, FR, HR, IT, PL, SE, SI, UK	BG, DK, EL, ES, IE, LT, LV, NL, PT, RO

The approach to broadband facilitation varies substantially from EU MS to another, not least because of the national market conditions. Based on those an appropriate measure is selected, aimed at meeting the common EU targets for connectivity.

The European Union outlines 3 investment models for the purposes of publicly funded projects:

1. **Investments in the operator subsidy or gap funding model:** the public authority subsidises one network provider to either build a network or to upgrade its existing network. The subsidy covers the gap between the costs necessary for the investment and the operation over a certain time and the expected revenues. The operator becomes/remains the owner of the new/upgraded infrastructure.
2. **Investments in the publicly run municipal network model:** the public authority builds a broadband network. A newly established company or a dedicated division within an existing utility deploys the network directly or through standard procurement to the market. The public authority remains the owner of the network and runs operation and maintenance. The network is generally made available to all market players.
3. **Privately run municipal network model:** the public authority builds a passive network and remains its owner. However, the network is leased to a private network operator who brings in active elements and runs the network for a certain period under the condition of fair and non-discriminator open access for other operators.

²⁴<https://www.berec.europa.eu/en/document-categories/berec/reports/berec-analysis-of-individual-nras-role-around-access-conditions-to-state-aid-funded-infrastructure>



According to BEREC, the EU MSs have opted for the five different investment models (please see Table 2 below).

Table 2: Investment models

#	Investment model	Applied in
1	Operator subsidy model (gap funding)	AT, CZ, DE, DK, EE, ES, FI, FR, HR, IT, NL, PL, PT, RO, SE, UK
2	Publicly run municipal (regional) network model	AT, ES, FR, HR, LT, LV, UK
3	Privately run municipal (regional) network model	AT, BG, DE, FR, HR, IT, RO, UK
4	Private Public Partnership (PPP)	FR, HR
5	Concession Model	EL

An important point on a specific approach – running a new network facilitating connectivity, it can be organised as vertically integrated or wholesale-only business, with the former only run in Germany (please see Table 3 below).

Table 3: Organisation of network facilitating connectivity

#	Model	Applied in
1	Wholesale only model	BG, EE, EL, LT, LV, NL, PT, SE, SI
2	Integrated wholesale plus retail model	DE
3	Both models	AT, DK, ES, FI, FR, HR, IT, PL, RO, UK

Given the applicable rules for the public investment are met, measures designed and implemented by governments to support rollout of and access to very high-speed internet networks and services provide a viable way forward to meet the policy connectivity targets, by applying one of the approaches already employed by EU MSs.

4.3 Adequate internet access service

Under the EECC, the EU MSs are required to ensure that specific groups of users have access to specific digital services.

The services that are required to be supported by the access service are the following:

- E-mail;
- Search engines enabling search and finding of all type of information;
- Basic training and education online tools;
- Online newspapers or news;
- Buying or ordering goods or services online;
- Job searching and job searching tools;
- Professional networking;
- Internet banking;
- eGovernment service use;
- Social media and instant messaging;
- Calls and video calls (standard quality).

The EECC²⁵ specifically describes that EU MSs shall ensure that all consumers in their territories have access to:

- Available adequate broadband internet access service at an affordable price, in light of specific national conditions.
- Voice communications services at the quality specified in their territories, including the underlying connection, at a fixed location.

²⁵ Art.84



It further requires the BEREC to:

- Contribute to consistent application of the provision;
- Publish a report on the EU MSs` best practices to support implementation of harmonised approach to defining adequate broadband internet.

This approach provides a principle for measuring KPIs for electronic communication services. These KPIs are not set by BEREC. However, in case the KPIs are set for the services, meeting those KPIs shall enable the customers using the digital services as outlined above, with calls and standard definition video calls being the most capacity intensive.

Through universal service framework and ensuring the availability of adequate internet access service, the EU MS may promote availability of broadband. However, it is possible that KPIs set forth will not meet the requirements in terms of connectivity targets as set forth by the Digital Compass Programme.

The approach outlined by the BEREC report²⁶, provides a key reference to the report of *Implementation of the Revised Universal Service Directive: Internet Related Aspects of Article 4*²⁷. Based on the report, the functional internet access can be defined by assessing whether the specific data transmission speed on national level is used by:

- At least 50% of all households;
- At least 80% of all households with a broadband connection.

To ensure a harmonised principle, the EU MSs would benefit from a KPI definition, that describes adequate internet access service. Given the existing situation in provision of electronic communications services, it may lead to specific outcomes in the national broadband markets.

