Study on post Covid measures to close the digital divide

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Content

1 Introduction 1
2 Literature review 3
2.1 Methodology 3
2.2 Main Findings 4
2.2.1 Digital divide: one concept, multiple facets 4
2.2.2 Causes of the digital divide 8
2.2.3 Evolution of the digital divide during Covid-19 pandemic 12
2.2.4 Impacts and consequences of the digital divide 15
2.2.5 Preliminary recommendations to bridge the digital divide 20
3 Quantitative analysis 30
3.1 Methodology 30
3.2 Main findings 31
3.2.1 Supply 32
3.2.2 Demand 33
3.2.3 Evolution of the digital divide during Covid-19 pandemic 36
3.3 Conclusions 37
4 Interviews 39
4.1 Methodology 39
4.1.1 Identification of key experts 39
4.1.2 Methodology for conducting interviews 40
4.1.3 Elaboration of questionnaires 41
4.1.4 Analysis of the results 42
4.2 Introduction 42
4.3 Results of the interviews 44
4.3.1 Impact of Covid-19 on digital divides 44
4.3.2 Groups affected by digital divides 45
4.3.3 Causes of the digital divide 47
4.3.4 Impact of the digital divide 48
4.3.5 Telecommunication networks performance 49
4.3.6 Highlighted measures 50
4.3.7 List of recommendations suggested by interviewees 50
4.3.8 Conclusions and considerations for the future. 52
5 Case studies 55
5.1 Methodology 55

5.2 Czech Republic 64
5.2.1 Digital divides through their main indicators 64
5.2.2 Initiatives implemented to close digital divides 68
5.2.3 Lessons learnt from the initiatives 72
5.3 Hungary 73
5.3.1 Digital divides through their main indicators 73
5.3.2 Initiatives implemented to close digital divides 78
5.3.3 Lessons learnt from the initiatives 83
5.4 The Netherlands 84
5.4.1 Digital divides through their main indicators 84
5.4.2 Initiatives implemented to close digital divides 89
5.4.3 Lessons learnt from the initiatives 92
5.5 Spain 94
5.5.1 Digital divides through their main indicators 94
5.5.2 Initiatives implemented to close digital divides 98
5.5.3 Lessons learnt from the initiatives 102
5.6 Sweden 103
5.6.1 Digital divides through their main indicators 103
5.6.2 Initiatives implemented to close digital divides 107
5.6.3 Lessons learnt from the initiatives 111
5.7 General conclusions of case studies 112
6 Recommendations 115
6.1 Summary of the challenges to bridge digital divides 115
6.1.1 Lack of broadband coverage and need to accelerate network rollouts in underserved areas 115
6.1.2 Low affordability of telecom services for disadvantaged groups 116
6.1.3 Lack of motivation and low level of digital skills 116
6.1.4 Lack of accessibility of digital services 117
6.2 Specific recommendations for NRAs 117
6.2.1 Recommendations to improve broadband coverage and accelerate network rollouts 117
6.2.2 Recommendations to improve affordability of telecom services 122
6.2.3 Recommendations to improve take-up of telecom services and digital skills 123
6.2.4 Recommendations to improve accessibility of digital services 125
6.3 General recommendations in which NRAs can cooperate 127

6.3.1 Recommendations to improve broadband coverage and accelerate network rollouts 127
6.3.2 Recommendations to improve affordability of telecom services 130
6.3.3 Recommendations to improve take-up of telecom services and digital skills 134
6.3.4 Recommendations to improve accessibility of digital services 139
6.4 Summary of recommendations 141
7 General conclusions 145
Annexes 148
Annex 1: Desk research's bibliography 148
Annex 2: Graphs of the quantitative analysis 154
Annex 3: Additional graphic analysis of the digital divide 182
Annex 4: Questionnaires for interviews 199
Questionnaire for telecommunications operators and other digital companies 199
Questionnaire for National Regulatory Authorities 201
Questionnaire for civil society organisations working to close digital divides 203
Questionnaire for academic experts 205
Questionnaire for public agencies promoting digital inclusion 207
Annex 5: Benchmarking of initiatives implemented across Europe to bridge digital divides and map of actors involved 209
Initiatives implemented at European, international and national level 209
Summary of actors with whom NRAs can cooperate to bridge the digital divide 231

1 Introduction

The digital divide is a clear side effect of the fast-paced digital transformation of the economy and society that has taken place in the last two decades. Digital divides are not new, and, indeed, policy makers and other stakeholders (civil society organisations, development agencies, multilateral institutions) have been struggling to close them for years. During the Covid-19 pandemic, however, digital divides have grown in significance, widening pre-existing inequalities and becoming a key factor of social exclusion.[1] For this reason, closing digital gaps has become one of the top political priorities in Europe.

The digital divide has been extensively studied in the past, and the pandemic has triggered a renewed interest in it. This report intends to provide additional ideas and information about the issue, and to guide the activity of NRAs in closing digital divides. The information included in the report has been elaborated with the use of four methodological resources:

- **Literature review**. Reports, policy briefs, academic articles, position papers and other documents analysing the issue of the digital divide have been reviewed. Firstly, the methodology used to carry out the literature review is explained. After that, the concept of digital divide and its multiple levels are described. The following subchapter is devoted to summarising the main causes of the digital divide, both in the supply and demand side. Then, the evolution of the digital divide during the Covid-19 crisis and its impacts and consequences are analysed. Finally, preliminary recommendations gathered from the literature are presented.
- **Quantitative analysis**. This part of the report is aimed at illustrating and analysing how the digital divide has evolved in BEREC member countries through the use of quantitative and statistical data. This analysis also intends to evidence some of the findings outlined in the literature review, with a specific focus on the consequences of the Covid-19 pandemic. The quantitative analysis is structured in two main subsections. First, the methodology to select the databases, the indicators, and the characteristics of the data analysed is presented. Then, the main findings are shown, taking into consideration the supply/demand framework and the different levels of the digital divide. Finally, visual data in form of graphs and tables for years 2019 and 2020, as well as the effects of the Covid-19 pandemic in the digital divide, are presented in two annexes.
- **Interviews**. Experts in the field of digital divides have been interviewed. Interviews were used to identify the causes and impacts of the digital divide in society, as well as to collect potential recommendations to be implemented by stakeholders concerned (particularly by NRAs) to bridge the digital divide.
- **Case studies**. Practical implementations of measures to bridge the digital divide have been identified and analysed through case studies in diverse BEREC member countries.

The study finalises with a series of specific **recommendations** for NRAs and other general recommendations in which regulators can cooperate with other stakeholders to

[1] (Zheng Y. & Walsham G., 2021)

jointly address the issue of digital divides. The recommendations are structured according to the problems they intend to solve.

2 Literature review

2.1 Methodology

The literature review has been carried out according to these steps:

1. Selection of the most relevant documentation.
2. Analysis and classification of documents.
3. Identification of main ideas from the selected documentation.

Selection of the most relevant documentation

The first step to conduct the literature review has been the selection of the most relevant documentation. To this end, three main sources of information have been considered:

- Reports and studies from European institutions and multilateral organisations.
- Reports and studies from private companies, sectoral associations, and civil society organisations.
- Academic papers.

Regarding the first category, studies and notes generated by the following public institutions and global organisations have been considered: BEREC, Cedefop, Eurofound, European Commission, European Parliament, ITU (International Telecommunication Union), NTIA (National Telecommunications and Information Administration – US Department of Commerce), OECD (Organisation for Economic Co-operation and Development), UN, UNICEF, UNESCO and UNCTAD.

Papers and policy briefs from the following civil society institutions and sectorial associations have been considered: AGE Platform Europe, Alliance for Affordable internet, Digital Future Society, European Association of Service Providers for Persons with Disabilities (EASPD), GSMA, World Wide Web Foundation, World Economic Forum.

Several companies have also contributed to the debate of the impact of the pandemic in the digital divide. We have reviewed literature from Capgemini, Delta Partners, Ericsson, and Plum Consulting.

The selected documents have been found through Google searches. The following topics have been considered to conduct the research:

- Impact of Covid pandemic in digital divide.
- Covid pandemic, digital divide and elderly people.
- Covid pandemic, digital divide and people with disabilities.
- Covid pandemic, digital divide and social inequalities.
- Covid pandemic, digital divide and education.
- Covid pandemic, digital divide and telework.
- Covid pandemic, digital divide and rural areas.
- Covid pandemic, digital divide and digital skills.

The identification of academic papers related to the topics analysed has been carried out by searching in several scientific databases (ScienceDirect, Jstor, IEEE Xplore, ResearchGate and Google Scholar), using combinations of the following search terms:

"Covid-19" AND/OR "pandemic" AND/OR "digital divide" AND/OR "education" AND/OR "rural" AND/OR "internet access" AND/OR "skills" AND/OR "disadvantaged groups" AND/OR "telework".

Another criterium used for the selection of the documentation has been the date of publication. In principle, only literature published after the beginning of the pandemic was selected. However, as the digital divide is a relative old concept, we extended the search to dates before the start of the pandemic in order to explain the different levels of it.

The initial selection has been complemented with cascade research, as the references included in the documents identified have also been analysed.

The total number of documents reviewed is 118.

Analysis and classification of documents

All selected documents have been carefully read and classified to facilitate the analysis. Classification has been made following two main criteria:

- Relevance of the document; whether the document is focused on the analysis of the digital divide and the impacts of the pandemic or whether it addresses these topics in a marginal way. The documents were classified as "very relevant", "relevant" or "of low relevance". The latter (19 documents) were not considered for further analysis.
- Specific topic addressed; the documents were classified according to the specific characteristic of the digital divide they focused on.
    - Definition of the digital divide.
    - Causes of the digital divide.
    - Consequences of the digital divide.
    - Recommendations to close the digital divide.

Identification of main ideas from the selected documentation

Once the documents were classified, the main ideas were extracted and used to compose the following summary of the literature.

2.2 Main Findings

2.2.1 Digital divide: one concept, multiple facets

Digital divide is a concept that has been evolving since its first appearances in the ninety's decade.[2] At that time, the term easily referred to the difference between those with access to new technologies and those without.[3] The OECD defined the digital divide as 'the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access information and communication technologies (ICTs) and to their use of the internet for a wide variety of activities'.[4] Since then, ICTs and digital technologies have experienced a rapid and exponential development. Their impact on individuals, organisations, and the society, have also become increasingly complex. Incipient research on digital divide pointed to the simple (but not less relevant) differences experienced by individuals

[2] (Vassilakopoulou P. & Hustad E., 2021)
[3] (NTIA, 1999)
[4] (OECD, 2001, p. 5)

caused by the dichotomy of having or not having access to internet. Currently, investigations reveal up to three different digital divides and numerous gaps related to them. Moreover, some research streams early started to discuss the use of the concept digital inequalities instead of digital divide due to the intricate relationship between digital divides and classic social inequalities that investigations have been bringing out.[5]

As mentioned above, the very first concept of digital divide, referred to the lack of access to digital technologies and internet, is what currently is called "first level of the digital divide." As result of this divide there are two groups of individuals clearly distinguishable. People on the "correct side" of the digital divide are those who have available internet sources as well as own the means to make the connection possible (hardware and software, e.g., smartphones). It is expected that this group may benefit from using internet and digital technologies. On the "wrong side" are the unconnected people, those who cannot access internet nor ICT or digital technologies because of lack of enabling infrastructure and/or lack of digital devices. Individuals on this side are in a disadvantaged position with respect to the first group.[6]

Back in early 2000s, and due to the growth of people online, some scholars stressed the need to pay attention on how prepared people were to use digital technologies, namely their level of digital literacy.[7] There has been a rapid and wide deployment of broadband infrastructure enabling internet access, especially in developed countries. And, though the first type of digital divide is still present, with 600 million people non covered by mobile internet networks in 2019, which represents 7% of the global population,[8] the lack of access lost relevance as the only barrier to access the internet in developed countries. Until about 2010 the first type of digital divides was the main concern of research and policy making.[9] Thereafter, researchers shifted the focus to digital divide on skills and usage, the so-called "second level of the digital divide".[10]

According to UNESCO, digital skills consist of a 'range of abilities to use digital devices, communication applications, and networks to access and manage information, enabling people to create and share digital content, communicate, and collaborate, and solve problems for effective and creative self-fulfilment in life, learning, work, and social activities at large'.[11] Digital skills can be assessed in several manners. One of them is the internet Skills Scale (ISS), developed and validated by van Deursen, Helsper and Eynon.[12] It is a framework which is applicable for general internet user population. The ISS measures several types of digital knowledge and capacities: operational skills, information navigation skills, social skills, and content creation skills. The logic of the second level of the digital divide states that those people with lower levels or deprived of skills (digital illiterate) may be unable to take advantage of internet and digital technologies use to obtain personal or professional benefits.[13]

[5] (DiMaggio P. & Hargittai E., 2001)
[6] (De R. et al., 2020)
[7] (Hargittai E., 2002)
[8] (Bahia K. & Delaporte A., 2020)
[9] (Van Dijk J., 2020)
[10] (Scheerder A. et al., 2017)
[11] (UNESCO, 2018)
[12] (Van Deursen A., Helsper E., et al., 2015)
[13] (Van Deursen A. & Helsper E., 2017)

The gaps revealed by studies on the second type of digital divides are more complex than those related to the first type. And because of their relationships and parallels with other social inequalities, these gaps suggest that the concept of digital inequalities rather than digital divides is more appropriate.[14] The pioneering studies on the second type of digital divides already highlighted age, gender and education as main factors associated with the lack of skills and low use of digital technologies and the internet.[15] In relation to age, there is a clear difference in the ability and time spent using digital technologies between elderly people and young generations. Some scholars have used the terms digital natives and digital migrants to conceptualise this gap, reflecting the difference between those who are practically born into a digitised world, and those who have grown up in an "analogue" world and now need to go through a process of digitisation.[16] The gender gap is also present in digital divides. Although the digital gender gap is slowly narrowing, women still own fewer digital devices, are less taught in technologies and less confident on their digital skills, and the number of women graduated with IT degrees is far under number of men, among others.[17] Regarding education, the use of computers and internet increases as the level of education does.[18] Furthermore, educational attainment also determines different uses of internet.[19]

Income is the fourth main component influencing digital disparities. At the time of digital technology growth and spreading, income was crucial facilitating the access to technology, both devices and internet access, benefiting those with higher earnings. Reducing income inequalities is expected to narrow digital divides.[20]

Disability is another factor that contributes to widen the first and the second digital divides. According to Scanlan,[21] people with disabilities lag general population in computer and smartphone ownership and internet access. Usage gaps were found, particularly related to online shopping, hiring services over the internet and online banking. Research also shows that the disability digital gap is being progressively closed, although it is still quite significant.

Since about 2015, researchers have detected another type of the digital divide. It refers to the outcomes people obtain from their use of internet and digital technologies. Under this third type, two individuals in equal conditions of internet access and appropriate skills may have different outcomes.[22] When there is a use of internet, in possession of digital skills, that do not translate into beneficial outcomes, the third type of digital divide is revealed.[23] On the contrary, those individuals who benefit from the use of digital technologies in their offline life may experience how these benefits in turn improve their digital skills, becoming a virtuous circle.[24]

[14] (Van Dijk J., 2020)
[15] (Hargittai E., 2002)
[16] (Prensky M., 2001)
[17] (Tarín, C. et al., 2018)
[18] (Nishijima M. et al., 2016)
[19] (Van Deursen A., Van Dijk J., et al., 2015)
[20] (Elena-Bucea A. et al., 2020)
[21] (Scanlan M., 2021)
[22] (Van Deursen A. & Helsper E., 2015)
[23] (Scheerder A. et al., 2017)
[24] (Van Deursen A. & Helsper E., 2015)

The third type of digital divides became more evident when negative outcomes of the use of internet (cybercrime, disinformation, game addiction) did not affect all users equally.[25] It is also closely related to the consequences of the second type of the digital divide (skills and usage) and other contextual factors involved.[26] Its relationship with social inequalities is more intricate than in the other cases.

The third type of digital divides is particularly relevant in those regions or countries where the internet penetration reaches high levels, close to full connectivity. When the digital divides in access and skills are almost closed, differences in outcomes of the internet use become the next issue to be addressed. In their study, Van Deursen and Helsper[27] analysed the impact of socio-economic and sociodemographic characteristics of the population on the offline results produced by their internet activities. The results of the analysis suggest that the internet has an impact on the economic, social, political, educational, and institutional life of individuals. Another interesting conclusion was that inequalities in skills and types of internet use produce similarly unequal outcomes. They concluded that, in general terms, internet use tends to benefit those who enjoy a higher social status.

One of the main conclusions regarding the concept of the digital divide is that there is not a unique definition. The three types described here are the most widely accepted way of explaining the digital divide. However, there are other proposals in the literature. **Table 1** summarises the different types of digital divides included in the most cited studies and academic articles. This synthesis allows to see the complexity of the digital divide phenomenon, which is a constantly evolving concept, as inequalities are persistent but variable, also in the digital world.

Table 1: Types of digital divide considered by the most relevant literature

Author(s)	Types of digital divides
(OECD, 2001)	Differences in the access to ICTs Differences in the use of the internet for a wide variety of uses
(OECD, 2020c)	Differences in internet uptake Differences in capabilities Differences in effective use
(Van Deursen A. & Helsper E., 2015)	Differences in infrastructural access Differences in skills and usage patterns Differences in users' proficiency in enlisting digital resources for the achievement of specific objectives
(World Economic Forum, 2020)	Differences in coverage, penetration and speed

[25] (Van Dijk J., 2020)
[26] (Wei K. t al., 2011)
[27] (Van Deursen A. & Helsper E., 2015)

	Differences in affordability Differences in digital literacy
(Deganis, I. et al., 2021)	Differences in access Differences in affordability Differences in skills Differences in awareness/relevance
(Van Dijk J., 2020)	Differences in access Differences in skills Differences in capabilities of obtaining benefits (outcomes)

Source: Own elaboration

Box 1. Gaps and their drivers, an unresolved distinction

The literature review has highlighted the blurred line between the types of digital divides and their drivers. For instance, some authors consider the lack of affordability or the lack of awareness as additional divides. For others, however, these are merely causes that accentuate the classic gaps (access, skills and outcomes). We have adopted this second approach, describing the most accepted categorisation of the digital divide in three types and considering the rest of issues as drivers or causes of such levels.

After the description of the different types of digital divides, the following section focuses on the analysis their causes.

2.2.2 Causes of the digital divide

There are diverse causes contributing to the digital divide. Some causes derive from the supply side (provision of telecommunication services), which are intricately linked to the first type of digital divides (access), and some from the demand side (users of telecommunication and digital services). The following sections summarise the causes identified in the literature reviewed. First, causes derived from the supply side will be described. After that, the focus will be on demand-side causes.

2.2.2.1 Causes in the supply side

The supply side of the digital sector involves telecom and digital service providers. In some cases, their legitimate aim of making their business profitable has the negative and unintended consequence of limiting network deployments in remote and/or depopulated areas, especially considering fixed infrastructure deployment, more expensive than wireless infrastructure. Investments in network rollouts are therefore conditioned by the need of achieving positive business cases.[28] Reduced or even non-existent investment

[28] (Katz R., 2021)

in network deployment in specific areas leads to a widening of the first type of digital divides, specifically affecting the quality and coverage of broadband connections.

The growing use of data traffic (e-learning platforms, videoconference applications, video streaming services, etc.) requires internet connections with minimum quality requirements. Basic broadband is not enough to cope with the current data traffic demand, particularly considering the demand of essential digital services in the new post-pandemic normality. However, the quality of the internet connections is still very dependent on geography,[29] with a clear distinction between rural and urban areas.[30] Quality differences on the provision of telecommunication services directly contribute to widen digital divide, as 'lower quality of the internet access correlated with a limited use of the internet for both communication and information purposes'.[31]

In addition to the quality of telecom services, the lack of coverage is also identified as a factor in the widening of the digital divide. The literature confirms that this problem is less relevant in Europe than in other regions, although it recalls the existence of great pockets of population in developed countries with low coverage and access to speeds less than 10Mbps.[32] For instance, a recent academic article noted that 4% of Poland's population have not internet coverage and an additional 10% cannot rely on their connection for an efficient telework or remote learning.[33]

Main differences in the coverage and quality, in terms of speed, of networks in Europe are found between rural and urban areas. The European Commission quantified the coverage gap between the EU as whole and rural areas in its latest broadband coverage report.[34] While NGA[35] coverage in the EU28 reached 85.8% of households by the end of June 2019, the rural NGA coverage was 59.3%, 26.5 percentage points below the global NGA coverage. The good news is that this gap is gradually closing, as it was 30.9 percentage points in mid-2018 and 34.7 percentage points in mid-2017. If coverage of very high-capacity networks (VHCN) [36] is considered, the gap reached 23.9 percentage points (44% on average in the EU vs. 20.1% in rural areas). The aim of the European Commission is that all European households are covered by a gigabit network by 2030 irrespectively where they live.[37] This analysis will be further developed in the quantitative analysis.