4.4 Chapter conclusions

This chapter analyses three instruments for broadband rollout – market analysis, public investment and universal services framework.

The market analysis identifies whether the services, offered by electronic communications markets, are competitive and benefit the consumers. If that is not the case, NRAs apply discretion to steer the markets towards effective competition.

To close the urban/rural divide in regard to broadband infrastructure, the public investment is provided to promote regional development. The state support measures, investment models and organisation of network facilitating connectivity are selected by the country.

Universal service framework is a key tool in electronic communications regulatory framework aimed at ensuring that all citizens have access to basic and affordable electronic communication services, regardless of their location or income level.

It has to be noted that all three instruments can be applied individually or simultaneously based on the country`s needs and resources.

²⁶ https://berec.europa.eu/eng/document_register/subject_matter/berec/reports/9289-berec-report-on-member-states-best-practices-to-support-the-defining-of-adequate-broadband-internet-access-service-ias

²⁷ (COCOM10-31 Final)



5 EU Best practice examples on broadband facilitation policies

5.1 Approach for selection and analysis of EU best practice examples

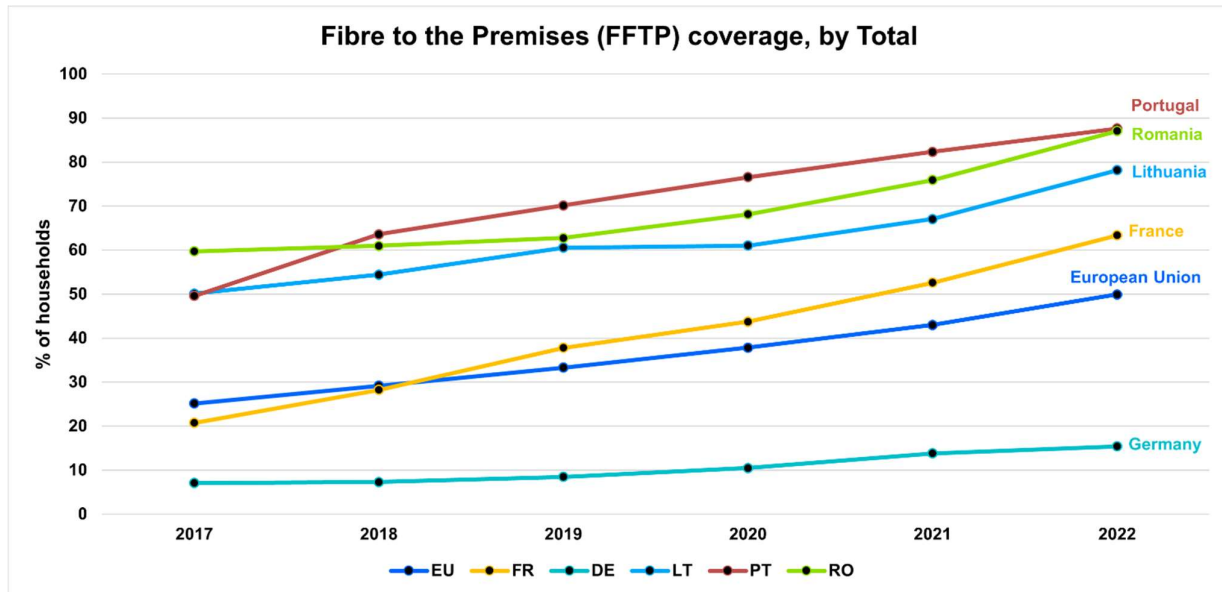
Digital Compass targets set overall expectations for the EU MSs regarding digital development, including fibre infrastructure. Regardless, each EU MS is at different stages of fibre deployment, thus has to adapt the national approaches to implementation to its specific situation. To better illustrate the differences of broadband facilitation policies in the EU MSs²⁸, this report carried out a desk analysis of best practices in five EU MSs – **Germany, France, Lithuania, Romania and Portugal**.

The analysis was based on publicly available policy documents and official data from the EC and national sources. It includes countries' historical starting points, current market situation, existing broadband policies and implementation challenges. For the data analysis, the report referred to DESI reports. The comparison aims to reflect the interaction of deployment of different broadband networks to reach competitive broadband market conditions.

These particular countries were selected as they are at significantly different points of fibre technology deployment:

- Due to large investments in DSL infrastructure in the past, **Germany** is resilient to install new generation fibre lines.
- Similarly to Germany, **France** has a widely established DSL infrastructure, however, recently there have been efforts made to switch to fibre infrastructure.
- From the start of broadband infrastructure development, **Lithuania** and **Romania** focused on deploying fibre lines.
- While historically **Portugal** has developed DSL infrastructure, incumbent operator initiated comparatively early fibre deployment in the country, that was supported by the national authorities.