One of the causes most cited in the literature related to the supply side is the lack of affordability of telecom services and internet enabled devices. The Broadband Commission on Sustainable Development of ITU and UNESCO defined an affordability target for diverse price baskets of telecom services, whose costs should not exceed 2% of monthly GNI[38] per capita. According to ITU, the cost of data-only mobile broadband

[29] (Negreiro M., 2020)
[30] (Esteban M. A. et al., 2020)
[31] (Hao M. et al., 2021); (Van Deursen A., 2020)
[32] (World Economic Forum, 2020)
[33] (Kuc-Czarnecka M., 2020)
[34] (European Commission, 2020a)
[35] The NGA (next generation access) combination comprises VDSL, FTTP and cable modem DOCIS 3.0 technologies, providing speeds of at least 30 Mbps.
[36] VHCN coverage includes homes passed by either FTTP or DOCSIS 3.1 networks capable of providing gigabit download speeds.
[37] (European Commission, 2021)
[38] Gross National Income.

basket[39] exceeds the affordability target in 84 countries. Considering fixed-broadband basket[40], it was unaffordable in 111 countries.[41] Although unaffordability of telecom services affects more to developing and least developed countries, it is a relevant issue for specific groups in developed countries.

According to the survey already mentioned, 56% of people aged 22 to 36 who do not access the internet do not do so because devices (computer or mobile phone) are too expensive. Another 51% consider that internet subscriptions are also too expensive.[42] Something similar occurs among people living in rural areas. Up to 47% of respondents say they have never used the internet because internet subscriptions are too expensive, and 44% consider that internet enabled devices are unaffordable. In a time of economic crisis and uncertainty, low-income groups such as young people and rural population are those most at risk of falling into poverty, resulting in the inability to afford internet subscription fees and the devices to access the internet.

In addition to the economic causes of the digital divide in the supply side, the lack of accessibility of internet services and internet enabled devices is also considered a relevant barrier that impede people with disabilities to reap the benefits of being online. In a survey conducted in France, Germany, India, Sweden, the United Kingdom, and the United States shortly before the outbreak of the pandemic, six out of ten respondents who have never used the internet and have a disability consider that internet is too complicated to use, and four out of ten would feel nervous if they had to use it.[43] These figures reflect that, despite the efforts to design and provide accessible digital services and products,[44] there is still room for improvement to bring more people with disabilities into the digital ecosystem.

According to Robinson et al.,[45] digital divides affecting persons with disabilities are very difficult to bridge. Although they have been progressively narrowed, this reduction is much smaller compared to that achieved in other areas such as gender.

NRAs were asked by BEREC about the main factors to provide an equivalent access for people with disabilities.[46] They highlighted the availability of accessible terminal equipment, the prices, the accessibility of customer support services, the quality and functionality of the services, and the existence of accessible complaint methods as the most relevant elements ensuring accessibility of internet services.

Closely related to accessibility, the lack of or the low usability of digital services plays an important role as additional factor in widening the digital divide, particularly for those users with disabilities or with low digital skills.[47] User-friendly interfaces and well-designed functions can enhance users' experience when accessing digital services, and thus incentivise their usage.[48]

[39] Telecom offer including only mobile broadband (minimum monthly allowance of 1.5 GB).
[40] Telecom offer including only fixed broadband (minimum monthly allowance of 5 GB).
[41] (ITU, 2020)
[42] (CapGemini, 2020)
[43] (CapGemini, 2020)
[44] (BEREC, 2019)
[45] (Robinson L., Schulz J., Ragnedda M., et al., 2020)
[46] (BEREC, 2015)
[47] (Robinson L., Schulz J., Ragnedda M., et al., 2020)
[48] (Ye L. & Yang H., 2020)

2.2.2.2 Causes in the demand side

Although age is one of the main variables explaining the divide in digital skills, there are also significant gaps among young generations across European countries. The acquisition of digital skills in childhood and adolescence is closely intertwined with the integration of computational thinking[49] in formal curricula. However, this integration is very uneven across European countries, with many of them not including computational thinking as a key competence in their school curricula.[50] This problem is accentuated when considering non-formal education.

Another key cause of the digital divide related to the demand side is the lack of interest or motivation in using the internet. The literature reviewed exposes that this cause almost exclusively affects elderly people. The aforementioned CapGemini report states that almost two thirds of respondents aged 60+ who do not use the internet argue lack of interest in doing so.[51] The percentage for the total sample is 38%. The lack of motivation as key factor of the digital divide was already suggested by Van Dijk[52] and confirmed by further research.[53] Motivational barriers are as important as technological and skills gap: 'The task of closing the digital divide therefore becomes an issue of not only improving elderly access to technology, and offering skills training so they can develop digital skills, but also implementing programs to increase the elderly population's motivation to use technology, and better understand the benefits it can offer'.[54]

Other underlying causes may lie behind motivational barriers for using the internet. The most relevant one is the lack of confidence, which can derive from the fear of making mistakes when using digital services.[55] Again, this cause affects elderly people.[56] The gender digital gap also affects, since women are less confident in their digital skills than men, particularly in advanced digital skills, such as coding.[57]

The lack of motivation to use digital services may also be driven by the perceived complexity of digital technologies and services. In the end, the lack of motivation is closely related to the lack of skills, which is more accentuated in elderly people.[58]

Beaunoyer et al.[59] propose, based on Hargittai,[60]an interesting classification of additional factors impacting the effective use of digital technologies:

- Technical means: this factor is related to the quality of the devices used to access the internet, considering both hardware and software, and the reliability of the internet connection.

[49] Computational thinking includes competences such as abstraction and generalisation, algorithmic thinking, debugging, problem decomposition, and general processes of problem analysis.
[50] (Braun A. et al., 2020)
[51] (CapGemini, 2020)
[52] (Van Dijk J., 2006)
[53] (Friemel T.N., 2016)
[54] (Van Jaarsveld M., 2020, p. 3)
[55] (CapGemini, 2020)
[56] (Van Jaarsveld M., 2020)
[57] (Tarín, C. et al., 2018)
[58] (Elena-Bucea A. et al., 2020)
[59] (Beaunoyer B. et al., 2020)
[60] (Hargittai E., 2003)

- Autonomy of use: location from where users access the internet and the freedom to use it as they wish.
- Social support networks: experienced users providing assistance to fewer savvy users.
- Experience: degree of familiarity with technology that allows users benefiting from its use.

Table 2 summarises the factors that most affect each type of digital divides, according to the literature. This will be further validated in the quantitative analysis.

Table 2: Factors affecting the different types of digital divides

		Factors					
		Location (rural/urban)	**Income**	**Age**	**Education level**	**Gender**	**Disability**
Types of digital divides	**Access** (internet connections)	X	X	X	X		
	Access (devices)		X			X	X
	Skills		X	X	X	X	
	Outcomes		X	X	X	X	X

Source: Own elaboration

One of the main insights gleaned from the existing literature is that most causes, particularly in the demand side, existed prior to the pandemic of Covid-19.[61] However, the reports and academic articles do agree on the idea that these causes have become more evident and harmful during the pandemic, negatively affecting digital inequalities.[62] The following section will pay attention to this evolution.

2.2.3 Evolution of the digital divide during Covid-19 pandemic

The exceptional circumstances brought about by the pandemic (lockdowns, social distance, unprecedented economic downturn) have highlighted pre-existing digital divides, which under normal conditions, would not have drawn attention.[63]

[61] (Katz R., 2021)
[62] (Beaunoyer B. et al., 2020)
[63] (Negreiro M., 2020)

Box 2. What has increased as a result of the pandemic: the gaps or their consequences?

In general, the literature agrees with the idea that the pandemic has resulted in an increase of the digital divides. This conclusion may be accurate considering the third level of the digital divide (outcomes), as the gap has widened between those who have used the internet efficiently and productively in their daily lives (learning, teleworking, online banking, e-shopping, etc.) and those who have not. However, in the first and second levels what has worsened is the consequences. There are not more people without internet access (except for those accessing from public places -libraries, schools, open wi-fi hotspots- that were closed during the lockdowns), but those who previously did not have it have experienced more pernicious consequences due to the pandemic (not being able to attend classes remotely, not being able to telework, not being able to shop online, etc.). Nor are there more people without e-skills, but those who did not have them before have not benefited equally from their access to the internet.

2.2.3.1 Supply side effects

As the ITU highlights in the summary of a roundtable with economic experts about the economic impact of Covid-19 on digital infrastructure, 'network modernisation would be primarily focused on urban environments, postponing deployment of new technology in suburban and/or rural areas'.[64]

The delay in the deployment of enhanced digital infrastructures in less-profitable areas is intricately linked to the negative impact of the pandemic in the financial results of the telecom providers. As the experts in the same document noted, 'the reduction of telecommunications capital spending because of the Covid-19 induced economic downturn will have a negative impact on the rate of network expansion, particularly in rural areas'.[65] In the end, the slower rollout of very high-capacity networks in rural areas will, considering the quality of connections, result in a widening of the digital divide in relation to urban areas if no further financial support measures are taken.

Apart from the negative consequences of the pandemic in the financial results of telecom operators, these providers have had to tackle increased network maintenance activities to cope with the surge in traffic during the pandemic. Therefore, they have had to prioritise the allocation of capital investment to network maintenance and postpone investments in network modernisation and new deployments.[66]

The pandemic negatively affected economic performance of the telecom sector, with an average EBITDA reduction of 2.1% in the first quarter of 2020.[67] As mentioned above, the need of positive business cases for network deployment has always been a constant in the industry. However, while before the pandemic the profitability of network deployments could be achieved due to the existence of public subsidies for the rollout, the economic emergency caused by the pandemic, with many economic sectors in need of public support, may lead to a reduction in public funds for network deployment in uncovered areas, at least in the short and medium-term. As some of the experts consulted by ITU declared, 'since the telecommunication industry had been less affected

[64] (Katz R., 2020, p. 9)
[65] (Katz R., 2020, p. 10)
[66] (Katz R., 2020)
[67] (Delta Partners, 2020)

compared to other sectors (e.g., airlines, travel and lodging, etc.), public funds would not be expected to flow to the digital sector'.[68] The potential allocation of public funds to other urgent needs, reducing the financial support for the rollout of network infrastructure in remote areas, might also result in an increase of the digital divide related to access. Fortunately, this is not the case in the EU, where the European Commission urged Member States to allocate a minimum of 20% of spending included in their national recovery and resilience plans to foster the digital transformation, and considered the rollout of fast broadband services as a flagship area to which Member States could target their investments.[69]

2.2.3.2 Demand side effects

From the demand perspective (users of telecom and digital services), most of the causes existed prior to the pandemic. The pandemic has only exacerbated them.

The factors impacting the effective use of digital technologies described in section 2.2.2.2 (technical means, autonomy of use, social support networks and experience[70]) have been affected by the pandemic, and thus contributing to widen digital inequalities. Regarding the technical means, the pandemic has prompted the updating of IT equipment in many households. While low-income households have not been able to afford the acquisition of new equipment, households with high incomes have undertaken this technological upgrade. In the end, the consequences of the pre-existing inequalities related to IT equipment in households have worsened due to the pandemic.

The lack of adequate internet enabled devices in households only became evident when all household members needed to connect simultaneously to telework or attend remote classes. [71] As the World Economic Forum states, 'despite billions of dollars of investments, massive connectivity progress globally and strong continued efforts across the industry, these gaps have been exacerbated in the recent crisis and are likely to persist and even worsen once the world reaches a "new normal" with pervasive digitization across all aspects of life'.[72]

It is estimated that, in the new normal, total connectivity requirements (considering both internet access and devices) could be as high as $4,000 per household annually in high-income economies, about $3,000 per household annually in middle-income countries and €1,000 per household annually in low-income countries, exceeding any affordability threshold.[73]

The autonomy of use has also been restricted for some internet users due to the pandemic. Those users who relied on public locations to access the internet (schools, libraries, telecentres, wi-fi hotspots in coffee shops, etc.) were suddenly disconnected when lockdowns began. Even in households with internet connection the autonomy of use also decreased, as members had to share internet enable devices, reducing the time for telework, distance learning, or online entertainment.

[68] (Katz R., 2020, p. 10)
[69] (European Commission, 2021b)
[70] (Beaunoyer B. et al., 2020)
[71] (Cedefop, 2020)
[72] (World Economic Forum, 2020, p. 6)
[73] (World Economic Forum, 2020)

The lockdowns and social distance imposed by governments to control the spreading of the pandemic reduced the possibilities of obtaining assistance from social support networks when dealing with digital services. People with low digital skills were the most affected, as they could only get support for their problems with digital technologies through these same digital technologies.

Experience is gained through an intensive use of digital technologies. Those who were capable of increasing internet use during the pandemic could improve their experience and, therefore, their digital skills. However, those who were disconnected could not draw upon digital technologies to improve their skills.

The digital divide related to the outcomes people get from their online activity also widened during the pandemic. Professionals who could work at home and students who could continue their classes through online services took advantage of digital technologies for productive purposes. However, those who were unable to do so, were more engaged in unproductive, addictive and even pernicious activities like social media, online gaming,[74] online gambling, or pornography.[75]

Considering **specific sectors and groups**, the digital divide has also worsened. In the education sector, the pandemic has exacerbated three different layers of the digital divide:[76]

- Difficulties in the online access to learning materials and digital education platforms due to the lack of internet access or inadequate quality of connections.
- Digital usage gap, as students from low socioeconomic backgrounds obtained less support to use digital tools effectively.
- School digital preparedness. Differences between the possibilities and capacities of schools to offer digital learning to students widened.

The Covid-19 crisis has had a differential impact on the use of various digital technologies by elderly people. In general, internet use by elderly people, which was already growing before the pandemic, has accelerated during the lockdowns.[77] However, the pre-Covid trend towards closing the gap in smartphone use between seniors and younger population has stopped. While youngsters have significantly increased internet usage through smartphones, elderly people have made a similar use.[78]

The conclusion reached by all documents analysing the causes of the digital divide is clear: the pandemic has not led to the emergence of new causes but has aggravated, in some cases significantly, the existing ones.

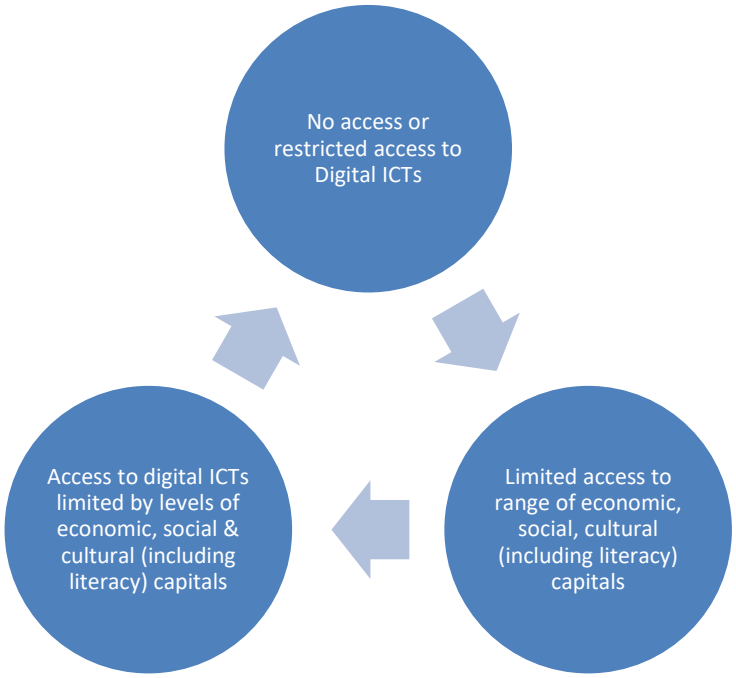
2.2.4 Impacts and consequences of the digital divide

Much of the literature on the digital divide is devoted to analysing its impacts and consequences. They are many and varied. While some impacts refer to specific sectors or activities (education, healthcare, finance, e-Administration), other are more cross-cutting (social exclusion, workability).

[74] (McDool, E. et al., 2020)
[75] (Awan A. et al., 2021)
[76] (Negreiro M., 2020)
[77] (Rinderud P., 2021)
[78] (Rinderud P., 2021)

The most worrying consequence of the digital divide is its contribution to the perpetuation of the "digital vicious cycle",[79] depicted in **Figure 1**.

Figure 1: The digital vicious cycle



Source: (Baum F. et al., 2014, p. 357)

Digital divide limits, or even prevents, the access to digital technologies. This, in turn, reduces the possibilities of improving economic, social, and cultural capitals, which, in the end, contributes again to limit the access to digital technologies. Digital inequalities are intrinsically associated with social and economic inequalities, feeding back into each other.

2.2.4.1 Impacts on health and healthcare

Considering specific essential activities like healthcare, in the context of the current sanitary crisis, experts alert that 'digital inequalities are putting socially and economically disadvantaged people at more risk to the virus and the numerous socio-economic consequences of the pandemic'.[80] Many governments and health institutions have relied on digital services to inform and raise awareness among people about the pandemic. Therefore, those disconnected might have been more exposed to the virus.

The pandemic has also revealed another worrying impact of the digital divide in healthcare. The Covid-19 has put lot of pressure on health systems, which have accelerated the deployment of algorithmic decision-making systems based on AI/ML[81] technologies to improve health processes such as triage or ICU bed assignment.[82] The accurateness of these systems heavily depends on the training data they are fed with.

[79] (Baum F. et al., 2014)
[80] (Beaunoyer B. et al., 2020, p. 1)
[81] Artificial Intelligence/Machine Learning
[82] (Marabelli M. et al., 2021)

The problem arises when training data is biased, for instance due to the underrepresentation of specific populations (low-income people, migrants, specific ethnics, etc.) in digital medical records. One of the factors for this underrepresentation is the low use of e-health services by disadvantaged groups. The algorithms are going to replicate this bias in their decisions, which can lead to a worse healthcare for these disadvantaged groups. According to Marabelli et al.[83], this is one of the reasons why in the US Afro American population have been disproportionality affected by the Covid-19 virus in terms of infection and mortality. In this case, the digital divide is not the fault of the user but is caused by the system itself.

In these pandemic times other authors also highlight how digital measures implemented to control the spread of the coronavirus (track systems, vaccination passports, etc.) might exacerbate social exclusion for people who do not have smartphone or enough digital skills.[84]

2.2.4.2 Impacts on education

Many reports and academic articles[85] are focused on analysing the impacts of the pandemic in the digital divide related to education. Education is the sector most disrupted by the pandemic, where the digital divide has affected the most. In fact, the pandemic has exposed existing educational gaps, most of them related to digital technologies, which have not been paid enough attention until now.[86]

Difficulties in attending online classes were related to the availability of suitable devices at home and the lack of training in the use of digital learning platforms. According to the OECD, a relevant digital divide in the access to computer for schoolwork exists between students from different socio-economic backgrounds. Those students attending socio-economically disadvantaged schools[87] are less likely to have access to a computer for schoolwork.[88] Differences in the availability of internet access for students from diverse socio-economic backgrounds also exists but are less relevant.