The differences between the percentage of households, covered by FTTH and FTTB in Germany, France, Lithuania, Romania and Portugal are illustrated in Picture 5. In the following sub-sections, the report will analyse the broadband facilitation policies and projects in Germany, France, Lithuania, Romania and Portugal in more detail.



Picture 5: Fixed broadband coverage by FTTP coverage (Source: European Commission)

²⁸ <https://digital-strategy.ec.europa.eu/en/policies/broadband-eu-countries>



5.2 German case study

Background

Germany historically has developed a strong reliance on DSL (cooper) infrastructure. In the early broadband development, German telecommunications market was privatised, thus limiting the powers of regulatory authorities to facilitate and attract private investments for the establishment of fibre lines.²⁹ As of 2021, only 15% of households have access to an FTTP connection (compared to an EU average of 50%), which places Germany second lowest EU MSs in fibre coverage.³⁰

National broadband plans

German government has acknowledged that limited fibre infrastructure can intervene with digitalisation and economic development agenda. Since 2016, a nation-wide political objective to provide full gigabit network coverage by 2025 was introduced. The same year, the Network Alliance together with German Ministry of Transport and Digital Infrastructure launched an investment plan of EUR 100 billion in fibre infrastructure and a decision to focus on stimulating demand from companies through an information campaign.³¹

According to the national agenda, there are four phases planned for the development of Gigabit society. They include:

1. Reach 50 Mbit/s coverage nationwide by 2018;
4. Offer business establishments fibre optic connection by 2019;
5. Create conditions for nationwide 5G rollout by 2020;
6. Establish full gigabit-enabling infrastructure by 2025.

The agenda suggests creating incentives for businesses to invest in fibre infrastructure. It covers improved legal, regulatory and financial conditions to increase private investments and cooperation among interested parties. Also, the Fibre Optic Expansion Act (DigiNetzG) aims to facilitate synergies among different projects by connecting development of fibre infrastructure together with ongoing or planned infrastructure projects. For easier and less expensive instalment of fibre lines, it is suggested to use shallow or above-ground routing options. Thirdly, the agenda acknowledges the challenges for facilitating broadband development in rural and remote areas. It is planned to encourage market competition by offering public subsidies for infrastructure projects, focusing on less developed commercial and industrial areas as well as ports. Lastly, the agenda discusses the development of 5G networks to improve mobile connectivity.

Additionally, Germany has developed another set of targets, directly related to Digital Compass agenda. It aims to make FTTP available for all German households by 2030 and introduce 15 million new FTTP connections by the end of 2025.

Broadband investments

Notably, several investments into fibre infrastructure have been reported. For instance, Deutsche Telekom will cooperate on network rollout with the help of financial investor 'IFM investors'. 'GlasfaserPlus GmbH' plans to establish FTTH connections for four million households in rural and subsidised areas. Another substantial investment to fibre deployment in rural and underserved areas is designed by Telefónica group and the insurance company Allianz AG³².

Implementation challenges

Regardless of the recent developments, a delay of meeting Digital Compass targets is expected. As mentioned before, the privatisation of broadband networks had a negative impact on the establishment of fibre connectivity. Regardless of the national policy agenda, the incumbent prioritised vectoring technology, thus delaying investments into fibre infrastructure to 2021.³³ As existing DSL infrastructure meets current connectivity

²⁹ Ilgmann, C., & Störr, A. (2020). Telecommunication Networks in Germany—Expanding with a Public Company. *Wirtschaftsdienst*, 100, 614-621. <https://link.springer.com/article/10.1007/s10273-020-2720-5>

³⁰ Digital Economy and Society Index (2022). Country profile – Germany. <https://digital-strategy.ec.europa.eu/en/policies/desi-germany>

³¹ Europe's Digital Progress Report (2017). Country Profile – Germany. <https://digital-strategy.ec.europa.eu/en/policies/desi-germany>

³² Digital Economy and Society Index (2022). Country profile – Germany. <https://digital-strategy.ec.europa.eu/en/policies/desi-germany>

³³ Digital Economy and Society Index (2019). Country profile – Germany. <https://digital-strategy.ec.europa.eu/en/policies/desi-germany>



demands for the majority of German population, there are limited incentives for operators to expand their network to rural areas.