Digital divide in education is also referred to the differences in the level of digital literacy of students, teachers, and family members to support the suddenly and unplanned shift towards online learning.[89] The inequal access to online educational resources as well as the difficulties experienced by many students in finding technology assistance from their parents are the main consequences of the digital divide in education. In the end, both consequences resulted in a severe halt in the educational process for those students most affected by the digital divide. Obviously, 'the introduction of new technologies is benefiting students and teachers with access to them and the ability to use them. However, they present complexities for those groups and individuals who for social,

[83] (Marabelli M. et al., 2021)
[84] (Zheng Y. & Walsham G., 2021)
[85] (UNESCO, 2020); (OECD, 2020a); (Negreiro M., 2020); (Gabaldón D. & Vela S., 2020); (Cedefop, 2020); (Chircop D., 2020)
[86] (Chircop D., 2020)
[87] Socio-economically disadvantaged schools are defined as a school whose socio-economic profile (the average socio-economic status of the students in the school) is in the bottom quarter of the PISA index of economic, social and cultural status amongst all schools in the country.
[88] (OECD, 2020b)
[89] (Gabaldón D. & Vela S., 2020)

cultural, economic, or personal reasons lack the access, knowledge and skills required to use them'.[90]

2.2.4.3 Impacts on access to key services

The digital divide may lead to increase financial exclusion. The pandemic has accelerated the shift towards a cashless economy, to avoid risks of infection through bank notes handling. However, the digital divide prevents access to digital financial services for specific groups (rural population, the elderly, migrants, people with low digital skills and others).[91] Although this consequence is more noticeable in low-and-middle income countries, which have less developed financial and bank systems, it can also affect people in developed countries who tend to rely on cash and physical bank branches to manage their financial activity. The report cited explicitly mentions the elderly people and those living in rural areas.[92]

The relationship between citizens and their public administrations through digital means is another activity impacted by the digital divide. During the pandemic almost all public services were provided online, while face-to-face procedures were cancelled. Although this situation is being progressively reverted, allowing again physical interaction with public administrations, the trend towards the online provision of public services is unstoppable. Digital divide has specially hindered disadvantaged groups to access digital public services, for instance to ask for a subsidy, in a time when public support was essential.[93] Digital identity is key to access e-government services and many people from these groups lack the ability to obtain and use it. Digital-only services restrict access to public benefits to significant pockets of population, precisely those who are suffering most from the socio-economic consequences of the pandemic. According to Capgemini,[94] 43% of people who do not use the internet would need help to apply online for a public benefit. Other research points to age, gender, and skills deficiencies as determinants of the digital divide in relation to the use of digital public services.[95]

Cybersecurity issues are also closely related to the digital divide. Disadvantaged groups (low-income individuals, elderly people, migrants, etc.) often lag in the adoption of cybersecurity tools and behaviours, mainly due to a lack of skills, being more exposed to the malicious action of cybercriminals.[96]

2.2.4.4 Impacts on socio-economic conditions

The digital divide has substantially conditioned workability during pandemic, widening the socio-economic gap between those who could work remotely and those who could not, either because the nature of their job or because their lack of appropriate skills. On average, almost four out of ten EU workers started to telework after the outbreak of the pandemic, although with significant differences between EU countries.[97] Educational level and the place of residence were determinants of the probability to work from home, variables which also explain a large part of the differences in the digital divide.

[90] (Gabaldón D. & Vela S., 2020, p. 10)
[91] (Benni N., 2021)
[92] (Benni N., 2021)
[93] (UN, 2020)
[94] (CapGemini, 2020)
[95] (Botrić V. & Božić L., 2021); (Seljan S. et al., 2020)
[96] (Robinson L., Schulz J., Dunn H. S., et al., 2020); (Sultan A., 2019)
[97] (Sostero M. et al., 2020)

Researchers also found that the nature of occupations was the main factor enabling or preventing teleworking. Thus, 'white-collar' jobs are very suitable to teleworking while 'blue-collar' occupations have limited teleworking capability. It prompts the surge of a new divide, which could tend to widen social disparities if telework continues its expansion. The disparities in the access to telework could be considered a new dimension of the income inequalities.[98] According to a research conducted in Germany, employed people with computer use only at home (who can be assimilated to 'blue-collar' occupations) earn on average 58% of the incomes of employed persons with computer use at work and at home (working on 'white-collar' jobs).[99] The same study concludes that individuals using a computer at work show higher levels of competence in problem solving in technology-rich environments (PS-TRE), which indicates that the work environment also impacts the skills digital divide.

The most dramatic consequence of the digital divide is its contribution to increase social exclusion. In fact, previous impacts (obstacles to remote education and work, financial exclusion, reduction of job opportunities, disparities in healthcare) are specific forms of social exclusion. In addition, the literature points to two other relevant types:[100]

- Political exclusion. Digital divide might prevent people from exercising their political and human rights.
- Social participation exclusion. Disadvantaged groups may have limited digital ways to interact and participate in social activities, leading to social isolation.

Overall, consequences of the digital divide pose significant risk of exclusion for people most affected by this phenomenon. The following section will present the recommendations proposed by the literature consulted to bridge the digital divide and reduce its negative consequences.

[98] (Milasi S. et al., 2020)
[99] (Ertl B. et al., 2020)
[100] (Ye L. & Yang H., 2020)

2.2.4.5 Summary of impacts of the digital divide

Table 3 summarises the impacts of the digital divide analysed in previous sections.

Table 3: impacts of the digital divide

Sector/Activity	Impact
Healthcare	More exposition to the Covid-19 for disconnected people. Lack of access to e-Health services. Biased decisions of algorithmic decision-making systems may lead to a worse healthcare for disadvantaged groups.
Education	Inequal access to educational resources. Students have difficulties in finding technological support from their family environment. Standstill in the educational process.
Other key services	Increase of financial exclusion due to the trend towards a cashless economy. Digital-only services restrict access to public benefits to significant pockets of disconnected population. People without digital skills are more exposed to cyber-fraud and online scams.
Socio-economic conditions	Increase of the socio-economic gap between those who could work remotely through digital means and those who could not. Increase of social exclusion: Digital divide might prevent people from exercising their political rights and participating in social initiatives.

Source: Own elaboration

2.2.5 Preliminary recommendations to bridge the digital divide

The literature consulted proposes a comprehensive series of recommendations aimed at bridging the various types of digital divides. Recommendations are structured below following the gaps they intend to bridge.

Some of these recommendations were effectively implemented by European NRAs and telecommunication providers during the pandemic.[101] It is therefore necessary to identify what measures can be adopted on a permanent basis and what can be recommended for urgent situations.

Box 3. Detailed recommendations to improve access while less concreteness is provided for tackling the other divides.

The literature provides very detailed recommendations aimed at tackling connectivity issues. Most of these recommendations were focused on short-term measures to alleviate the immediately effects of the pandemic. While some of them could be used to constitute a "toolbox" for future crisis, others may be adopted as permanent recommendations to reduce the digital divide on access in the medium term.

On the contrary, recommendations to bridge the second and third levels of the digital divide (skills and outcomes, respectively) are rather generic without a clear distinction between the short and medium-term.

2.2.5.1 Recommendations to ensuring internet access for all

The pandemic has revealed the critical nature of telecommunication networks as a key element in advancing the digitisation of society. The impact of the digital divide during the pandemic has also highlighted failures on the functioning of the sector to provide reliable internet access for all.[102]

One of these failures is the scarce knowledge of the real gaps on availability and affordability of telecom services. This knowledge is essential to undertake any measure to close the digital divide. NRAs could assume this task, providing detailed information on both gaps, including sociodemographic variables such as age, education level, income level, etc.[103]

Another failure relates to governments' views on public resources such as spectrum, which is essential for advancing digital inclusion. Historically, governments have sought to extract the greatest economic benefit from spectrum auctions. Some experts are calling for a change in the governments' mindset, so that instead of perceiving spectrum auctions as a source of high revenues for the public treasure, they should be aimed to make progress in reducing digital inequalities by allowing more affordable prices.[104] As recent best practice guidelines published by ITU states, 'set policies that guarantee an effective use of spectrum through moderate pricing and prioritize the expansion of networks over maximizing revenues for the government can have a significantly favourable impact on the digital economy, infrastructure investment and bringing benefits to remote or more disadvantaged areas, in particular in the context of emerging technologies (such as 5G and Internet of Things, IoT)'.[105]

[101] (BEREC, 2020)
[102] (Katz R., 2020)
[103] (Lawton B., 2020)
[104] (Katz R., 2020)
[105] (ITU, 2021)

To ensuring internet access for all during the pandemic, the Alliance for Affordable internet (A4AI) and the World Wide Web Foundation suggested several measures to governments, companies, and civil society organisations.[106] Governments were encouraged to design connectivity pledges and solidarity plans impelling telecom companies to provide internet access for all citizens. These plans might include measures such as not cutting off internet access to users who could not afford their bills due to the economic crisis resulting from the pandemic, and late fees exemptions. Governments were also urged to reduce, or even remove, taxes on internet services. Universal Service obligations and funds allocated to promoting digital inclusion were proposed to subsidise internet enabled devices and free wi-fi hotspots.

Telecom companies were invited to increase flexibility on payments for their users, so that none of them would be disconnected for not paying their bills on time. A4AI and the Web Foundation also proposed telecom companies to define basic data allowances for all, specially ensuring its affordability for low-income groups, and including zero-rate plans for accessing public services websites related to essential activities (health, education, e-government, etc.).

When talking about ensuring internet access for all, it is also necessary to pay attention to accessibility issues. Traditionally, accessibility provisions included in specific regulation - the Universal Service Directive (USD), the Roaming Regulation and the Audiovisual Media Service Directive (AVMSD) - have been implemented following different approaches. Some countries only impose accessibility obligations under the USD to the Universal Service Provider (USP), while others impose these obligations to all providers.[107] Regarding the other regulations, diverse ways to improve accessibility of services are also considered (imposing obligations to a specific provider, to all providers, etc.). There are therefore relevant disparities among NRAs across Europe to ensure equivalent access to digital services. It stems from the different competencies of NRAs, which prevents them from addressing accessibility issues in a similar way. It is also interesting to recall that some NRAs have taken additional measures to enhance accessibility of telecommunication services, such as a stronger focus on the accessibility of websites, accessible information regarding compliant management or the extension or relay services.[108]

The European Electronic Communications Code (EECC) already includes some provisions aimed to ensure equivalent access and choice of ICT products and services for persons with disabilities.[109] In a report published prior to the entry into force of the EECC, the World Bank proposed a detailed list of recommendations to promote ICT accessibility.[110] The most relevant ones are:

- To develop a coherent regulatory framework to ensure accessibility of all types of ICT products and services.
- To oblige governments and government-funded programs to mandate ICT accessibility in public procurement rules.

[106] (Jorge S. et al., 2020)
[107] (BEREC, 2018b)
[108] (BEREC, 2018b)
[109] (BEREC, 2019)
[110] (Samant D., 2016)

- To define voluntary measures (codes of conducts, guidelines, follow-up committees) to monitor and promote implementation.
- To create and fund disability awareness, training and technical assistance programs, especially for digital service and content providers.
- Offer loans and grants to persons with disability to purchase assistive and accessible technologies.
- Include services for persons with disabilities within Universal Service obligations.
- Support local development of accessible ICT and contents.

The European Accessibility Act[111] is the main legislative instrument enacted in the EU to ensure accessibility of digital products and services. It establishes common rules on how these products and services must be made accessible. In particular, the products and services affected by this directive are:

- Computers and operating systems
- ATMs, ticketing and check-in machines
- Smartphones
- TV equipment related to digital television services
- Telephony services and related equipment
- Access to audio-visual media services such as television broadcast
- Services related to air, bus, rail and waterborne passenger transport
- Banking services
- e-Books
- e-Commerce

It entered into force in June 2019 and Member States had three years to transpose its provisions into national legislations. After that, Member States will have three additional years (until 2025) to apply those provisions. Therefore, there is still a long time to go before digital products and services become truly accessible. However, if Member States adequately enforce the implementation of the directive once it is transposed, it will be a very important step towards ensuring that people with disabilities benefit equally from the digital society.

2.2.5.2 Recommendations to accelerate network rollouts

A4AI and the Web Foundation have suggested National Regulatory Authorities (NRAs) to take adequate regulatory actions to accelerate the rollout of remarkably high-capacity networks (mainly fibre networks). In particular, they have proposed that NRAs should define rapid mechanisms to release the necessary spectrum to provide internet service in underserved areas, as well as to soften regulatory burdens to ease the entrance of new players in the market and to encourage network infrastructures' sharing.[112]

Experts consulted by ITU recommend adapting regulatory frameworks to stimulate investments in very high-capacity networks while maintaining an appropriate level of competition. They suggest softening State aid regulations to accelerate the rollout of such networks, 'shifting from a "purist" to a "pragmatic" viewpoint'.[113]

[111] (European Commission, 2019)
[112] (Jorge S. et al., 2020)
[113] (Katz R., 2020, p. 22)

These experts also propose diverse business models based on infrastructure sharing to reduce the break-even cost of deploying broadband networks in depopulated and remote areas:[114]

- 'Network infrastructure sharing partnerships;
- Partnerships between complementary networks (such as providing backhaul access in exchange for meeting license obligations);
- Revenue sharing between cell site, backhaul providers and operators; and
- Partnerships with electric utilities and railways to enable network expansion.'

Another way proposed to achieve an adequate level of broadband coverage in rural areas is the creation of wholesale specialists providing backhaul services, international links and core servers to third-party operators. This model favours the investments in rural broadband of unconventional telecom market players such as digital platforms[115]. Governments can also participate in similar schemes, financing national backbones which provide wholesale services to third-party operators. The growing trend in Europe towards outsourcing wireless infrastructure to tower companies can also contribute to accelerating network rollouts, as it reduces costs and time for deployment.

The experts consulted by ITU made specific recommendations to public administrations to alleviate constraints on commercial business plans and create incentives to close the digital divide in unserved areas by accelerating the rollout of broadband infrastructure:[116]

- Subsidise cost of deployment by offering loans with lower interest rates and more extender tenor than traditional lenders.
- Implement tax exemptions for deployments in rural and unserved areas.
- Reduce property taxes for facilities deployed in rural areas.
- Exempt or reduce taxes and import duties for telecom equipment to be deployed in unserved areas.
- Lower cost of right of way access.
- Aggregate demand from public administrations (schools, libraries, health facilities) in unserved areas to ensure regular users for telecom providers.
- Synchronise infrastructure development among stakeholders to reduce costs.
- Accelerate administrative procedures to obtain rights of way and tower deployments.
- Provide access to cell deployment sites on public properties.

Experts from the World Economic Forum propose additional measures in the same way:[117]

- Encourage passive sharing partnerships (masts, sites, cabinets, power) where multiple networks are not viable.
- Promote active sharing of RAN and core network, allowing it where it is not currently permitted, and always without distorting competition.[118]

[114] (Katz R., 2021, p. 18)
[115] Katz (2021) highlights Facebook's investments in the project "internet para todos" in Peru, aimed at deploying wholesale infrastructure to provide mobile broadband coverage to over 30,000 rural communities.
[116] (Katz R., 2021)
[117] (World Economic Forum, 2020)
[118] (BEREC, 2018a)

- Promote establishment of IXPs[119].
- Release new spectrum timely and affordably.
- Leverage unlicensed spectrum to set up community networks.
- Allow repurposing of unused or underused spectrum.
- Allow spectrum sharing.
- Offer incentives to pursue energy efficiency.
- Consider using National Research and Education Networks to provide access in schools taking advantage of unused capacity by universities and research centres.
- Promote joint investments with financial institutions, multilateral organisations, or government agencies.
- Leverage Covid-19 recovery funds to accelerate digital infrastructure deployment in underserved areas.
- Implement “dig once” policies to enable internet providers to install fibre more easily and cheaply.

The WEF experts have also proposed recommendations aimed at incentivising the combined use of diverse access technologies (existing and emerging) to adapt network rollouts to the specific characteristics of unserved and underserved areas. WEF experts recommend integrating wireless technologies with fibre deployments to provide more efficient broadband connection in remote areas. They also recommend accelerating 4G/5G deployments to allow high-quality broadband connections in areas without fixed networks. The combination of fixed wireless access and 5G is also seen as a desirable alternative to cover the last mile in rural or remote areas.

Other proposed combinations of access technologies include innovative solutions based on high altitude pseudo-satellites (HAPS) or unmanned aerial vehicles (UAV) to provide internet connectivity to remote areas.

The final recommendations of WEF experts aim to make more efficient network operators’ processes. They include smart rollout planning, the use of digital twins to simulate and optimise deployments, AI-driven optimisation of network configuration, network virtualisation and adopt agile ways of working.

2.2.5.3 Recommendations to mobilise financial resources

Projects aimed at bridging digital divide in access tend to have low profitability, which difficult their financing. To solve this issue, the involvement of Development Finance Institutions (DFIs) is deemed vital. Experts consider that more innovative funding models should be implemented to roll out broadband infrastructure in areas with low return of investments (ROI), including:[120]

- Co-investment models between operators and investment funds.
- Municipal financing models involving the municipality which wants to bridge the digital divide, investors, and lenders.
- Pooled financing. Individual projects aimed at bridging the digital divide in a specific unserved area are usually under the minimum funding threshold that lenders provide. To get the necessary fund for these projects, ‘pooled funds

[119] IXP: internet Exchange Point
[120] (Katz R., 2021)

provide access to private capital markets (bank finance and bonds) at advantageous terms for borrowers (e.g.: communities, non-profits, Small and medium-sized enterprises (SMEs), micro-enterprises, etc.) sharing similar missions or business objectives and similar credit characteristics, but lacking the financial scope and scale, expertise, and credit history to access credit markets on their own'.[121]

Accelerating the rollout of very high-capacity networks in remote and depopulated areas requires huge investments. However, the average revenue per user of telecom services has gradually declined in the last years. In order to mobilise the required investments, it is therefore necessary to stimulate revenue growth for telecom operators. According to WEF experts, it can be achieved through three ways:[122]

- Driving digitisation across key sectors by defining new use cases.
- Promoting adoption of digital services by new users.
- Improving monetisation and price realisation.

Recommendations proposed to drive digitisation through new use cases include:

- Digitise government services.
- Incentivise digital transformation of key sectors through financial instruments (grants, loans, subsidies, etc.).
- Launch national digital strategies involving all key sectors. Ensuring collaboration between all public administrations involved.
- Create clear regulatory frameworks and horizontal standards.
- Reduce or remove regulatory barriers to digitisation (reduce high taxes to e-commerce, remove barriers to fintech, eHealth, etc.).
- Stimulate government-led procurement to aggregate demand of telecom services across economic sectors.
- Boost industry collaboration to provide integrated solutions to SMEs.

Recommendations for increasing users base comprise:

- Cost reduction for consumers: reduce mobile sector specific taxes and import duties, design cheaper devices with basic features, provide subsidies for acquiring devices and subscribing internet services.
- Direct provision of devices and internet services through public administrations, schools, NGOs, etc.
- Implement communal wi-fi hotspots or computing facilities.
- Develop innovative financing schemes for low-income users: zero or low interest instalment payment models, cheap device rentals, etc.
- Improve digital literacy of diverse groups: students, workers, women, elderly people, etc.

Recommendations to improve monetisation:

- Reinforce telecom market structure promoting operators' consolidation where it allows to serve users more efficiently and affordably.

[121] (Katz R., 2021, p. 31)
[122] (World Economic Forum, 2020)

- Governments should review specific regulations that could drive down price realisation.
- Incentivise the offer of value-added products and services.
- Define price optimisation strategies.

2.2.5.4 Recommendations to stimulate collaboration between stakeholders

It is clear from the literature that bridging digital divides implies the cooperation between many stakeholders: governments and public institutions (at national, regional and local level), civil society organisations, academic institutions, NRAs, telecom operators, digital platforms, and companies. An interesting recommendation concerning the latter is the inclusion of connectivity as one of the objectives of their Corporate Social Responsibility (CSR) actions, at the same level as the reduction of poverty, the fight against hunger, and the improvement of education and healthcare systems, as connectivity is recognised as an essential element to meet the UN Sustainable Development Goals.

Jorge S. et al.[123] propose the creation of public-private partnerships (PPPs) to mobilise the necessary economic resources to make both devices and access affordable for all. PPPs should focus their efforts in establishing emergency funds to allow rapid access to devices, prioritising uninterrupted connectivity for critical services (emergency services, e-health services), supporting deployment of free public wi-fi infrastructure, and sharing knowledge on best practices.

The World Economic Forum[124] also suggests creating partnerships to facilitate long-term investments, to accelerate access to key resources and to drive higher utilisation of infrastructure.

Civil society organisations are also urged to collaborate by creating solidarity mechanisms through which citizens could donate their surplus devices and share their data plans with the most disadvantaged.[125]

The Digital Future Society, a non-profit international initiative aimed at helping policymakers to understand the challenges posed by digital divides and to prioritise actions to achieve digital inclusion for all, propose a multi-stakeholder approach to address the issue of digital divide, involving public sector (including NRAs), civil society, international organisations, research institutions and private sector.[126] The Digital Future Society also proposes what they call the “digital cooperation roadmap”, which includes the strategic steps to build coherent and efficient initiatives to tackle digital divides. The roadmap includes the following phases and sub-phases:

1. Preparing for digital cooperation.
    - Identify and engage stakeholders.
    - Map the local context in which the digital divide takes place.
    - Create the coalition.
    - Co-design the initiative with the coalition.
    - Define impact indicators and a feedback system.
2. Launching the initiative.

[123] (Jorge S. et al., 2020)
[124] (World Economic Forum, 2020)
[125] (Jorge S. et al., 2020)
[126] (Digital Future Society, 2019)

- Conduct a public relations campaign.
- Roll out the initiative.
- Strategic dissemination and community building.
- Feedback and evaluation.
- Document and communicate.
- Host a final event.

3. Sustaining the digital cooperation.
   - Update the strategy and impact tracking.
   - Transform the initiative into a platform for tackling digital divide.

This roadmap can be a useful tool for managing cooperation between stakeholders when implementing programs to bridge digital divides.

2.2.5.5 Recommendations to bridge the second and third types of digital divides

The recommendations proposed by global organisations (ITU, World Economic Forum, Alliance for Affordable internet, Web Foundation), analysed in previous paragraphs, are focused on closing the first type of digital divides, the access. It seems to be logic, as the lack of internet access is the main digital gap in developing and less developed countries, affecting 3.7 billion people globally.[127] However, in the European context, although some pockets of population without good internet connections still exist (mostly in rural or depopulated areas) for which the previous recommendations remain valid, the second and third types of digital divides (skills and outcomes, respectively) have more prevalence.

An interesting recommendation to bridge the gap on digital skills and outcomes for elderly people is to adopt an intergenerational perspective.[128] The involvement of young generations from their own families in digital skills programmes for seniors may increase their efficiency, as one of their main motivations for using digital technologies is to connect with their families.

In rural areas, where coverage gaps are more usual and disposable income is often lower, schools become the main, if not the only, alternative to access the digital universe. In this context, teachers play a key role in improving digital literacy and motivation for a productive use of digital technologies of their students. However, while three out of four education systems recognise digital skills as a key competence that teachers should have, only half of the European education systems propose digital literacy as an initial teacher training.[129] It is, therefore, highly recommended the implementation of training programs for teachers, especially in rural areas, to increase their digital skills, as they are likely to be the only guide their students will have when using digital services.[130]

The acceptance of digital innovations in rural businesses to take better advantage of the outcomes obtained in the use of digital technologies requires overcoming the resistance to change. To this end, Räisänen and Tuovinen[131] propose to rely on communication campaigns, opinion leaders and agents of change and trust to raise awareness about the benefits of digitisation among rural producers and entrepreneurs.

[127] (Broom D., 2020)
[128] (Esteban M. A. et al., 2020)
[129] (European Commission, 2020b)
[130] (Esteban M. A. et al., 2020)
[131] (Räisänen, J. & Tuovinen, T., 2020)

In the field of education and training, Braun et al.[132] propose some recommendations aimed at providing students and teachers with the necessary digital skills for their future digital life and work:

- Put stronger focus in school curricula on the transmission of soft skills that are of specific relevance for the digital age, particularly computational thinking.
- Promote cooperation between employers, schools and other supportive actors (e.g. coding clubs) to help disadvantaged students without extensive social networks.
- Introduce digital coaches in schools that assist teachers in using digital tools.

Finally, it is also necessary ensuring a safety use of digital services. The possibility of becoming a victim of an online fraud, inhibits many people (mainly the elderly population) from using the internet to e-shop, interact with administrations or access financial services. E-skills training should therefore consider cybersecurity issues to teach people how to stay safety online.[133]

[132] (Braun A. et al., 2020)
[133] (CapGemini, 2020)

3 Quantitative analysis

The findings from the literature review related to the evolution of the digital divides in Europe have been analysed from a quantitative perspective. The following section details the methodology used in the quantitative analysis. Then, the main findings from this analysis are described. The graphs and tables with the main indicators can be consulted in Annex 2: Graphs of the quantitative analysis.

3.1 Methodology

Out of the three main groups of quantitative analysis (descriptive, causal, and predictive), the study has focused on the first type: descriptive analysis to understand the data and its underlying relations.

Descriptive statistics are useful to identify the basic features of the data analysed and summarise it in a meaningful way. Moreover, they allow for the identification of underlying trends and can suggest the existence of causal relationships. This type of quantitative analysis can be further classified in a univariate or multivariate analysis. The multivariate analysis helps describe the relationship between pairs of variables through its multivariate frequency distribution. The use of scatter plots and quantitative measures of dependence (correlation) provides a basic picture of the interrelation between two variables and can help find interactions between them. However, descriptive analysis does not allow the researcher to check if those relations are present beyond the considered data.

A multivariate analysis is nonetheless important even when the analysis is merely descriptive as it allows researchers to disentangle the different effects. If this analysis is not carried out, the results will likely be biased because it is impossible to separate the effects of some variables on others. Causal analysis can overcome this limitation and, usually, involves establishing three main elements: correlation, direction of the causal relation and an empirical or structural model. For this type of analysis, regression techniques and, (most of the time) microdata are required, which was however impossible to acquire due to time constraints. All data used for the descriptive analysis is publicly available from several sources (Eurostat, ITU and OECD, primarily).

The study has focused on the following datasets from international public organisations:

- The Digital Economy and Society Index (DESI) key Indicators and e-Government benchmark from the Digital Scoreboard of the European Commission. DESI is a composite index that summarises relevant indicators on Europe's digital performance and tracks the evolution of EU Member States, across five main dimensions: Connectivity, Human Capital, Use of Internet, Integration of Digital Technology and Digital Public Services.
- Digital Agenda Key Indicators Data from Eurostat, which illustrate some key dimensions of the European information society (Telecom sector, Broadband, Mobile, Internet usage, Internet services, eGovernment, eCommerce, eBusiness, ICT Skills, Research and Development).
- International Telecommunication Union (ITU) Country ICT Data.

Following the results of the literature review, the fundamental variables for digital exclusion on the supply and demand side are considered:

- **Supply side.** The analysis will be focused on measuring the population on a given country not covered by broadband networks. This estimation can be carried out based on different indicators:
    - Connectivity and universal access. This refers to the penetration and availability of fixed broadband, including coverage and the price of the different bundles.
    - Mobile connectivity.
    - Internet infrastructure.
- **Demand side:** population living in areas with broadband coverage who do not subscribe to any service due to several reasons. To capture this effect the following variables will be analysed:
    - Internet usage.
    - Digital skills.
    - Outcomes.

The analysis is enriched with socioeconomic variables, which will allow comparisons between different groups and will ensure the identification of more specific recommendations. Some of them, and their rationale for consideration, are:

- **Density of the living area.** Rural areas may have lower broadband coverage compared to urban regions what widens the digital divide for the former.
- **Gender.** The digital divide widens for women.
- **Age.** Young people are expected to have higher levels of digital skills compared to previous generations.
- **Educational attainment.** It is expected that the level of digital skills increases with the level of education.
- **Income.** It is expected that the level of digital skills increases with income.

In order to perform this analysis, several guiding principles have been followed, although data availability issues have been taken into account. First, data from 2010 to 2020 has been used, when available; however, when any year lacked data, it has been replaced by the nearest year available. For instance, some databases lacked data for 2020 and data from 2019 has been used. Alternatively, when data from 2010 was unavailable, the earliest year has been used. Moreover, some databases, such as the ICT Price Basket, have revised their methodologies; thus, homogeneous data only span from 2018 to 2020. Secondly, the analysis covers all BEREC member countries, accounting for a total of 36 countries, when available. However, in some indicators, there can be missing countries, especially those that are part of BEREC but are not EU members.

3.2 Main findings

Considering the main findings of the literature review, an analysis of the levels and determinants of the digital divide, based on the different levels of analysis and considering the sociodemographic and socioeconomic variables that influence the digital divide, was conducted.

Prior to the presentation of the main results, a note on the limitation of the analysis must be made. First, lack of data for those countries that are part of BEREC but are not EU members has been detected, particularly when analysing data from Eurostat, even though most of them are considered by Eurostat when providing statistical information on the digital society. Second, the years 2010 and 2019 have been established as a benchmark; however, in the case of lack of data on those years, the criterion has been to select the oldest or most recent data, respectively. Finally, it is also important to note that current statistics may not yet reflect the effects of the Covid-19 pandemic on the digital divide, as the most updated data are referred to 2019. The analysis has been focused on those indicators that, being relevant to the study, have available data for 2020.

All of the graphs referred to in the following sections are included in *Annex 2: Graphs of the quantitative analysis.*

3.2.1 Supply

In this subsection, the penetration and availability of fixed broadband, including take-up and coverage, the mobile connectivity, the internet infrastructure, and the price of the different bundles are analysed.

Starting with standard fixed broadband coverage, **Graph 1** shows the percentage of households with it, for years 2011 and 2019. For the majority of countries in the sample, the degree of coverage was already high (above 75%) in 2011, thus increases have been generally modest during the decade. In any case, for those countries with relatively lower degree of coverage at the beginning of the period (e.g., Slovenia, Latvia, Slovakia or Poland) coverage has typically increased. Some exceptions are Portugal, Finland and Lithuania, where the percentage of households with standard fixed broadband coverage has decreased.

According to the literature review, the main differences in coverage and speed of networks in Europe are found between rural and urban areas: i.e., the main coverage gap within countries is due to the so called rural/urban divide. Therefore, as anticipated in the previous section, we pay especial attention to this source of divide. In order to quantitatively analyse it, **Graph 2** shows the percentage of rural households with standard fixed broadband coverage. As compared to **Graph 1**, the degree of coverage in rural areas was consistently lower, in relative terms, in 2011. Moreover, despite improvements up to 2019, there still exists a clear rural/urban divide in several countries, with relatively lower percentages of rural households with standard fixed broadband coverage.

Given the already high degree of standard fixed broadband coverage in 2011 (up to 100% in some countries), the evolution experienced between this year and 2019 has been much more evident in the case of fast fixed broadband connection. For example, **Graph 3** shows that, from low levels of this type of connection (under 25% in all cases), the increase has been pronounced in most of the countries, even in those with relatively lower degree of adoption in 2011 and exceeding 50% in many of them. In any case, big differences between countries still persist, with percentages ranging from under 25% to over 75%.

Graph 4 and **Graph 5** show the percentage of urban and rural households with Next Generation Access (NGA)[134] broadband coverage/availability, respectively. In this case, the increase between 2011 and 2019 has been pronounced in the average indicator, even in countries with relatively low degree of coverage/availability in 2011 (e.g., Italy or Greece), reaching percentages over 75% in the majority of the sample. Besides, the increase has been much pronounced in rural areas, which had an extremely low degree of coverage/availability in 2011. In addition, and in contrast with the standard fixed broadband coverage, in this case the divide is much more evident and persistent, between and within countries (i.e., between countries and between their rural and urban areas).

Regarding mobile connectivity, it can be seen that the majority of countries in the sample already had a high (near 100%) coverage on 3G mobile broadband (High Speed Packet Access protocol) in 2011 (**Graph 6**), and this coverage has further increased in 2017, with some exceptions, such as Iceland, Luxembourg and Greece. In the case of 4G mobile broadband (Long Term Evolution protocol), the situation has been the following (**Graph 7**): irrespectively of the degree of coverage in 2012, which was highly unequal among countries, with some reaching percentages above 75% (Sweden and Portugal) and some other with percentages near zero (e.g., Belgium, France or Slovakia), all the countries in the sample have reached a level near 100% in 2019.

Another important aspect in the supply side is the price of the different bundles. In order to do so, an analysis of data from 2018 to 2020 is performed, due to several reasons: firstly, this data reflects ICT prices according to the current methodology of basket definition by ITU; and secondly, it will allow us to analyse the effects of the Covid-19 pandemic (next section).

In this sense, **Graph 8** shows the evolution of the price of different bundles proposed by ITU (fixed broadband 5GB, mobile broadband data only 1.5 GB, and a low consumption basket of mobile data and voice) between 2018 and 2020. As can be seen in the different figures, there is not a clear general pattern: in some countries, the price of the baskets rose between 2018 and 2019, whereas in others it fell, and the same occurred between 2019 and 2020. For instance, the price of the mobile broadband 1.5 GB experienced an evident reduction in Hungary or Slovakia between 2019 and 2020, whereas it increased in Croatia, Norway or Belgium.

3.2.2 Demand

Once the supply side has been analysed, the study now focuses on the reasons why part of the population does not subscribe to any service even in areas of a given country where they are available. In order to do so, variables such as internet penetration and usage, the level of digital skills of the population, and several outcomes to account for the take up of internet services are reviewed. This analysis is further enriched with socioeconomic variables, which will allow comparisons between different groups of population.

[134] NGA includes the following technologies: FTTH, FTTB, Cable Docsis 3.0, and VDSL (at least 30 Mbps download).

3.2.2.1 Digital divide on access

Starting from one of the most evident manifestations of the digital divide, such as the percentage of households with any member having access to the internet at home, **Graph 9** shows the evolution of this indicator between 2010 and 2019 and the value for 2020. As can be seen, access has increased in this time period in all countries and has furthermore slightly increased during 2020.

As mentioned early, several breakdowns have been used to further analyse the data. Out of the five that are analysed in this report (age, sex, level of education, population density, and income), in the case of households only the latter two are relevant.

In this respect, **Graph 10** shows again the percentage of households with any member having access to the internet at home, now considering the level of income of the household (i.e., showing the first and fourth quartiles of income). As can be seen, there is an evident divide between levels of income within countries, and the differences between countries seem to be driven by the lowest quartile of the distribution, whereas the percentage in the first quartile remains practically constant across the sample.

Similarly, the urban/rural divide is shown in **Graph 11**, although is less pronounced that the divide on income.

Graph 12 shows the number of fixed broadband subscriptions for 100 inhabitants. The evolution has been pronounced between 2010 and 2019, and there exist stark differences between countries. It is relevant to note that there is a high degree of correlation between the number of fixed broadband subscriptions for 100 inhabitants and the level of GDP per capita of the country: **Graph 13** plots both variables, showing that, irrespectively of the unit of analysis being households or countries (or individuals, as it will be analysed), the level of income is an important factor explaining the digital divide. As an instrument for comparison, **Graph 14** shows the number of fixed-telephone subscriptions for 100 inhabitants, showing no correlation between both variables.

We finish this subsection analysing the degree of mobile broadband penetration, which has been different across countries. **Graph 15** shows the number of active mobile broadband SIM cards per 100 people in 2010 and 2019: the increase has been stark, starting from a relatively low level in 2010, and consistent across countries. Another indicator of mobile broadband penetration, such as the number of active mobile-broadband subscriptions per 100 inhabitants, shows a similar pattern and evolution, albeit with a bigger sample size (**Graph 16**).

Finally, **Graph 17** shows the strong degree of correlation between mobile broadband penetration and GDP per capita. However, it is worth to notice the existence of outliers, such as Poland, with the highest number of active mobile-broadband subscriptions per 100 inhabitants despite its relatively low GDP per capita, as well as the existence of some degree of “saturation effect” once a certain level on income is reached.

3.2.2.2 Digital divide on skills

Another level of digital divide relates to skills. According to the definition in the Key Indicators – Digital Scoreboard, individuals that have been using internet during last 3 months are attributed a score on four digital competence domains: information, communication, content-creation and problem-solving, depending on the activities they

have been able to do. **Graph 18** shows the percentage of individuals who have basic overall digital skills (i.e., who have basic or above basic skills in all the four digital competence domains). As can be seen, there is a great divide between countries, though improvements have been made between 2015 and 2019 in most of them (except Bulgaria; see footnote for Luxembourg and Latvia).

Conversely, **Graph 19** shows the percentage of individuals who have low overall digital skills. Although both indicators do not add up to 100%, due to the definition and the methodology to determine them, there is a strong (negative) correlation between them.

In order to analyse the effect of the level of income in this layer of the digital divide, **Graph 20** shows the correlation between the level of GDP per capita and the level of basic skills of the population: there is a positive and consistent relation between those two variables. However, a strong causality cannot be inferred from this analysis since causation could either go in one or other direction.

Digital divide on skills has some implications that must be considered, in terms of structural and sectorial composition and, eventually, in terms of productivity and growth. In this regard, **Graph 21** shows the percentage of enterprises employing ICT specialists and its evolution between 2012 and 2019. Counterintuitively, the degree of employment was substantially higher in 2012 than in 2019, in most countries. One of the factors that might explain the lower number of ICT specialists employed is that digital skills at an above-basic level are now more commonly required of other professionals. For instance, an economist might program and maintain databases without being called an ICT specialist.

Since there is a stark digital divide between large and small and medium enterprises with respect to this indicator, with large enterprises employing a much higher proportion of ICT specialists, the fact that a much higher percentage of large enterprises provide training to their personnel to develop/upgrade their ICT skills introduces another source and driver of further inequality.

3.2.2.3 Digital divide on outcomes

The final level of the digital divide, regarding outcomes, has been analysed using several indicators:

- Individuals who have used the internet in the last 3 months (**Graph 22**).
- Individuals who are frequent internet users (every day or almost every day) (**Graph 23**).
- Individuals who have used the internet, in the last 3 months, for internet banking (**Graph 24**).
- Individuals ordering goods or services online (**Graph 25**).
- Individuals who have used the internet, in the last 3 months, for doing an online course (of any subject) (**Graph 26**).
- Individuals using the internet in the last 3 months, seeking information about health: injury, disease, nutrition, improving health, etc. (**Graph 27**).

- Individuals who have used the internet, in the last 3 months, for making an appointment with a practitioner via a website (e.g. of a hospital or a health care centre) (**Graph 28**).
- Individuals who have used the internet, in the last 12 months, for interaction with public authorities (**Graph 29**).
- Telephoning or video calls (via webcam) over the internet (**Graph 30**).
- Individuals who have used the internet, in the last 3 months, for participating in social networks (creating user profile, posting messages or other contributions to Facebook, Twitter, etc.) (**Graph 31**).

In all indicators, an increase between 2010 and 2019, and a further increase in 2020, has occurred, implying that a higher proportion of people now use the internet, are regular users, and use it for a wide range of outcomes, from education to health to leisure.

By using the different breakdowns, further analyses by age, sex, level of education, income, and population density have been conducted.[135] They show a consistent degree of digital divide between young and old people, men and women, high and low levels of education, high and low levels of income, and urban and rural areas. In the next section, how the Covid-19 pandemic has affected these divides is analysed.

3.2.3 Evolution of the digital divide during Covid-19 pandemic

As mentioned in the literature review, during the recent Covid-19 pandemic, the digital divide has been revealed as a key factor of social exclusion, contributing to widen pre-existing social inequalities.

In this section, changes in affordability for different bundles between 2019 and 2020 are reviewed. A review of how the Covid-19 pandemic has affected the pre-existing divides in terms of age, sex, level of education, income, and population density has also been carried out.

As aforementioned, the evolution of the price of different bundles between 2019 and 2020 did not show a clear pattern (**Graph 8**): in some countries, the price of the baskets in PPP$ rose between 2019 and 2020, whereas in others it fell. Here, we analyse the cost of the different baskets as a percentage of monthly GNI per capita, which is a better measure to account for changes in economic conditions.

Table 31 shows the basket prices as a percentage of GNI per capita between 2018 and 2020, whereas **Table 32** shows the difference in percentage points in this indicator between 2019-2020, for the five baskets defined by ITU:

- Fixed broadband 5GB.
- Mobile broadband data only 1.5 GB.
- Mobile Cellular Low Usage.
- Mobile Data and Voice Low Usage.
- Mobile Data and Voice High Usage.

[135] See *Annex 3: Additional graphic analysis of the digital divide*

The cost as a percentage of monthly GNI per capita has fallen in most of the countries for all baskets: it has decreased in 24 countries for fixed broadband 5GB, mobile broadband data only 1.5 GB, and mobile Data and Voice Low Usage, and in 29 countries in the other two categories. The average variation in the sample ranges from -0,04 (Mobile Data and Voice Low Usage) and -0,29 percentage points (Mobile Data and Voice High Usage). Therefore, we can conclude that ICT baskets have become more affordable during the Covid-19 pandemic.

By using the different individual breakdowns and for the different, the variation in the digital divide between 2019 and 2020 has been calculated. Since the data show a consistent degree of digital divide between young and old people, men and women, high and low levels of education, high and low levels of income, and urban and rural areas, the following indicator has been constructed:

$$Variation\ on\ the\ digital\ divide = (H_{2020} - Low_{2020}) - (H_{2019} - Low_{2019})$$

Where *H* denotes the group with systematically higher proportion of internet use (e.g., young people), *L* denotes the group with systematically higher proportion of internet use (e.g., old people), and 2020 and 2019 refers to the years of the observations.

Since we cannot draw causal conclusions by observing simple before-and-after changes in outcomes, we take the before-after difference in treatment group's outcomes. This indicator is therefore interpreted, under specific assumptions, as *à la* "diff-in-diff", showing the variation in the digital divide between the two years, and taking a positive sign if it has widened and a negative sign if it has been reduced. However, while accounting for the widening or the reduction in the digital divide, it lacks an evident interpretation in terms of what has been the internal variation within the groups, and a closer inspection is necessary for accounting for that.