5.3 French case study

Background

France is an example of an EU MS that historically was reliant on DSL technology, but recently has been striving to increase the number of fibre-based connections. The decision has been influenced by increased costs and decreased efficiency of operating existing DSL network together with the new fibre network.³⁴ As of 2021, 63% of households have access to an FTTP connection.

National broadband plans

In 2013, French government announced the National Broadband Plan “Plan France Très Haut Débit” (Plan for Ultra-Fast Broadband in France).³⁵ The overarching goal of the plan is to reduce the digital divide between urban and rural areas. The plan has been updated several times since its release.

Primarily, the French government aimed to achieve a 100% broadband coverage of 30 Mbps or more by 2022. In 2017, they set another goal to provide ‘good high-speed’ Internet (at or above 8 Mbit/s) to all French inhabitants by 2020. Apart from this, in 2018 two network operators made a legal commitment to roll-out FTTH to 13.65 million units by 2020 (namely 37 % of the total housing units in France).³⁶

Plan for Ultra-Fast Broadband was later complemented with Digital Compass targets through which France aims to provide all households fast broadband access by 2022 and a fibre network by 2025.

Broadband investments

To achieve the above-mentioned goals, an investment of EUR 20 billion is planned. The funds are divided based on the existing FTTH developments. For very densely and less densely populated areas, broadband development will be financed from private investments while rural and remote areas will receive public subsidies. It is based on the fact that fibre deployment is a profitable economic activity in the populated areas.³⁷ An additional support of EUR 240 million is planned from the French COVID-19 recovery plan.

Implementation challenges

There are a few main challenges with the achievement of Plan for Ultra-Fast Broadband objectives. Firstly, the incumbent fixed wholesale revenues are still largely depended on copper-related services. As a result, there is little economic incentive to develop fibre infrastructure. Additionally, public sector has delayed the start of activities, thus resulting in around 30% of objectives met by the end of 2019.³⁸

However, France has taken active steps to respond to the challenges. In 2021, “Orange Concessions” was established, 50% owned by incumbent and 50% owned by a consortium made up of La Banque des Territoires (Caisse des Dépôts), CNP Assurances and EDF Invest. It became the leading infrastructure operator in rural areas and undertook the deployment of fibre networks that were originally planned to be built by the public sector. Also, French NRA updated their market analysis for broadband markets for the period 2021-2023 to facilitate the transition from DSL to fibre networks, investments into fibre and creation of “a truly competitive business market”.

Even though France has delayed the achievement of its Digital Compass goals, since 2019 DESI has been reporting around 10 per cent increases in French FTTP coverage every year, 44% in 2019, 53% in 2020 and 63% in 2021 respectively. Given the historical dependency on copper network, it can be suggested that efforts through Plan for Ultra-Fast Broadband have given results. There is still progress to be made as the coverage in rural areas reaches around half of overall coverage (30.5%). According to France’s Recovery and Resilient

³⁴ Neumann, K. H., Plückebaum, T., Schäfer, S., & Eltges, F. (2020). Copper switch-off, fibre take-up and ULL tariffs in France. WIK-Consult Report. <https://www.econstor.eu/handle/10419/251544>

³⁵ Europe’s Digital Progress Report (2017). Country Profile – France. <https://digital-strategy.ec.europa.eu/en/policies/desi-france>

³⁶ Digital Economy and Society Index (2019). Country profile – France. <https://digital-strategy.ec.europa.eu/en/policies/desi-france>

³⁷ Neumann, K. H., Plückebaum, T., Schäfer, S., & Eltges, F. (2020). Copper switch-off, fibre take-up and ULL tariffs in France. WIK-Consult Report. <https://www.econstor.eu/handle/10419/251544>

³⁸ Digital Economy and Society Index (2020). Country profile – France. <https://digital-strategy.ec.europa.eu/en/policies/desi-france>



Plan, broadband and 5G topics remain key investment areas through focusing on digitalisation of businesses, facilitation of digital investments and connecting 1 700 000 additional buildings to fibre.

5.4 Lithuanian case study

Background

In comparison to Germany and France, Lithuania had a different starting point in broadband facilitation. During Soviet occupation, there were limited technological developments in the country. After regaining independence from the Soviet Union in early 1990s, Lithuania prioritised investment in more modern and resilient fibre broadband technology.

Since 2017, Lithuania has been named as one of the EU's best performers in terms of broadband connectivity. According to the most recent data, 78% of Lithuanian households are covered by FTTP connection as of 2021, 18% higher than EU average.³⁹

National broadband plans

Regardless, Lithuania has been facing challenges to expand broadband infrastructure in rural and remote areas. For that reason, there were several different investment projects related to broadband facilitation. In 2014, Lithuanian government introduced a national broadband facilitation plan for 2014-2020 based on the Digital Compass priorities. Lithuania set the following goals to be accomplished by 2020:

- Cover 50% of all Lithuanian household by 100 Mb/s connection;
- Provide 30 Mb/s connection to all Lithuanian households;
- Establish high-speed broadband for 65% inhabitants and 95% of businesses.

This plan aimed to expand fixed and mobile broadband connection in areas that do not receive sufficient private investments and to facilitate broadband competition among operators. In 2021, the National Broadband plan was updated to better encompass the EU's digital targets and respond to limited availability of high-speed connection in rural areas.

Broadband investments

To facilitate private broadband investment in rural and remote areas, Lithuania initiated the Rural Area Information Technology Broadband Network (RAIN) project. The partially EU-funded project was implemented in two phases. During the first phase (2005-2008), RAIN project established 3357 kilometres of fibre infrastructure in white areas, in total connecting 467 villages and 330 schools. In the second phase (2009-2015) the project expanded fibre infrastructure by 5775 kilometres thus providing broadband connection to 700 000 Lithuanian inhabitants.

Corresponding to the objective to facilitate broadband competition among operators, the established fibre lines incentivised the operators to offer broadband connection in rural and remote areas. It is estimated that in total, RAIN project developed infrastructure that reaches 1 million inhabitants.⁴⁰ For its impact in broadband connectivity, the project has received Social and economic impact and affordability award at a Europe-wide competition for a European Broadband Award.⁴¹ The work of RAIN was continued by the "Broadband infrastructure development in rural areas" (PRIP) project (Phase 1 – 2014-2015; Phase 2 – 2016-2018) that focuses on expanding broadband connectivity in farmer and rural tourism homesteads, agricultural and food processing companies, advisory offices, State forests and rural communities.⁴²

From 2021, Lithuania shifted its priorities to the achievement of at least 100 Mbps internet speed in 95% of Lithuanian households by 2025 as reflected in an updated national broadband plan. The plan is being supported by RAIN-3 project that builds upon the successes of the previous partially EU-funded projects described above. RAIN-3 project supports the expansion of broadband infrastructure, specifically, building of communication towers and fibre-optic cables.

Implementation challenges

³⁹ Digital Economy and Society Index (2022). Country profile – Lithuania. <https://digital-strategy.ec.europa.eu/en/policies/desi-lithuania>

⁴⁰ <https://www.placiajuostis.lt/lt/rain-2>

⁴¹ <https://sumin.lrv.lt/en/news/strategic-project-for-lithuania-rain-2-won-the-international-award>

⁴² <https://digital-strategy.ec.europa.eu/en/news/lithuanias-rural-broadband-infrastructure-expansion-rip>



The intermediate analysis of RAIN-3 implementation offers a few significant lessons learned from Lithuania's experience of expanding fibre broadband connection in rural and remote areas. Firstly, the project faces legal issues to receive the municipal approval for building the communication towers. Legally, these towers are considered buildings of special purpose, thus require additional review and prolonged bureaucratic approval process. Some operators have reported discrepancies among municipalities in their interpretation of legal acts that result in different requirements for each building permit.

Another major issue is the decreasing number of inhabitants in rural and remote areas. Insignificant traffic in these areas offer limited incentives for operators to expand the infrastructure.⁴³

Regardless, there has been significant improvement since the start of the first projects in the early 2000s. Significantly, all previously described broadband projects have been organised and managed by the state-owned network operator Placiuostis Internetas (PI). It can be argued that assigning the responsibility to one main implementing body offers consistency and durability of attaining the goals.

5.5 Romanian case study

Background

Romanian path to broadband deployment follows similar historical circumstances as Lithuania. Romania was under a communist regime up until 1990s, thus technological advancements in broadband area were limited. After the Communist rulership ended in 1990s, the country focused on fibre deployment rather than DSL copper lines. As a result, in 2021 the percentage of household which have access to FTTP connection was 37% higher than the EU average, accumulating to the total of 87%.⁴⁴

Since 2015, the broadband market has been deregulated largely due to the emergence of infrastructure-based competition among providers. Consequently, the providers were able to invest in their own broadband infrastructure, such as fibre networks or coaxial cable networks, and compete with other providers based on the quality and price of their services.

National broadband plans

In 2015, Romanian government presented the National Strategy for Romanian Digital Agenda 2020 which aims to achieve the following goals by 2020:

- Fixed broadband coverage for 100% of population out of which:
 - 80% of households accessing over 30 Mbps broadband;
 - 45% of households with subscriptions over 100 Mbps.