Table 33 to Table 40 show the results of this analysis, by outcomes and breakdowns. It is worth noting that, whereas the divide in internet use has decreased across the categories, the one for doing an online course (of any subject) has widened by age, level of education and level of income.

3.3 Conclusions

In this section the data regarding the different levels of the digital divide have been reviewed.

A longitudinal analysis shows that supply side variables such as coverage, mobile connectivity and internet infrastructure have improved in all countries, though evident divides still exist between them, and between the urban and rural areas. Prices have not shown a clear pattern during the last three years, but we document an increase in the affordability for the different ICT baskets.

On the demand side, penetration and usage have improved during the last decade, with a systematic urban/rural divide within countries and a substantial divide between countries strongly correlated with the level of GNI per capita. The level of digital skills has also improved during the decade but shows a stark divide between countries and, within them, and is strongly correlated with the size of enterprises (the larger ones tend

to train more their personnel to develop/upgrade their ICT skills than the small and medium ones).

Besides, several indicators to account for the take up of internet services have been reviewed, along with several socioeconomic variables, which has allowed comparisons between different groups of the population. This analysis shows an increase of take up between 2010 and 2019 and a further increase in 2020, implying that a higher proportion of people now use the internet, are regular users, and use it for a wide range of outcomes, from education to health and leisure. Digital divides between young and old people, men and women, high and low levels of education, high and low levels of income, and urban and rural areas nonetheless persist.

Finally, the evolution of the digital divide during the Covid-19 pandemic and its potential contribution to widen pre-existing social inequalities has been analysed. Data on the cost of several ICT baskets as a percentage of monthly GNI per capita shows that they have become more affordable during the Covid-19 pandemic. Besides, the positive evolution of several indicators of use and outcomes has been shown.

4 Interviews

4.1 Methodology

Interviews with relevant stakeholders have been developed following four differentiated phases:

1. Identification of experts.
2. Elaboration of questionnaires adapted to each expert.
3. Conducting the interview.
4. Analysis of the results.

In the following sections, the methodological approach for conducting each phase is explained.

4.1.1 Identification of key experts

The success of the interviews heavily depends on an accurate identification of the most relevant experts on the digital divide within the digital ecosystem. Interviews should provide information about digital divide in a holistic way, considering different perspectives of the problem: end users' vision, telecom services providers approaches, regulatory challenges, public and private strategies, social and economic implications, etc. In order to get a comprehensive vision of the issue, the selection of the potential interviewees has been based on the following criteria:

- The final list encompasses representatives from all types of stakeholders involved in bridging the digital divide: telecom operators associations, consumer associations, NGOs and associations representing the most affected people by digital divide (elderly people, people with disabilities, people with low educational level, etc.), national regulatory authorities, public agencies promoting digitisation and academic experts on digital inclusion.
- The list includes experts across Europe, as digital divide is closely linked to socioeconomic conditions (distribution of urban and rural population, education level, income level) and indicators related to the digital society (coverage and affordability of telecommunication services, percentage of internet users, etc.), which can significantly vary between BEREC member countries.

Taking into account both criteria, the following methodology to identify and select the experts has been used:

1. Review of the profile of authors of the reports, studies and papers identified during the literature review phase to check whether they fit the defined criteria.
2. Review of the profile of speakers in conferences and meetings related to digital inclusion that have taken place in EU countries in recent years. The following relevant conferences have been identified:
    - *Digital Inclusion for All* (https://digitalinclusionforall.eu/), with more than 30 speakers analysing the challenges of digital inclusion. This event was hosted by the European Knowledge Community on Digital Inclusion. The community is supported by the EU-funded project MEDICI[136], aimed at

[136] https://medici-project.eu/about-medici-project/

integrating vulnerable and disadvantaged people in the digital society. MEDICI project has developed many other events (roundtables, keynotes, workshops, etc.) with relevant experts. We have reviewed the profile of all those experts and selected the most suitable for the study.
    - *Digital Inclusion Joint Conference* (https://eutopia-university.eu/digital-inclusion-conference/), where academic experts discussed good practices and potential solutions for digital inclusion.
    - *All Digital Summit* (https://summit.all-digital.org/), hosted by All Digital association, focused on the improvement of digital skills across Europe.
3. Review of the initiatives included in the Digital Inclusion Map & Catalogue, developed in the framework of the EU-funded MEDICI project. The objective of the review has been to identify the most suitable decision-makers to be interviewed.
4. Search for experts on the social network LinkedIn. Search terms such as “digital divide” or “digital inclusion” have been used.
5. Finally, European telco NRAs which have implemented regulatory measures to close digital divide related to access during the pandemic has also been considered.

A preliminary list of about 60 experts was elaborated following the methodology described above and refined with the feedback provided by BEREC after the first meetings.

4.1.2 Methodology for conducting interviews

A selection of the most relevant experts has been made in accordance with BEREC to achieve the estimated number of interviews (20-25), respecting the main criteria: a coherent geographic distribution across Europe and the inclusion of representatives of all groups of interest related to digital divide.

For each selected expert, his/her contact details have been searched and one member of the work team has contacted him/her to explain the objectives of the interview and to invite him/her to participate. When the expert accepted the invitation, the interview was scheduled, and one team member conducted it.

A questionnaire has been defined for each interview, including both general questions related to the digital divide and specific questions adapted to the field of expertise of each expert. The duration of the interviews was between 20 and 30 minutes.

The questionnaire was sent to the experts several days before the interview to allow them preparing the responses.

The interviews have been conducted in two ways:

- Telephonic interviews. The interviews have been conducted either by telephone or by VoIP services, like Teams, Zoom, etc.
- Written interviews. The interviewee has fulfilled the questionnaire, giving his/her opinions in writing.

During the interview, the structure of questions proposed in the questionnaire has been used. However, experts have been allowed to offer any other information that he/she considers relevant for the study.

Telephonic interviews were recorded -upon authorisation of the expert- and the interviewer elaborated a summary with the main ideas, which has been then used to compile the deliverable on the results of the interviews.

4.1.3 Elaboration of questionnaires

Questionnaires combine a common set of questions with some specific questions related to the field of expertise of the interviewees. Up to 5 different questionnaires have been used, with specificities for the following groups:

- Telecom operators and digital companies (individual companies or associations).
- National Regulatory Authorities.
- Civil society organisations working to close digital divide.
- Academic experts.
- Public agencies promoting digital inclusion.

The **common part** of the questionnaires aims to address the following general topics:

- Main causes behind digital divides and the effect of the pandemic over theses causes.
- Challenges that the Covid-19 pandemic has posed in bridging digital divides.
- Measures adopted to bridge the digital divides in the context of the pandemic and the effects of their implementation.
- Evolution of digital divides in the short and medium term after pandemic.
- Lessons learned from the pandemic related to the digital divide, effects on preparedness to fight digital divides and societal awareness.
- Recommendations to bridge digital divides after Covid-19 pandemic.

Questions for telecom operators and digital companies are aimed to investigate the following topics:

- The action of telecom operators to ensure network performance.
- Affordability of telecom and digital services in a context of economic recession in many countries.
- Impact of measures adopted by telco operators to avoid digital divide enlargement during pandemic.
- IT equipment requirements and shortages in households for teleworking and online education.

The specific questions for **NRAs** explore the following issues:

- The NRA regulatory response to the impact of the pandemic.
- Competition and prices issues related to the Covid-19 impact on the sector.
- Other actions or collaborations in which NRAs may have been involved.

Civil society organisations which work to close digital divides have been questioned about:

- Impact of Covid-19 pandemic on accessibility of internet services.
- The relationship between digital skills acquisition, work and the impact of the Covid-19 pandemic.

Finally, there is a set of specific question for **academic experts** addressing the following topics:

- The empirical evidence of the impact of Covid-19 on digital divides.
- The most decisive measures to close digital divides under Covid-19 context.

Questionnaires can be found in Annex 4: Questionnaires for interviews.

4.1.4 Analysis of the results

All interviews were recorded – upon authorisation of the interviewees – and transcribed. In this way, all the information gathered could be processed to identify the relevant topics for the experts.

After the transcription of each interview, a summary with the main ideas was produced.

Although the interviews are essentially a qualitative resource, all the information collected have also been treated in a quantitative form, in order to complement the analysis of the statistical information. This information is presented in a graphic way to facilitate its understanding. Considering the proposal of questionnaires defined above, the quantitative information to be processed is the following:

- Interviewees who consider that digital divide has increased during pandemic.
- Categorisation and distribution of the groups most affected by digital divide.
- Categorisation and distribution of causes of the digital divide.
- Categorisation and distribution of impacts of the digital divide.
- Assessment of the telecommunication networks performance during pandemic and its impact on the digital divide.
- Interviewees who consider that awareness on digital divide has increased after the pandemic.
- Expected evolution of digital divides.

4.2 Introduction

For a more qualitative look at the issue of digital divides, twenty-three experts were interviewed, either through telephonic or written interviews. The interviewees were chosen to represent the different types of stakeholders involved in reducing digital divide: telecom operators associations, consumer associations, NGOs and similar associations, national regulatory authorities and public bodies promoting digitisation. Of the twenty-three experts consulted, ten were from NGOs or civil society organisations, six hailed from public bodies or international organisations, six were representatives of telecom regulators, and one was the CEO of a digital company.

The list of experts, their organisation and the group they were categorised, is as follows:

Table 4: List of experts interviewed

Name	Organisation	Position	Group
June Lowery-Kingston	DG CNECT	Head of Unit Accessibility, Multilingualism and Safer Internet	Public Bodies/International Organisations
Ervin Kajzinger	Hungarian National Media and Infocommunications Authority (NMHH)	Director of International Affairs and Strategy	Telecom Regulators
Tania Maamary	Brussels Regional Informatics Centre (BRIC)	Digital Inclusion Coordinator	Public Bodies/International Organisations
Maarit Palovirta	European Telecommunications Network Operators' Association (ETNO)	Director of Regulatory Affairs	NGOs/Civil Society Organisations
Mher Hakobyan	European Disability Forum	Accessibility Officer	NGOs/Civil Society Organisations
Gunilla Lundberg	IT-Guide	Founder and operations manage	NGOs/Civil Society Organisations
Anna Tsiboukli	MEDICI Project (Mapping Digital Inclusion in Europe)	Steering committee member	NGOs/Civil Society Organisations
Jean Guo	Konexio	Founder and Executive Director	NGOs/Civil Society Organisations
Sonia Jorge	Alliance for Affordable Internet (A4AI)	Executive Director	NGOs/Civil Society Organisations
Victoria Mandefield	Solinum	Founder and Project Manager	NGOs/Civil Society Organisations
Samira Rharissi	Dutch Authority for Consumers and Markets (ACM)	Senior enforcement official	Telecom Regulators
Luisa Ribeiro Lopes	Portugal INCODE.2030	Coordinator of the axis for inclusion	Public Bodies/International Organisations
Marta Moreira Dias	DNS.PT Association	Board Member and Legal & Corporate Affairs Manager	NGOs/Civil Society Organisations
Juan Carlos Ramiro	AISTE	CEO	Telecom Operators/Digital Companies
Achiles Kameas	All Digital Association	Chair of the Board	NGOs/Civil Society Organisations

Maria Ruiz	Spanish National Commission of Markets and Competition (CNMC)	Responsible for International Affairs	Telecom Regulators
Mariagrazia Squicciarini	UNESCO	Chief of Executive Office, Social and Human Sciences Sector	Public Bodies/International Organisations
Annegret Groebel	German Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railway) Bundesnetzagentur	Head of Department International Relations	Telecom Regulators
Sussane Duus	Danish Agency for Digitisation	Head of Digital Inclusion	Public Bodies/International Organisations
Maryant Fernández Pérez	European Consumer Organisation (BEUC)	Senior Digital Policy Officer	NGOs/Civil Society Organisations
Stephen Bereaux	ITU	Deputy Director of the ITU Telecommunication Development Bureau	Public Bodies/International Organisations
Hana Továrková	Czech Telecommunication Office (CTU)	Council Chair	Telecom Regulators
Andreas Richter	Swedish Post and Telecom Authority (PTS)	Head of unit for digital participation	Telecom Regulators

Source: Own elaboration

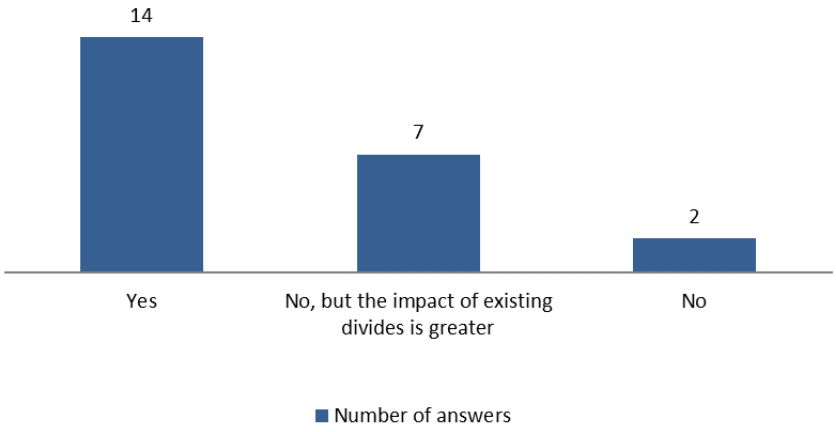
The result of the interviews is structured as per the order of the topics addressed. The graphics used are a visual summary of the expert's responses, and therefore have no statistical value and should not be interpreted as such.

4.3 Results of the interviews

4.3.1 Impact of Covid-19 on digital divides

The consensus found amongst the twenty-three interviewed experts was that the pandemic has either worsened digital divides or worsened the impact of already existing digital divides.

Figure 2: Has the digital divide worsened during the pandemic?



Source: Own elaboration based on interviewees' responses

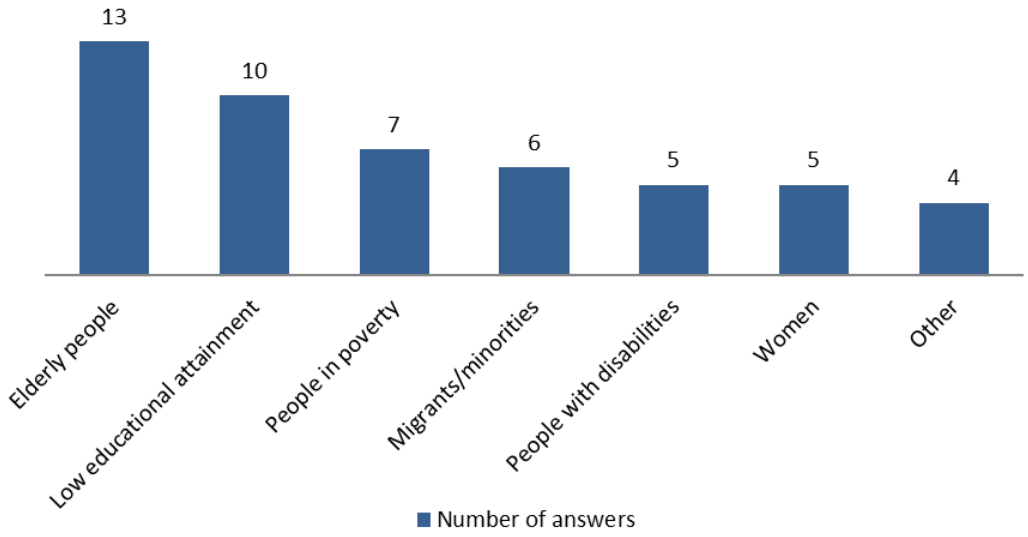
The experts which claim the latter argued that the pandemic may not have necessarily pushed more people into digital exclusion, but it has made the lives of those already digitally excluded much harder, as the world, and Europe in particular, experienced a surge of digitalisation which turned many existing services, both public and privately offered, into digital only, or digital first. Those without access, knowledge, or inclination to use the internet, often found themselves excluded from these digital services.

4.3.2 Groups affected by digital divides

There is also a large consensus regarding the groups most affected by digital divides, although different experts are sometimes focused on different groups, depending on their field of expertise or occupation.[137]

[137] Given the fact that some experts listed more than one group, the total answers in the graph do not amount to twenty-three. This is also the case in following graphs.

Figure 3: Who are most affected by digital divides?



Source: Own elaboration based on interviewees' responses

In general, four groups are almost always highlighted: people with low educational attainment, people living in rural or remote areas, the elderly, and people with disabilities. A large overlap exists between these groups of course; elderly people are more likely than younger generations to live in rural areas, and people with disabilities are more at risk of poverty than the general population, to give two examples. A large overlap also exists between these groups and others mentioned by some of the experts. People with low levels of education, minorities and migrants are all more likely to suffer from poverty than the average person. The gender gap might be partially explained by the fact that there are almost twice the number of women aged 85 or more than there are men, etc.

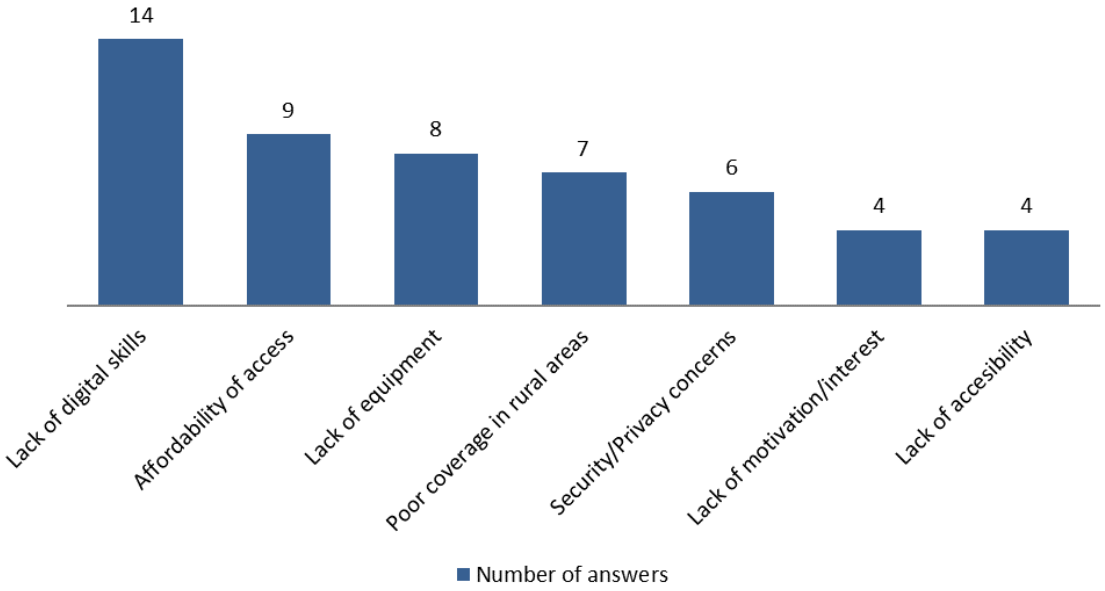
It is often hard to identify the root cause or condition that leads to digital exclusion, a fact remarked on by several experts. Nonetheless, there is a significant overlap between the groups typically affected by digital divide and its three dimensions: lack of access (poorer people, people living in remote areas, migrants, etc.), lack of knowledge and skills (elderly, minorities, people with low education levels, etc.) and unequal outcomes or benefits from digital use (women, people with disabilities, etc.).

Experts (seven of them, to be specific) also remark on the link between social exclusion and digital exclusion. To be socially excluded is to be digitally excluded, and vice versa, particularly during the pandemic's restrictions. People who were socially excluded, particularly amongst the elderly, could not ask for help from family or relatives, meaning they could not access the digital tools they might have needed during the lockdowns. Equally so, those who were digitally excluded could not use the internet to communicate or use many public services which had migrated to become fully online, thus becoming far more isolated than before.

4.3.3 Causes of the digital divide.

The groups affected by the digital divide are also mirrored by the causes experts give for the existence of digital gaps. The literature makes a distinction between 'supply-side causes' and 'demand-side causes' or problems, and although not every expert makes use of this terminology, their reasoning often follows similar categorisations.

Figure 4: What are the main causes of digital divides?