The National Strategy was supported by the National Plan for Next Generation Network infrastructure development.⁴⁵ It prioritises the development of fibre networks as close to the end user as possible. The broadband plan also aims to:

- Connect public institutions (public demand aggregation);
- Increase use in public areas;
- Support small and medium-sized enterprises in training, configuring, and implementing infrastructure projects and services;
- Increase accessibility of services, content, and applications development;
- Support consumers' education in digital skills;
- Increase inclusion of disadvantaged groups of users.

In 2021, it was reported that fast broadband and fixed very high-capacity network coverage reached respectively 93% and 87% of households in Romania, thus contributing to the achievement of the Gigabit Society targets.⁴⁶

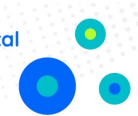
Broadband investments

⁴³ Išankstinis ES fondų investicijų į skaitmeninio junglumo gerinimo veiklą 2021-2027. <https://www.esinvesticijos.lt/lt/dokumentai/isankstinis-es-fondu-investiciju-i-skaitmeninio-junglumo-gerinimo-veikla-2021-2027-m-finansavimo-laikotarpiu-vertinimas>

⁴⁴ Digital Economy and Society Index (2022). Country profile – Romania. <https://digital-strategy.ec.europa.eu/en/policies/desi-romania>

⁴⁵ <https://www.comunicatii.gov.ro/planul-national-de-dezvoltare-a-infrastructurii-ngn/>

⁴⁶ Digital Economy and Society Index (2022). Country profile – Romania. <https://digital-strategy.ec.europa.eu/en/policies/desi-romania>



The national strategy was supported by several broadband investment projects. In 2015, Romania initiated partially EU-funded Ro-NET project of around EUR 70 million. It aimed to address “white areas” that have limited electronic access and electronic distribution communications networks.⁴⁷ The direct beneficiary and recipient of all grants of state aid is the Ministry of Communication and Information Society through a project implementation unit, which will remain the owner of the newly created backhaul infrastructure. In 2019, it was reported that the project expanded broadband infrastructure in 606 localities.

The project was continued with an additional EUR 94 million investment from the Recovery and Resilience Facility, otherwise known as the COVID-19 recovery package. It is planned to identify 700 localities and cover 160 000 households with fibre infrastructure.⁴⁸ This project is expected to be fully completed by the end of 2026. With these measures, Romania can achieve the Gigabit objectives for 2025 and possibly the 2030 Digital Decade targets, as previous project developed backhaul infrastructures capable of speeds up to 10 Gb/s.

To further address the urban-rural digital divide, Romanian Operational Programme for Competitiveness received EUR 100 million funding from the European Regional Development Fund (ERDF).⁴⁹ The broadband development in the rural and remote areas was supported by the LEADER programme with an additional EUR 2 million investment.

Additionally, the Integrated National Platform Wireless Campus’ project for EUR 36.67 million is under implementation. So far, Wi-Fi infrastructure has been built and is operational in over 4000 schools.

Implementation challenges

As illustrated in the beginning of the chapter, Romania is one of the leaders in fast broadband and very high-capacity fixed network coverage. However, the country faces challenges to improve the number of households subscribed to fixed broadband. In 2021, 66% of Romanian households had a fixed broadband take-up, while the EU averaged at 78%.⁵⁰ There are several causes for this comparatively lower fixed broadband take-up:

- **Financing:** one of the biggest challenges in deploying broadband infrastructure in Romania is securing the necessary funding. Although the government has invested significant resources in broadband infrastructure, more funding may be needed to extend coverage to remote and underserved areas.
- **Rural Connectivity:** the cost of deploying broadband infrastructure in rural areas can be significantly higher compared to populated areas, making coverage expansion a significant challenge.
- **Lack of competition:** despite the existence of a competitive broadband market, some areas in Romania are still served by a limited number of providers, leading to less efficient technologies.
- **Regulatory issues:** there have been some regulatory issues that have slowed down the deployment of broadband infrastructure in Romania, such as delays in obtaining construction permits and approvals.
- **Digital skills:** although Romania has made progress in developing digital skills and education, more investment is still needed in this area. Without a skilled digital workforce, it can be difficult to reap full benefits of broadband infrastructure.

It is expected that additional investments from Recovery and Resilience Facility will allow Romania to match the EU averages in the future.

5.6 Portuguese case study

Background

Portugal is a particular case in the topic of broadband infrastructure development. In 1990s, Portugal focused on the deployment of DSL network, similarly to Germany and France, also discussed in this report. To foster the development of telecom services including broadband, the Portuguese government decided to concede the basic network to the incumbent operator Portugal Telecom, attaching certain expectations. It aimed to assure that all Portuguese citizens, regardless of their location, have access to telecom services. The Portuguese government implemented certain safeguards in the concession contract, among which was an open access obligation to the incumbent’s ducts and poles.

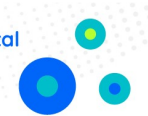
In the 2000s, the incumbent operator identified a business opportunity to foster the development of fibre infrastructure. In 2007, Portugal Telecom announced its decision to start investing into fibre network

⁴⁷ https://ec.europa.eu/regional_policy/en/projects/romania/ro-net-building-broadband-internet-access-to-boost-the-economy

⁴⁸ <https://digital-strategy.ec.europa.eu/en/policies/broadband-romania>

⁴⁹ Digital Economy and Society Index (2020). Country profile – Romania. <https://digital-strategy.ec.europa.eu/en/policies/desi-romania>

⁵⁰ Digital Economy and Society Index (2022). Country profile – Romania. <https://digital-strategy.ec.europa.eu/en/policies/desi-romania>



infrastructure, specifically FTTH. At the same time, the SMP regulation of access to ducts and poles was implemented, which fostered investments by other operators in fibre and the expansion of cable networks.

As a result, Portugal is one of the leading EU Member States in regards to FTTP networks, which covered 91% of households at the end of 2021.⁵¹

National broadband plans

To directly facilitate fibre deployment, Portuguese government adopted multiple legislations. Firstly, the Council of Ministers 2008 resolution defined fibre infrastructure deployment and investments targeted at it as a strategic governmental priority.⁵² It aimed to reach 1 million users connected to next generation networks by 2010.

The Council of Ministers 2008 resolution was followed by a Decree Law 123/2009⁵³ that issued strategic guidelines for the development of fibre infrastructure, including:

- An effective and non-discriminatory access to ducts and related infrastructures;
- Adoption of legislative solution to prevent incumbent operator from monopolizing the access to buildings.

The Decree Law covered four areas – access, database on physical infrastructures, civil work coordination and in-building infrastructures – that were also later reflected in the BCRD, adopted in 2014. It can be argued that the comparatively early development of legislative framework together with a strong SMP regulation of access to ducts and poles of the incumbent supported fibre deployment and allowed Portugal to achieve exceptional results in the area.

Also, in 2021, Portugal updated its Action Plan for Digital Transition to bring focus to the development of digital infrastructure. As a result, the country aims to enable citizens to take advantage of technological opportunities being offered. The plan is a part of Portugal's Recovery and Resilience plan. Importantly, it does not set specific goals for broadband development, but rather incorporates connectivity and broadband infrastructure into the following three pillars of the plan⁵⁴:

2. Capacity building and digital inclusion;
5. Businesses' digital transformation;
6. Public services' digitalisation.

Broadband investment

In Portugal, broadband deployment has occurred mainly through private investments, while public entities have been facilitating targeted investments. In 2009, two of Portugal's operators received an investment from the European Investment Bank of EUR 200 million to facilitate the rollout of FTTH broadband services.⁵⁵ Regarding the development of fibre in rural and remote areas, the Portuguese government launched public competitions for subsidies that will be discussed in more detail below. More recently, there has been an on-going public consultation regarding the regulation of access to the fibre network of the SMP operator in order to increase competition in more remote areas.

Implementation challenges

Similarly to other EU Member States, Portugal had challenges to address the gap between the coverage of fibre in urban and rural area. To address the divide, in 2009 Portugal launched public tenders to provide state aid for new generation access network in rural areas.⁵⁶ The tenders divided Portugal into regions to better grasp the broadband aid required for each region. The Portuguese state aid was approved by the European Commission under the rationale to respond to the need for next generation access networks of citizens and businesses located in rural areas.⁵⁷

In 2022, Portugal also initiated an inter-ministerial working group to:

- Create a national connectivity workplan;

⁵¹Digital Economy and Society Index (2022). Country profile – Portugal. <https://digital-strategy.ec.europa.eu/en/policies/desi-portugal>

⁵²<https://www.anacom.pt/render.jsp?contentId=984614&languageId=1>

⁵³<https://www.anacom.pt/render.jsp?contentId=975261&languageId=1>

⁵⁴Digital Economy and Society Index (2022). Country profile – Portugal. <https://digital-strategy.ec.europa.eu/en/policies/desi-portugal>

⁵⁵<https://www.eib.org/de/press/news/the-eib-contributes-with-eur-200m-to-the-roll-out-in-portugal-of-high-speed-broadband-services>

⁵⁶<https://www.anacom.pt/render.jsp?categoryId=332461>

⁵⁷https://ec.europa.eu/competition/state_aid/cases/236635/236635_1199063_71_2.pdf



- Analyse the demand on population coverage as well as fixed and mobile networks.⁵⁸

This will lead to new public tender to ensure coverage of areas not connected previously.