Source: Own elaboration based on interviewees' responses

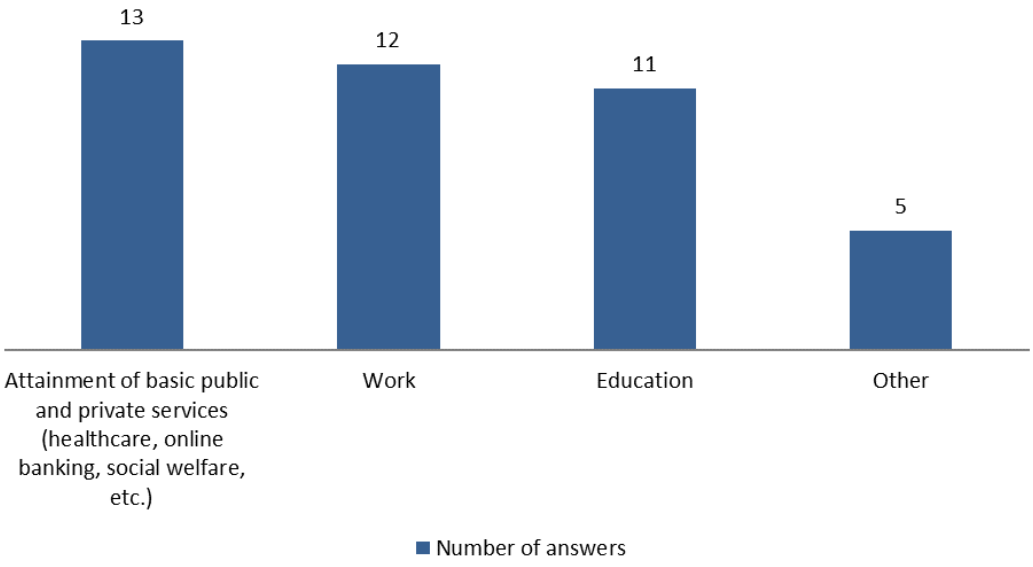
Lack of access, either due to poor coverage (more evident in rural/remote areas, though sometimes it is also the case in urban environments) or inability to pay for service fees are often quoted by the experts as being reasons for the existence of digital gaps in the supply side. Many experts also highlight lack of access to proper internet equipment, i.e., computers, tablets or smartphones. They argue that, whilst almost a totality of the population is connected to the internet via their smartphone, this does not constitute appropriate levels of access for a great deal of things; from education, to access to welfare, to administrative matters. 'Demand-side causes' are often quoted as being a matter of lack of skills, or lack of interest/attitude. It is interesting to remark here, that for some experts, demand-side causes are more important towards understanding digital divides than supply-side causes. One expert considers that elderly people suffer more from lack of interest in accessing digital services, than they do from lack of skills. Another believes a large part of the reticence of migrants to fully involve themselves in the digital economy is due to fear of government surveillance or even concerns of 'hacking'. Part of the gender gap in digital outcomes, is, according to another expert, simply a matter of confidence; women believe themselves to be worse at using digital tools than they really are. The point for some is that attitude or beliefs can be as important in explaining certain divides as lack of access, skills, or knowledge. The curious thing about this analysis, is, of course, that the pandemic might have helped bridge some of these 'attitude divides', as many people were forced into using digital services for such basic things as socialising

or leisure. Experts coincide in that this 'sink or swim' approach towards reducing digital divides are, however, not ideal from a public policy perspective.

4.3.4 Impact of the digital divide

The impact of digital divides, particularly during the pandemic, was felt almost across every daily activity, though experts were more likely to remark on certain areas.

Figure 5: Where has the digital divide had a greater impact during the pandemic?



Source: Own elaboration based on interviewees' responses

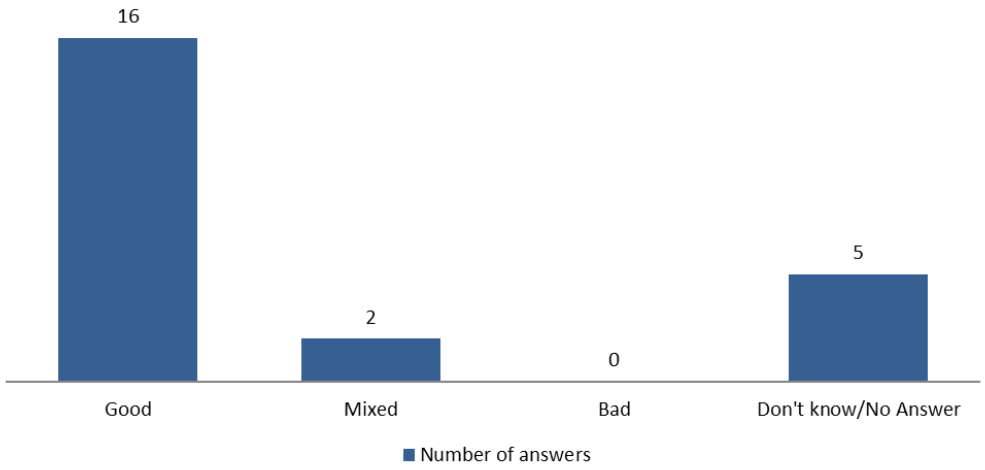
Experts often remarked on the impact on education, where previously existing gaps might have gone unnoticed, but work, leisure, consumption habits, etc. almost everything was impacted during the pandemic. One expert estimated that the rate of digitalisation jumped seven-fold due to the lockdowns, meaning that years of adaption were skipped, forcing people to adapt to a new reality almost overnight. The consequences for some were dramatic. People with visual disabilities, or with mental disabilities, or even with mental health problems, and those lacking any form of access to the internet found themselves completely cut off, both in social terms, and in terms of many essential services, including healthcare. Many experts criticise here the role of public administration, both slow to adapt to the digital transition, and also too eager to migrate their services to become fully, or primarily, digital. Given that there will always be people unable to connect or use the internet, for one reason or another, it is vital to ensure services can be provided in a more 'analogue' form, in the words of one expert. Of course, lack of access is only one of the digital gaps from which people suffering. The digitalisation of work environments, 'work-from-home' procedures, etc. also affected those with poor digital skills – and not only individuals; many companies too were not ready to provide their services digitally, or move their value chain to the digital sphere, resulting in big losses of productivity. Education, as previously mentioned, is also an area in which much value was lost. Multiple issues were mentioned, by several different experts; not every student had access to the internet from home, or a good studying environment, or access to the appropriate equipment from which to study. From the point

of view of the school/educators, not every teacher had the capability to use online tools to teach, and many who had did not use it to their fullest extent, or at least well enough to the level of a face-to-face class.

4.3.5 Telecommunication networks performance

A silver lining of the pandemic, according to the majority of the experts, including all experts working for national regulatory agencies, was the good performance of telecommunication networks.

Figure 6: How would you rate the performance of telecommunications networks during the pandemic?



Source: Own elaboration based on interviewees' responses

The consensus was that service availability and capacity was well-handled during the pandemic, with no major congestion issues due to increased data traffic, or price hikes. Indeed, many remarked positively on the voluntary measures taken by many telecommunication companies, such as increasing mobile data free of charge, or offering special packages to struggling SMEs with close to zero prices or providing users with important information and access to free online leisure. One expert, however, hailing from a civil society organisation, caveats this performance by arguing that in biasing networks in favour of those users with the ability to consume more, and thus pay more, existing inequalities were exacerbated.

In addition, experts hailing from national regulatory authorities were asked whether their organisations had enacted any new measures or regulations to tackle issues arising from the pandemic for telecommunication networks or services. Although preventive measures were discussed for some regulators (primarily in the Netherlands) every single expert claimed that such additional regulations had not been needed in the end. In the case of Germany, the Ministry of Education implemented an educational flat rate, giving priority to school content, and the German NRA had to monitor its proper implementation. This was not implemented in order to relieve telecommunication networks, however, but rather to ensure German students had the best access to online education.

4.3.6 Highlighted measures

The impact the pandemic had on digital divides meant not only an increased awareness of the issue, but also induced a policy response in almost every European country. There were many measures highlighted by the interviewees that were adopted during the pandemic in order to tackle the problem of digital inclusion, a large of which were 'emergency measures', taken in the short term with no view of a more long-term solution. They can be categorised using the three divides already listed (access, skills and knowledge, outcomes).

Measures aimed at dealing with lack of access were typically done by national and regional governments, as well as certain telecommunication companies, which, as mentioned above, offered a reduction of prices to some of their services. Experts remark on measures such as gifting or subsidising laptops to school children, offering free or public Wi-Fi or creating internet access points, and subsidising access to telecommunication services to families with children. To tackle the skill gaps, many governments, NGOs, and even regulatory bodies provided information and skills training for different groups of people, ranging from civil servants to the elderly (one example is National Coalition for Digital Skills and Jobs program in Italy). In Hungary, digital technical assistance was offered in person in places such as post offices, regional government offices, etc, so that those without internet connections or devices, or the skill or the confidence to use them, could still handle their digital affairs. A similar program was done by the government of Brussels. In Greece a 'Digital Academy' was created, in which people could assess their own digital skills, and then take a series of free training courses depending on their interest and the outcomes. Some experts also remarked on the changes which took place in the private sector, with many companies improving the accessibility of their services and digital offerings. Of course, the recency of most of these measures make it hard to measure, in most cases, whether they have been effective or not in closing digital gaps, although many experts are optimistic in this regard.

Expanding on the measures taken by governments, the private sector and civil society, many experts also gave their recommendations towards bridging digital divides with a more medium to long-term view. These recommendations are outlined in the following section. Chapter 6, devoted to the final recommendations, aggregates them along with others extracted from the case studies and literature review for a full conclusion on the measures.

4.3.7 List of recommendations suggested by interviewees

The recommendations are ordered following the categorisation already outlined, access, knowledge and skills, and unequal outcome. Most of the recommendations were given as a response to the question of 'What recommendations would you propose to bridge the digital divides after Covid-19 pandemic?' which was uniformly posed to all interviewees, regardless of their stakeholder group.

Recommendations to improve access:

NRAs:

- Research into the motivations of those choosing not to engage in the digital world.
- Ensure that a minimum threshold of connectivity/quality of connection is guaranteed across all regions and territories.
- For coverage for rural areas, work with or subsidise small to medium sized ISPs who are often the only ones present in remote or rural areas, and which are usually the closest to the communities currently underserved by the big companies.
- Ensure already existing legislation is properly implemented.

Other:

- Raising awareness of the advantages and opportunities of digitalisation, equipping citizens with the services, training or equipment necessary to enter the digital world and supporting the most at risk or vulnerable groups identified.
- Provide faster fiber connections to rural areas.
- Government aid in the form of digital systems (providing a computer, or a discount for a similar device) for students with financial difficulties.
- Increase availability of internet in geographical locations who do not have access.
- Reduction in internet services prices for families with children.
- Incentivise the creation of bundles or affordable packages to those individuals or families at the risk of digital exclusion due to economic conditions.

Recommendations to improve digital knowledge and skills:

NRAs:

- Awareness campaign for the elderly and other groups digitally excluded regarding benefits, safety and accessibility of the internet.

Other:

- Facilitate training to those professionals whose services have become more digitalised, across educational levels and languages
- Improving accessibility for public services, including languages. Tackle issues of security and online privacy.
- Introduce/reinforce classes on digital skills in the education system.
- Improving accessibility and providing digital education and professional training for the civil service.
- Create ‘user journeys’, in which steps are outlined, both in digital and analogue form for important administrative procedures.

Recommendations to bridge performance gaps in digital use:

NRAs:

- Foster a joint European digital ecosystem, in order to ensure the deepening of the digital single market.

- Mainstream disability and accessibility in digital policies, programmes and initiatives and ensure sufficient funding and expertise for accessibility.
- Ensure proper implementation and enforcement of legislation in support of accessibility (EECC, EAA, WAD, AVMSD).
- Gather systematic data on what works what not (digital participation and inclusion of persons with disabilities, accessibility, etc.).
- Meaningfully engage with DPOs – inform policy-making with input by disability rights advocates and accessibility experts.
- Improve accessibility of digital technology (use of subtitles, text-to-speech technology, etc.).
- Partner, or work with, consumer's associations, which often have direct links with citizens that regulators lack.
- Network with differing organisations to test guidelines, information material, etc with users. Prioritise user testing as feedback loops for accessibility features.
- Bring together the regulatory community, telecom operators, online companies, etc., to share best practice policies and measures.

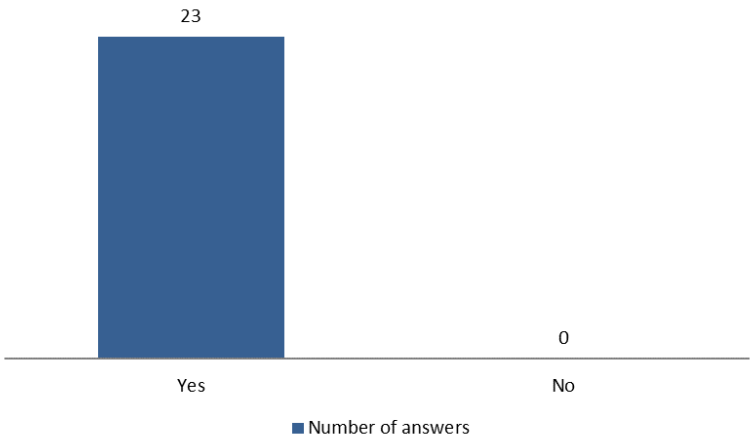
Other:

- Improving accessibility and providing digital education and professional training for the civil service.
- Design digital technology that is easier to use.
- Implement usability and accessibility features to lower the threshold of knowledge needed to access the internet.

4.3.8 Conclusions and considerations for the future.

An opinion which was uniformly held across all interviews, was that the pandemic had increased the awareness of digital divides.

Figure 7: Has awareness of digital divides increased as a result of the pandemic?

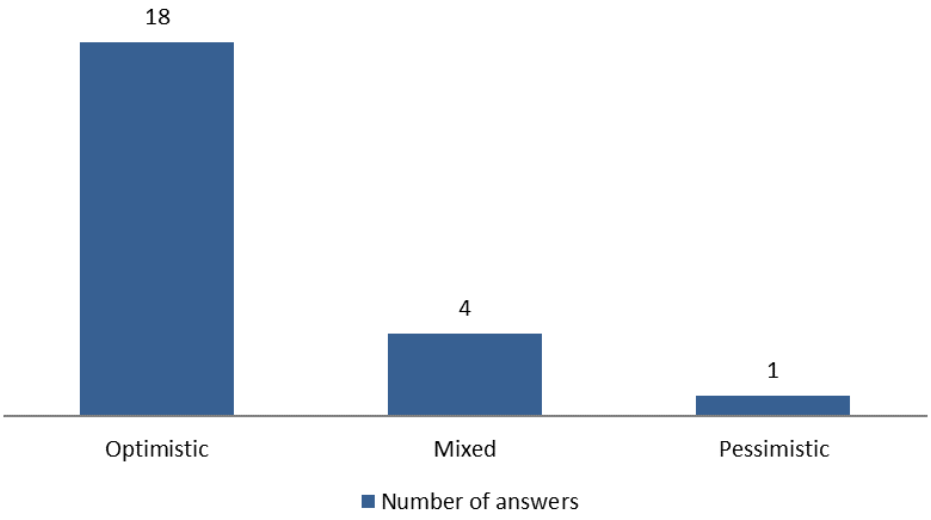


Source: Own elaboration based on interviewees' responses

Following the worsening of the digital divide during the pandemic, or at least the increased impact of already existing digital gaps, both public and political awareness of the issue increased drastically. Increased digitalisation as a result of lockdowns and similar measures not only highlighted pre-existing problems, but also revealed the extent to which access to the internet and attainment of digital skills was essential for the

modern citizen. Some experts framed it as an issue of citizens' rights; as to be digitally excluded was to be excluded from many basic services which were, or should have been, theoretically guaranteed. Awareness also increased about the possibilities and downsides of increased digitalisation, and the digital transformation society experienced. As one expert remarked; 'It is in the nature of digital transformations to create digital divides', and it is the task of governments to ensure efforts are taken to reduce these gaps. On a positive note, many experts also considered that awareness about the benefits of internet services also increased, with more people, particularly the elderly, taking the steps to participate in the digital world. This increased awareness not only led to action both by national governments and the private and civil society sectors but was also the greatest source of optimism for experts when it came to evaluating the future of digital divides.

Figure 8: What is your outlook on the evolution of digital divides?



Source: Own elaboration based on interviewees' responses

While many experts caveated their optimism with the condition that certain measures were taken, taking advantage of the more favourable political climate owed to the aforementioned awareness of the issue, as well as funds from the recovery plan for Europe, it is nonetheless true that a majority is optimistic that the digital gap will be reduced in the future. The gap between old and young will most likely decrease over time, as older generations are replaced with younger, more technically savvy ones. It is however important to recall that digital technologies will change, and current young generations will have to constantly update their digital skills. The issue of access too, and affordability, are being addressed currently, with the current legislative framework (EECC). It is the issue of skills, particularly as society transforms and becomes further digitalised where experts are likely to be more worried about, and where constant efforts will have to be undertaken in order to make sure existing divides do not widen. This goes hand in hand with accessibility and online privacy and security. Of course, while many experts stress the importance of government involvement to address this issue, others mention the importance of collaboration between different stakeholders, including private companies and the civil society sector. Experts working in NGOs and civil society organisations were also asked about the main lessons that could be drawn from the

impact of the pandemic on the digital divide, with many stressing precisely such collaboration, or the lack of it, between the different institutions, organisations, and governments involved in closing digital gaps. In the words of one expert; ‘there is no lack of activities just a lack of coordination’ even at the European level.

5 Case studies

This chapter of the study is aimed at analysing how digital divides have evolved in five different BEREC member countries, the measures adopted to bridge these divides and the outcomes of such measures. The analysis of case studies intends to draw lessons and best practices that can be extrapolated to the rest of BEREC member countries.

The selection of the case studies has been made according to the methodology explained in the following section. For each case, a description of the current digital divides is presented, taking into account topics such as coverage, access, usage and skills. After that, initiatives carried out by diverse stakeholders (NRAs, telecommunication operators, public administrations, companies and civil society organisations) are described, paying attention to the digital divide they try to bridge, the targeted groups, the outcomes and the factors of success/failure. Finally, the replicability of the initiatives in other countries is assessed.

5.1 Methodology

In order to identify BEREC member countries for analysing case studies, a cluster analysis has been developed. This statistical method allows grouping entities (in this case countries) which have similarity considering a wide range of variables, to select a representative for each group. The most updated indicators as well as the insights and conclusions drawn from the quantitative analysis have been considered to perform the cluster analysis.

As a preliminary consideration, it is important to note that the choice of the countries involves a certain degree of intuition and discretionarily: the set of countries has primarily been determined by using the cluster analysis methodology; however, geographical balance, as well as the existence of relevant experiences to be analysed as case studies, have also been considered as selection criteria. In any case, the proposal of countries, based on the supply and demand analysis performed, appears to be a representative sample of BEREC member countries.

Due to methodological aspects and the constraints posed by data availability, primarily the fact that the cluster analysis requires to have data for all the units (i.e., countries) and all the variables, we have focused the cluster analysis on EU member states, as statistical information for these countries is publicly available across all the databases. Attention has been paid to data from other EEA and Balkan countries that are part of BEREC. However, since data for all variables (particularly for the demand side) were not available for them, the following countries have finally been excluded from the analysis: Albania, Liechtenstein, Montenegro, North Macedonia, Serbia, Switzerland, and Turkey. Therefore, the cluster analysis has been performed to a sample of 29 countries.

The following indicators have been used for cluster analysis:

- **Supply side:** to identify relevant characteristics of the market, like coverage, and prices.[138]

    1. **Next Generation Access broadband coverage/availability:** percentage of households living in areas served by Next Generation Access (NGA).[139]
    2. **Rural NGA broadband coverage/availability:** percentage of households living in rural areas (those with less than 100 people per km^2) served by NGA.
    3. **Standard fixed broadband coverage/availability:** percentage of households living in areas served by xDSL, cable (basic and NGA), FTTP or WiMax networks.
    4. **Rural standard fixed broadband coverage:** percentage of households living in rural areas (those with less than 100 people per km^2) served by xDSL, cable (basic and NGA), FTTP or WiMax networks.
    5. **Cost of the fixed broadband basket as a percentage of monthly gross national income (GNI) per capita:** refers to the cheapest plan providing at least 5GB of monthly high-speed data (≥ 256Kbit/s) from the operator with the largest market share in each economy.
    6. **Cost of the data-only mobile-broadband basket as a percentage of monthly GNI per capita:** refers to the cheapest plan providing at least 1.5GB of high-speed data (≥ 256Kbit/s) over a 30-day (or four weeks) period of time from the operator with the largest market share in each economy.
    7. **Cost of the mobile-cellular low-usage basket as a percentage of monthly GNI per capita:** refers to the cheapest plan providing at least 70 minutes of voice and 20 SMS (in predetermined on-net/off-net/fixed ratios) over a 30-day (or four weeks) period of time from the operator with the largest market share in each economy.
    8. **New entrants' share in fixed broadband subscriptions:** market share based on fixed broadband subscriptions (lines). New entrants mean operators that did not enjoy special and exclusive rights or de facto monopoly for the provision of voice telephony services before the liberalisation.

- **Demand side:** to identify relevant characteristics of the population, like take-up and usage, affordability, digital skills and outcomes.[140]

    1. **Households with access to the internet at home:** any member of the household has access to the internet at home.
    2. **Households that have no access to the internet at home because the costs are too high.**

[138] Indicators 5, 6, 9, 10 and 11 have been extracted from ITU. The remaining ones have been extracted from the Digital Agenda Scoreboard Key Indicators database.
[139] NGA includes the following technologies: FTTH, FTTB, Cable Docsis 3.0, VDSL and other superfast broadband (at least 30 Mbps download).
[140] All indicators have been extracted from the Digital Agenda Scoreboard Key Indicators database.

3. **Households having a broadband connection:** broadband connection used by the household includes DSL, wired fixed (cable, fiber, Ethernet, PLC), fixed wireless (satellite, WiFi, WiMax) and mobile wireless (3G/UMTS).
4. **Households with fixed broadband connection.**
5. **Share of fixed broadband subscriptions greater or equal to 10 Mbps:** based on advertised download speeds.
6. **Take-up of mobile broadband:** mobile broadband penetration is defined as the number of active mobile broadband SIM cards per 100 people.
7. **Individuals who have used the internet in the last 3 months.**
8. **Individuals with above basic level of digital skills:** persons that have been using internet during last 3 months are attributed a score on four digital competence domains (information, communication, content-creation and problem-solving, depending on the activities they have been able to do). To be classified "above basic" on the overall indicator an individual must have above basic skills in all the four Digital Competence domains included in the index.
9. **Individuals with low level of digital skills:** missing some type of basic skills.
10. **Individuals who are frequent internet users:** individuals using the internet every day or almost every day, in the last 3 months.
11. **Using online banking:** individuals who have used the internet, in the last 3 months, for Internet banking.
12. **Doing an online course:** individuals who have used the internet, in the last 3 months, for doing an online course (of any subject).
13. **Individuals ordering goods or services online:** individuals carrying out this activity over the internet in the last 12 months, for private use.
14. **Making an appointment with a practitioner via a website:** individuals who have used the internet, in the last 3 months, for making an appointment with a practitioner via a website (e.g., of a hospital or a health care centre).

Table 5 and **Table 6** summarise the supply and demand-side indicators variables, respectively, showing their source, the year they refer to, and the broad category they refer to. In that respect, data from 2019 has been taken, in order to avoid distortions generated by the Covid-19 pandemic.

Table 5: Supply-side indicators used in the cluster analysis.

Variable	Source	Year	Maximum number of counties	Category
NGA broadband coverage/availability	Key Indicators	2019	29	Coverage
Rural NGA broadband coverage/availability	Key Indicators	2019	29	Coverage
Standard fixed broadband coverage/availability	Key Indicators	2019	29	Coverage

Rural standard fixed broadband coverage	Key Indicators	2019	29	Coverage
Cost of the fixed broadband basket as a percentage of monthly GNI per capita	ITU	2019	36	Prices
Cost of the data-only mobile-broadband basket as a percentage of monthly GNI per capita	ITU	2019	36	Prices
Cost of the mobile-cellular low-usage basket as a percentage of monthly GNI per capita	ITU	2019	36	Prices
New entrants' share in fixed broadband subscriptions	Key Indicators	2019	29	Competition

Source: own elaboration

Table 6: Demand-side indicators used in the cluster analysis.

Variable	Source	Year	Maximum number of counties	Category
Households with access to the internet at home	Key Indicators	2019	29	Take-up
Households having a broadband connection	Key Indicators	2019	29	Take-up
Households with fixed broadband connection	Key Indicators	2019	29	Take-up
Share of fixed broadband subscriptions greater or equal to 10 Mbps	Key Indicators	2019	29	Take-up
Take-up of mobile broadband	Key Indicators	2019	29	Take-up
Households that have no access to the internet at home because the costs are too high	Key Indicators	2019	29	Affordability
Individuals who have used the internet in the last 3 months	Key Indicators	2019	29	Usage
Individuals with above basic level of digital skills	Key Indicators	2019	29	Usage
Individuals with low level of digital skills	Key Indicators	2019	29	Digital skills
Individuals who are frequent internet users	Key Indicators	2019	29	Digital skills
Using online banking	Key Indicators	2019	29	Outcomes
Doing an online course	Key Indicators	2019	29	Outcomes
Individuals ordering goods or services online	Key Indicators	2019	29	Outcomes

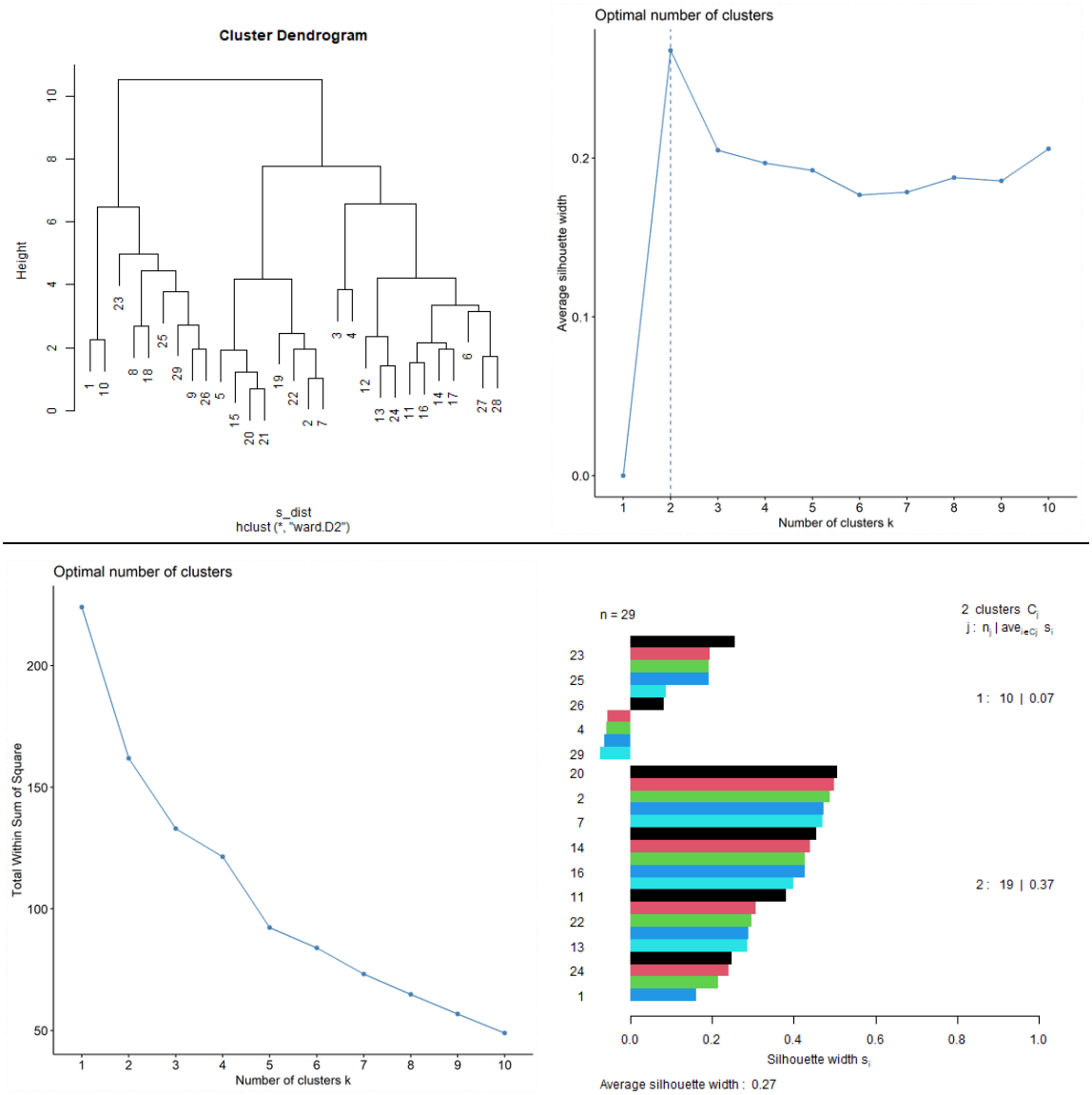
Making an appointment with a practitioner via a website	Key Indicators	2018*	29	Outcomes

Source: own elaboration. * Biennial indicator.

Cluster analysis has been performed using k-means and Euclidean distances, for a different number of clusters.

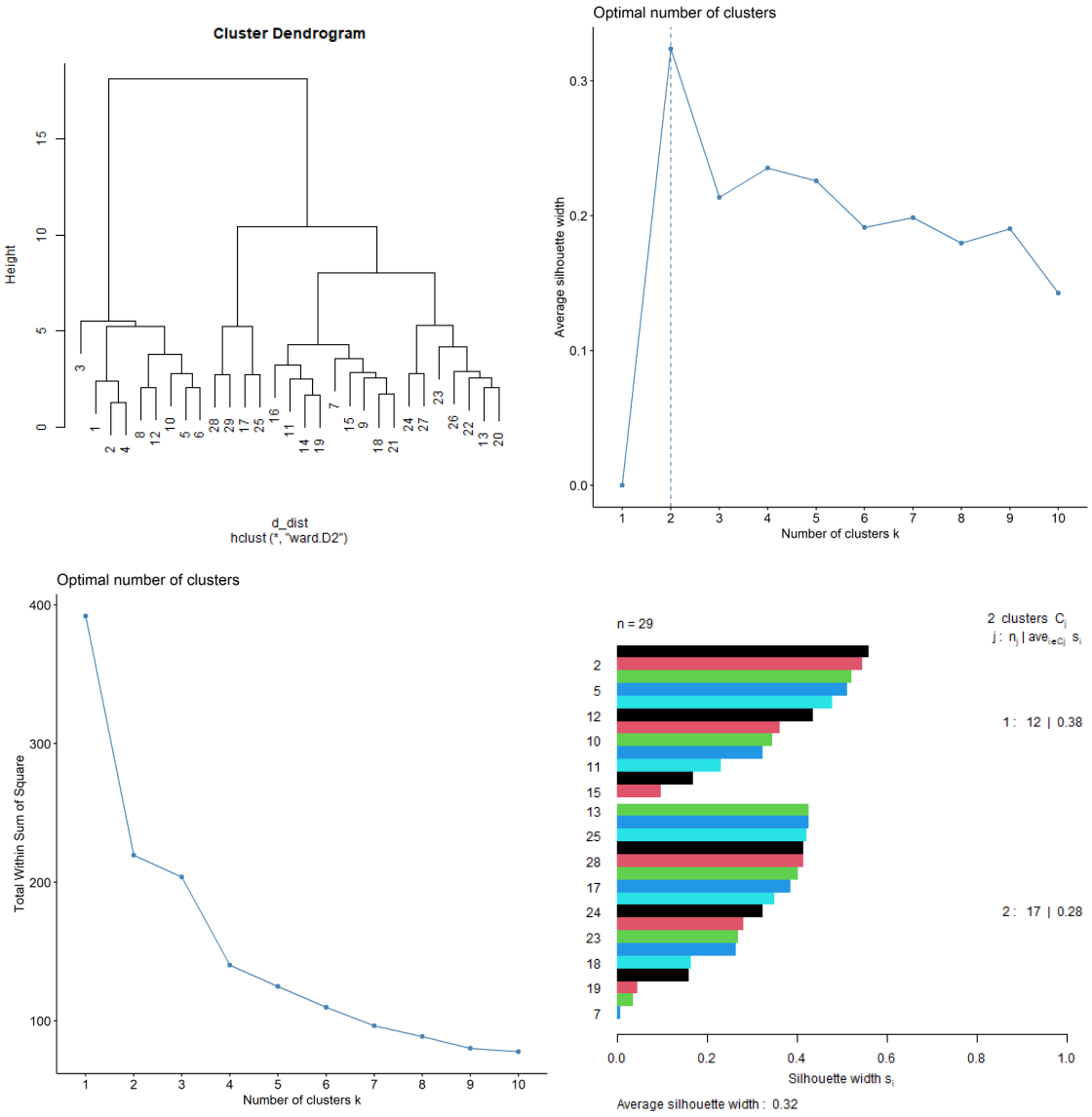
Figure 9 and **Figure 10** show the dendrogram, the optimal number of clusters, the Minimum Sum of Squares Clustering (MSSC), and the silhouette plot, for supply and demand variables, respectively. In order to minimise discretion, the optimal number of clusters was to be chosen (two clusters for demand and two for supply).

Figure 9: Cluster analysis (supply side)



Source: own elaboration

Figure 10: Cluster analysis (demand side)



Source: own elaboration

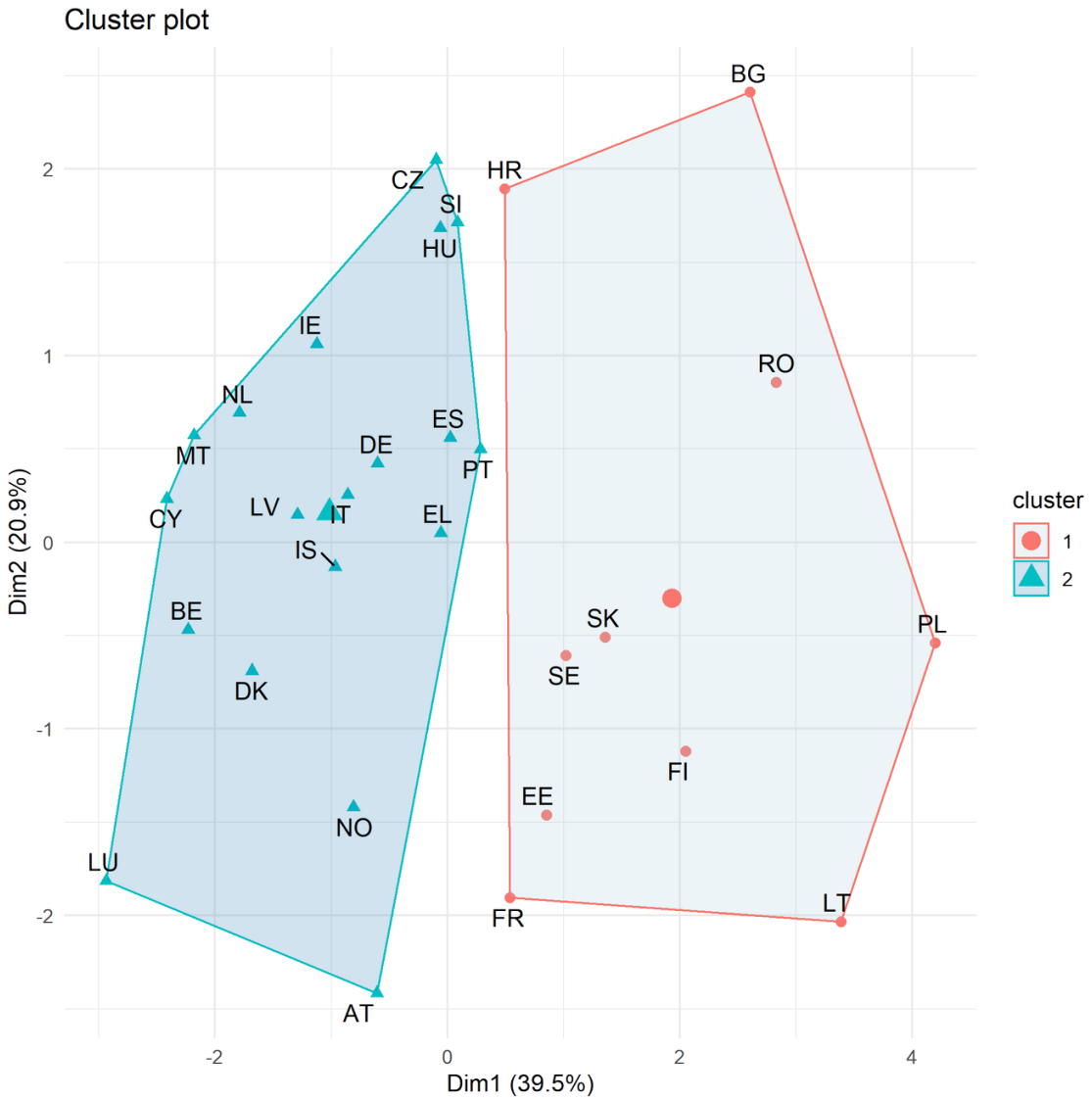
In the supply side (**Figure 11**), 2 clusters are identified:

- Relatively low NGA broadband coverage and fixed broadband basket cost, and relatively high mobile basket cost and new entrants' share in fixed broadband subscriptions (10 countries).[141]

[141] The use of the term “relatively” is deliberate since categories are established with respect to the rest of the units and average values. For instance, the first cluster, includes countries such as Sweden or Finland, with relative low degrees of NGA broadband coverage, especially in rural areas. In any case, this cluster remain almost unaltered (except for Bulgaria and Croatia) when choosing three clusters instead of two, showing the consistency of the methodology and its results.

- Relatively high NGA broadband coverage and fixed broadband basket cost, and relatively low mobile basket cost and new entrants' share in fixed broadband subscriptions (19 countries).

Figure 11: Clusters in the supply side

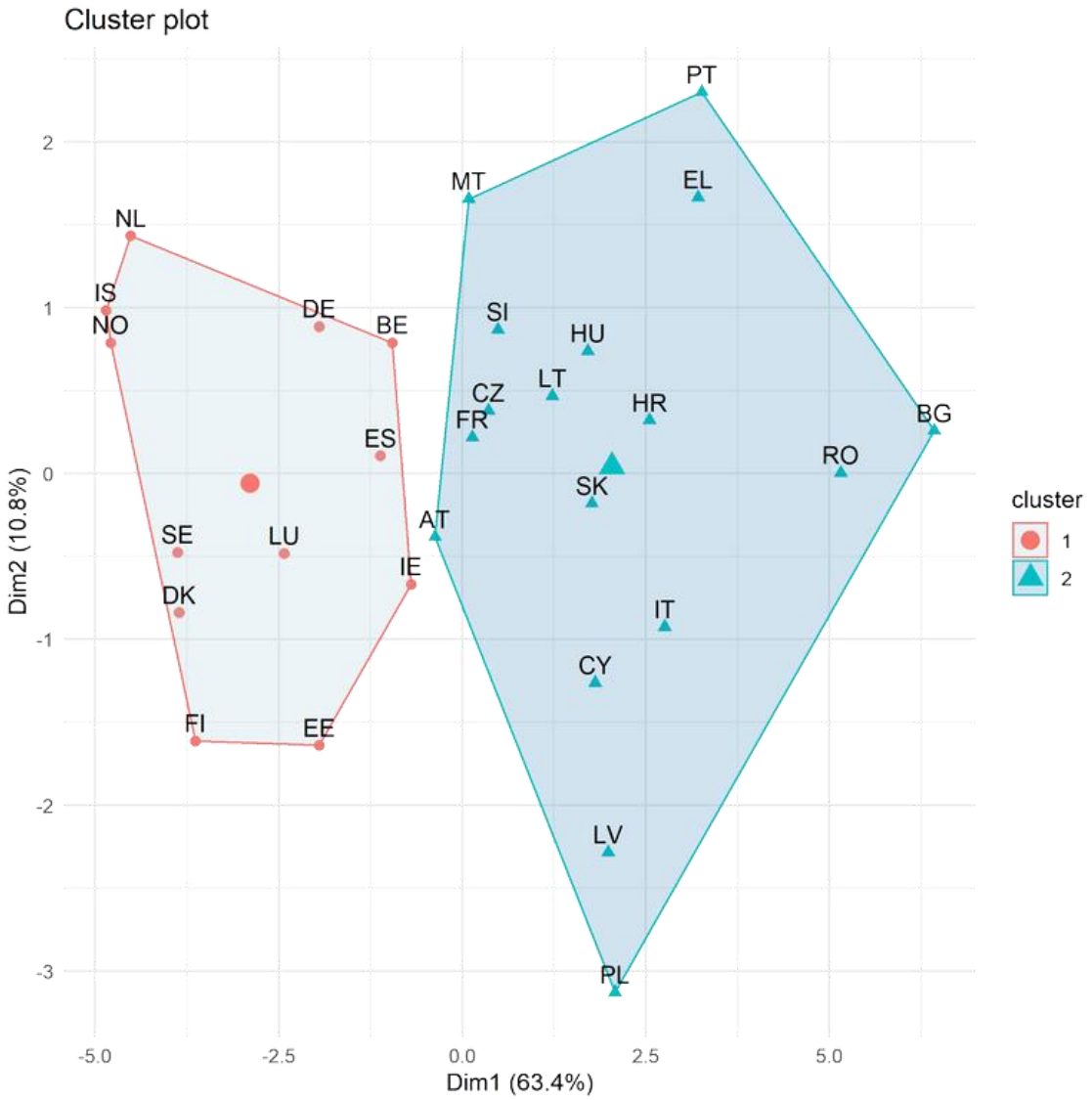


Source: own elaboration

In the demand side (**Figure 12**), 2 clusters are identified:

- Relatively low proportion of households with affordability problems and relatively high level of digital skills; relatively high take-up and usage (12 countries).
- Relatively high proportion of households with affordability problems and relatively low level of digital skills; relatively low take-up and usage (17 countries).