5.7 Chapter conclusions

Based on the analysis performed, it can be concluded that Germany, France, Lithuania, Romania and Portugal have established their national policies based on an EU Digital Compass agenda. However, due to significant differences in the broadband development, countries have focused on different approaches. Taking into account the starting point, Germany and France prioritised overall fibre broadband development, Lithuania and Romania – rural and remote areas, whereas Portugal is a special case that developed both.

The overarching problem that all five EU MSs are facing challenges to expand broadband in rural and remote areas. There is little economic incentive for operators to offer broadband connection in these areas as there are comparatively less users who can create traffic and generate profit. However, the EU MSs have had different approaches in addressing the issue:

- **Germany:** current German DSL network while not resilient for the future, corresponds to existing broadband demands. Due to this reason, there is limited initiative from the incumbent to facilitate fibre broadband development not only in rural, but also populated cities.
- **France:** France has been increasing fibre development in populated areas, and while limitations to broadband connection in rural areas remain, for the last few years French government and market participants have taken active steps to expand the connectivity in rural areas.
- **Lithuania:** due to strong focus in fibre development, a large part of populated areas has access to fibre networks in Lithuania. Regardless, the country has been facing challenges to facilitate the development in rural and remote areas. While the development was supported by several EU projects, administrative challenges continue to hinder further improvements.
- **Romania:** historically, Romania has focused on the development of fibre network, therefore, substantial part of rural and remote areas currently have access to fibre connection. To foster further development, Romania has to secure additional funding, foster competition among mobile operators and invest in digital skills of citizens.
- **Portugal:** compared to other EU MSs, Portuguese incumbent operator has early identified a business opportunity in fostering the development of fibre infrastructure. It had positive results for fibre infrastructure development not only in populated areas via private investments, but also in rural and remote areas, where fibre deployment was supported by public subsidies.

Based on the Digital Compass ambitions, it can be expected that the EU MSs will continue to focus on fibre broadband development in the future to improve the connectivity of citizens and business as well as contribute to the digital economy.

⁵⁸Digital Economy and Society Index (2022). Country profile – Portugal. <https://digital-strategy.ec.europa.eu/en/policies/desi-portugal>



Annex 1: Digital targets as set forth by the Digital Compass policy programme 2030

(1) a digitally skilled population and highly skilled digital professionals, with the aim of achieving gender balance, where:

- (a) at least 80 % of those aged 16-74 have at least basic digital skills;
- (b) at least 20 million ICT specialists are employed within the Union, while promoting the access of women to this field and increasing the number of ICT graduates;

(2) secure, resilient, performant and sustainable digital infrastructures, where:

- (a) all end users at a fixed location are covered by a gigabit network up to the network termination point, and all populated areas are covered by next-generation wireless high-speed networks with performance at least equivalent to that of 5G, in accordance with the principle of technological neutrality;
- (b) the production, in accordance with Union law on environmental sustainability, of cutting-edge semiconductors in the Union is at least 20 % of world production in value;
- (c) at least 10 000 climate-neutral highly secure edge nodes are deployed in the Union, distributed in a way that guarantees access to data services with low latency (i.e. a few milliseconds) wherever businesses are located;
- (d) the Union has, by 2025, its first computer with quantum acceleration, paving the way for the Union to be at the cutting edge of quantum capabilities by 2030.

(3) the digital transformation of businesses, where:

- (a) at least 75 % of Union enterprises have taken up one or more of the following, in line with their business operations:
 - (i) cloud computing services;
 - (ii) big data;
 - (iii) artificial intelligence;
- (b) more than 90 % of Union SMEs reach at least a basic level of digital intensity;
- (c) the Union facilitates the growth of its innovative scale-ups and improves their access to finance, leading to at least doubling the number of unicorns;

(4) the digitalisation of public services, where:

- (a) there is 100 % online accessible provision of key public services and, where relevant, it is possible for citizens and businesses in the Union to interact online with public administrations;
- (b) 100 % of Union citizens have access to their electronic health records;
- (c) 100 % of Union citizens have access to secure electronic identification (eID) means that are recognised throughout the Union, enabling them to have full control over identity transactions and shared personal data.



Annex 2: Broadband market analysis methodology



Broadband Market
Analysis methodology