Figure 12: Clusters in the demand side



Source: own elaboration

Table 7 summarises the results of the cluster analysis, showing the countries that lie in each one of the supply and demand pairs.

Table 7: Cluster analysis (groups of countries)

Supply/Demand	Cluster 1	Cluster 2
Cluster 1	EE, FI, SE	BG, FR, HR, LT, PL, RO, SK
Cluster 2	BE, DE, DK, ES, IE, IS, LU, NL, NO	AT, CY, CZ, EL, HU, IT, LV, MT, PT, SI

Source: own elaboration

Based on these pairs of clusters, the following wider list of countries to develop the analysis of cases studies is proposed:

1. **Sweden/Finland**: relatively low NGA broadband coverage;[142] relatively high fixed broadband and mobile basket cost; relatively high new entrant's share in fixed broadband subscriptions / relatively low proportion of households with affordability problems and relatively high level of digital skills; relatively high take-up and usage.
2. **Germany**: relatively high NGA broadband coverage; relatively low fixed broadband and mobile basket cost; relatively low new entrant's share in fixed broadband subscriptions / relatively low proportion of households with affordability problems and relatively high level of digital skills; relatively high take-up and usage.
3. **Hungary/Italy**: relatively high NGA broadband coverage; relatively low fixed broadband and mobile basket cost; relatively low new entrant's share in fixed broadband subscriptions / relatively high proportion of households with affordability problems and relatively low level of digital skills; relatively low take-up and usage.
4. **Spain/Netherlands:** relatively high NGA broadband coverage; relatively low fixed broadband and mobile basket cost; relatively low new entrant's share in fixed broadband subscriptions / relatively low proportion of households with affordability problems and relatively high level of digital skills; relatively high take-up and usage.
5. **Czech Republic:** relatively high NGA broadband coverage; relatively low fixed broadband and mobile basket cost; relatively low new entrant's share in fixed broadband subscriptions / relatively high proportion of households with affordability problems and relatively low level of digital skills; relatively low take-up and usage.

After analysing the initiatives carried out to close the digital divides, the final list of case studies is the following:

- **Czech Republic**
- **Hungary**
- **The Netherlands**
- **Spain**
- **Sweden**

Therefore, the final selection of countries covers three out of the four clusters, considering two representatives of the most numerous clusters and not considering any country from one of the clusters. However, the selection of countries fulfils all the relevant criteria required to analyse the case studies: first, the selection has been made following the results of the cluster analysis, minimising the degree of discretion by choosing countries which are representatives of their respective clusters; second, they are

[142] Sweden ranks 19th out of 31 European countries regarding NGA broadband coverage and 24th considering rural NGA broadband coverage. Finland ranks 28th and 31st, respectively.

balanced in geographical terms; finally, they have relevant experiences to be analysed as case studies.

5.2 Czech Republic

5.2.1 Digital divides through their main indicators

5.2.1.1 Digital divide in access

Coverage

Broadband coverage

Indicator	Value
Standard fixed broadband coverage (% households, 2020) *European Commission - Digital Agenda Key Indicators*	99.8%
Rural Standard fixed broadband coverage (% households, 2020) *European Commission - Digital Agenda Key Indicators*	99.2%
NGA broadband coverage (% of households, 2020) *European Commission - Digital Agenda Key Indicators*	96.9%
Rural NGA broadband coverage (% of households, 2020) *European Commission - Digital Agenda Key Indicators*	89.9%

Mobile coverage

Indicator	Value
Population covered by a mobile-cellular network *(%, 2019)* *ITU*	99.8%
Population covered by at least a 3G mobile network *(%, 2019)* *ITU*	99.8%
4G mobile broadband (LTE) coverage (% of households, 2020) *European Commission - Digital Agenda Key Indicators*	99.8%
Rural 4G mobile broadband (LTE) coverage (% of households, 2020) *European Commission - Digital Agenda Key Indicators*	99.8%

Take-up

Broadband take-up

Indicator	Value
Households having a broadband connection (%, 2020) *European Commission - Digital Agenda Key Indicators*	**88%**
– Low income households (1st quartile)	63.2%

– High income households (4th quartile)	99.2%
– Urban areas	90.1%
– Rural areas	86.3%

Mobile take-up

Indicator	Value
Take-up of mobile broadband (subscriptions/100 people, 2020) *European Commission - Digital Agenda Key Indicators*	91.9%

Access

Households

Indicator	Value
Households with access to the internet at home (%, 2020) *European Commission - Digital Agenda Key Indicators*	**88%**
– Low income households (1st quartile)	63.2%
– High income households (4th quartile)	99.2%
– Urban areas	90.1%
– Rural areas	86.3%

Individuals

Indicator	Value
Individuals who have used internet in the last 3 months (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**87.6%**
– Low income households (1st quartile)	62.1%
– High income households (4th quartile)	96.1%
– Urban areas	90.2%
– Rural areas	85.2%
– Male	88%
– Female	87.2%
– Young (16-24)	98.6%
– Old (55-74)	67.3%
– Low education level	75.3%
– High education level	98.7%
Individuals who are frequent internet users, every day or almost every day (% individuals, 2020)	**79.4%**

European Commission - Digital Agenda Key Indicators	
– Low income households (1st quartile)	51.8%
– High income households (4th quartile)	90.6%
– Urban areas	85.2%
– Rural areas	74.1%
– Male	79.8%
– Female	78.9%
– Young (16-24)	97.2%
– Old (55-74)	52.5%
– Low education level	67.2%
– High education level	96.3%

5.2.1.2 Digital divide in skills

Indicator	Value
Individuals with above basic level of digital skills (% individuals, 2019) *European Commission - Digital Agenda Key Indicators*	**25.8%**
– Low income households (1st quartile)	7.64%
– High income households (4th quartile)	39.4%
– Urban areas	35.4%
– Rural areas	19.8%
– Male	27.9%
– Female	23.8%
– Young (16-24)	61%
– Old (55-74)	7.5%
– Low education level	26.3%
– High education level	50.7%
Individuals with low level of digital skills (% individuals, 2019) *European Commission - Digital Agenda Key Indicators*	**24.4%**
– Low income households (1st quartile)	30.5%
– High income households (4th quartile)	16.4%
– Urban areas	17.9%
– Rural areas	27.7%
– Male	25.2%
– Female	23.5%
– Young (16-24)	7.5%

– Old (55-74)	32.1%
– Low education level	23.7%
– High education level	8,0%

5.2.1.3 Digital divide in outcomes

Indicator	Value
Individuals who have used the internet, in the last 3 months, for internet banking (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**69.7%**
– Low income households (1st quartile)	38.5%
– High income households (4th quartile)	82.3%
– Urban areas	73.8%
– Rural areas	65.3%
– Male	69.8%
– Female	69.5%
– Young (16-24)	62%
– Old (55-74)	44.8%
– Low education level	36.7%
– High education level	89.8%
Individuals who have used the internet, in the last 3 months, for doing an online course (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**9.2%**
– Low income households (1st quartile)	3.9%
– High income households (4th quartile)	14.2%
– Urban areas	14.3%
– Rural areas	7.1%
– Male	8.9%
– Female	9.6%
– Young (16-24)	31.6%
– Old (55-74)	1.8%
– Low education level	15.6%
– High education level	18.6%
Individuals ordering goods or services online (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**71.6%**
– Low income households (1st quartile)	41.4%
– High income households (4th quartile)	85%

– Urban areas	77.6%
– Rural areas	67.3%
– Male	70.6%
– Female	72.6%
– Young (16-24)	85.5%
– Old (55-74)	43.8%
– Low education level	55.3%
– High education level	89.5%
Individuals who have used the internet, in the last 3 months, for making an appointment with a practitioner via a website, e.g. of a hospital or a health care centre (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**9.3%**
– Low income households (1st quartile)	5.8%
– High income households (4th quartile)	10.5%
– Urban areas	10.5%
– Rural areas	7.2%
– Male	6.7%
– Female	11.8%
– Young (16-24)	6.2%
– Old (55-74)	7.2%
– Low education level	3.5%
– High education level	14.2%

5.2.2 Initiatives implemented to close digital divides

Digital divides in the Czech Republic are still present both in terms of access to digital services (particularly among low-income households) and in terms of digital skills. Initiatives implemented by players of the Czech digital ecosystem are focused on both areas.

5.2.2.1 NRAs

The Czech Telecommunications Office (*Český telekomunikační úřad* - hereinafter CTU) is the national regulatory authority tasked with market analysis, general authorisations, universal service, price and competition control, net neutrality, consumer protection and spectrum monitoring, among others. CTU also operates the national SIP (Single Information Point), according to the BCRD[143] directive. The main goal of the SIP is the provision of information and data necessary to deploy high-speed electronic communications networks.

[143] Broadband Cost Reduction Directive

Related to the area of consumer protection, in 2021 CTU launched a comparison tool[144] for the prices and quality of telecommunication services. The comparison tool allows consumers to find the offer that best suits their needs. Telecommunication operators can also assess how competitive their offers are compared to other companies. The comparison tool can play a relevant role to foster digital inclusion in the Czech Republic as it can help disconnected people to subscribe appropriate services and to keep prices low.

Another comparison tool launched by CTU is the "portal for visualisation of telecommunications services".[145] The portal offers a comprehensive visualisation tool that help users to compare the quality of various telecommunications services in the Czech Republic (results of measurements from various sources) before deciding to subscribe. This visualisation tool allows consumers to take better informed decisions when subscribing telecommunication services.

Most recently, CTU has launched its own QoS measurement tool (NetTest) which allows consumers to perform a certified measurement of speed and quality of internet access service. Results of such measurement can be used for substantiating claims against internet service providers.[146]

CTU also runs the project "Telecommunication Academy" (Telekomunikační akademie)[147], aimed at providing elderly persons with information and advice when contracting telecommunications services. The Academy also provides classes on video communications (how to identify charged numbers or how to make emergency calls) and teaches seniors about the usefulness of the internet, and how to behave safely online. The classes are conducted face-to-face by CTU staff and are offered to both individuals and seniors' clubs, retirement homes, etc. The project was launched prior the pandemic, and from January 2020 to the beginning of the lockdowns (mid-March 2020), a total of 34 courses were held across the country. After the outbreak of the pandemic a website with all courses were created to maintain the activity. With this project, the CTU have also contributed to improving digital inclusion of elderly persons, helping them to overcome reluctance and fear when using telecommunication services.

In the field of network development, in April 2021 CTU organised, along with the Ministry of Industry and Trade and the Broadband Competence Office, a webinar with municipalities [148] to discuss the current issues in the deployment of high-speed broadband networks. The involvement of municipalities in the deployment of enhanced telecom infrastructures is essential and CTU sought to engage them and solve their doubts.

Improving consumer protection when accessing telecommunication services and fostering the deployment of high-speed broadband networks have therefore been the CTU's most important contributions to digital inclusion during the pandemic.

144 https://srovnavac.ctu.cz/
145 https://qos.ctu.cz/intro
146 https://www.ctu.eu/press-release-ctu-launches-campaign-pay-only-real-speed
147 https://akademie.ctu.cz/
148 https://www.ctu.cz/sites/default/files/obsah/soubory-ke-stazeni/pozvanka_infor_final.pdf

5.2.2.2 Telecom operators

Telecommunication operators have been active in supporting Czech society deal with the impacts of the pandemic on digital divides. In order to help people be informed on the government and public health authorities' actions to control the pandemic, the mobile operators O2, T-Mobile and Vodafone enabled free access to several public websites.[149] Many operators, however, have gone even further in their commitment. Under their CSR programs, telecommunication operators have developed several initiatives to improve digital inclusion of disadvantaged groups during the pandemic.

O2 gave away equipment from its IT department to the Prague Social Services Centre. They were distributed in the Asylum for Women, to allow their children to connect to distance learning services.[150] O2 also offered free internet connections to 1,500 socially and economically disadvantaged children to help them to participate in distance learning. This initiative was managed in cooperation with the non-profit organisations Women for Women, People in Need and Česko-digital. O2 also contributed to increase digital literacy among children through the Smart School program.[151] The initiative included a grant program for teaching digital literacy and internet security. In 2020-21 74 schools were selected for funding, receiving CSK 4,5 million.

During the pandemic, T-Mobile provided 20,000 SIM cards with unlimited data for students whose families could not afford internet services, and as such, could not attend online classes.[152] They were distributed by schools among the students from low-income families. T-Mobile also equipped 500 single-parent families with laptops and broadband connections free of charge to allow their children to access online education.[153] Isolation and loneliness were two major challenges during pandemic. The 2020 edition of the "T-Mobile Helps" (*T-Mobile Pomáháme*) grant program was focused on addressing both issues. The program granted CZK 2 million to digital-based projects aimed at facilitating communication for those who felt lonely and isolated.[154]

The third major operator, Vodafone, also implemented specific initiatives to fight against digital exclusion during pandemic. The Vodafone Foundation launched an educational project for seniors,[155] in cooperation with the Foundations in Ireland, Luxembourg, the Netherlands and the United Kingdom. The main goal of the program was to educate elderly people in the use of mobile technologies through a series of interactive courses, which were provided for free. The program also included a digital educational platform, which participants could use to further acquire skills or recall courses they had already completed. The objective was to train 2,000 seniors throughout the country, involving 100 volunteers.

[149] https://vlada.cz/; https://www.mzcr.cz/
[150] https://nadaceo2.cz/novinky/predali-jsme-dalsi-notebooky-potrebnym
[151] https://www.o2chytraskola.cz/
[152] http://www.t-press.cz/en/press-releases/press-news-archive/t-mobile-doubled-the-volume-of-help-to-primary-schools-quick-data-gives-20-000-needed-pupilies-for-free-for-3-months.html
[153] http://www.t-press.cz/en/press-releases/press-news-archive/t-mobile-supports-self-employed-families-500-families-equipped-with-notebooks-and-internet-connection.html
[154] http://www.t-press.cz/en/press-releases/press-news-archive/being-together-the-t-mobile-helps-grant-programme-helps-fight-loneliness.html
[155] https://www.nadacevodafone.cz/programy/digitalni-vzdelavani-pro-seniory/

5.2.2.3 Public bodies

One of the main contributions of the Czech Government to bridge digital divides was the approval of the National Plan for the Development of Very High Capacity Networks[156] in March 2021. This plan, closely related to the National Recovery Plan approved in April 2021, is part of the Digital Czech Republic concept and the Czech Republic Innovation Strategy 2019-2030. The plan acknowledges the disruptive change in the use of digital services brought about by the pandemic, and the need of having a telecommunication infrastructure capable of coping with the growing increase of data consumption. As the plan states, "A high-speed internet connection is becoming an increasingly essential item for consumers, and a high-quality electronic communications network capable of reliably transmitting high volumes of data with low latency is key." The plan is aimed to facilitate the deployment of VHCN networks, providing at least 100 Mbps and the option of achieving up to 1 Gbps of download speed both in urban and rural areas. The plan also includes specific measures to provide key socio-economic agents (schools, public bodies, etc.) with connections of at least 1 Gbps symmetric speed. The plan estimates that the investment gap to cover the whole population is about CSK 11.5 billion. It foresees public funds to cover areas where private actors' business models do not recommend investing. The NRA will provide geographic survey results as a decisive information source.

The plan includes an interesting actor, the Broadband Competence Office (BCO)[157]. The BCO comprises diverse territorial offices and coordinators across the country, whose mission is supporting and advising local stakeholders to ease the deployment of VHCN networks. Although the BCO was already envisaged in a previous plan (National Plan for the Development of Next Generation Networks), the current plan intends to expand its advisory functions to accelerate the deployment of VHCN networks. The BCO is complementary to the SIP, run by CTU, and their specific goals are as follows:[158]

- Facilitating and mediating construction management of digital infrastructure among stakeholders (mainly municipality, operator/investor, civil society).
- Promoting coordination of civil works processes to facilitate expansion of VHCN networks.
- Removing barriers in construction process to reduce final costs of investments.
- Ongoing search for ways to improve project preparation stage and shorten the building time.

In addition to the implementation of the National Plan for the Development of Very High Capacity Networks, the Czech Government also undertook additional measures to reduce digital exclusion during the pandemic. In 2020, the government approved a first allocation of CZK 984.5 million for acquisition of technical equipment for schools to provide distance education. After subsequent provisions, the total amount invested was

156 https://www.mpo.cz/assets/cz/e-komunikace-a-posta/elektronicke-komunikace/koncepce-a-strategie/narodni-plan-rozvoje-siti-nga/2021/3/149908-21_III_mat_VHCN_EN.pdf
157 https://bconetwork.cz/home/
158 https://ec.europa.eu/information_society/newsroom/image/document/2020-51/compilation_report_special_group_-_summary_and_annex_002_A201FFA5-9ACE-4742-1ACCE7F8A8EC2438_72388.pdf

about CZK 1.3 billion. Schools used these funds to acquire technical equipment and software to provide online teaching.[159]

5.2.2.4 Civil Society organisations and NGOs

Many civil society organisations have been involved in tackling digital divides in Czech Republic during lockdowns and periods of social distancing.

The *Učíme* online project[160] is a community of volunteers managed by the non-profit organization Česko.Digital. The project is focused on showing teachers how to teach online and providing computers for children who need them. They launched the Computer Collection initiative in March 2020 to provide computers for children that did not have one at home. Česko.Digital cooperated with other NGOs to contact deprived families and the computers were delivered to these families by volunteers, who maintained contact with families to oversee that the pupils were involved in online classes.

At the beginning of 2021, Google announced the launch of its Google.org Impact Challenge in the Czech Republic and other countries for Central and East Europe.[161] The program was aimed at supporting civil society organisations working to reduce the digital skills gap. Google also collaborated with the non-profit organisation Czechitas[162] to provide 2,000 scholarships for four types of courses (IT support, project management, data analytics and UX design) to help women to improve their digital skills and employability.[163]

5.2.3 Lessons learnt from the initiatives

The Czech NRA, CTU, has focused its efforts to bridge the digital divides on providing telecommunication services' consumers with better information about prices and quality of service offered by operators. The price comparison tool launched by CTU in 2021 is an interesting initiative to help citizens to find the telecommunication offers that best suit their needs, which ultimately fosters their digital inclusion. The price comparison tool also allows to maintain competitive pressure on prices, enhancing affordability of telecom services. Although price comparison tools from private agents already exist, the fact that operators are obliged to provide truthful information on the prices of their services reinforces the usefulness of the tool developed by CTU. The price comparison tool, which partly stems from the requirements set out in the EECC, can be seen as a good practice to make telecommunications services more affordable and increase their take-up. In addition, this measure is easily replicable in most BEREC member countries, as almost all have competences on market research and price control.

Network deployment involves different public stakeholders. Municipalities are of great importance, as they can contribute to accelerate or delay rollouts depending on the efficiency of their administrative procedures (building permits, etc.) and the use of subsidies and financial instruments. Both the CTU and the Ministry on Industry and Trade

159 https://www.vlada.cz/en/media-centrum/aktualne/measures-adopted-by-the-czech-government-against-coronavirus-180545/
160 https://www.ucimeonline.cz/
161 https://impactchallenge.withgoogle.com/cee2021
162 https://www.czechitas.cz/
163 https://www.czechitas.cz/blog/czechitas-rozdeli-2000-stipendii-od-googlu-na-podporu-zamestnanosti

maintain an intense collaboration to advise municipalities in all aspects related to the deployment of high-speed networks. The creation of the Broadband Competence Office is also a good example of a public body dedicated exclusively to driving network deployments in the country, in close cooperation with the BCRD Single Information Point, by engaging the stakeholders where bottlenecks usually appear, i.e., the municipalities. This public body already exist in other BEREC member countries, and it would be advisable for all countries to have a similar advisory entity.

The pandemic has shown the urgent need of having fast internet connections at home. Aware of the gaps that still persist in the Czech Republic in terms of connectivity, the government has launched an ambitious plan for the development of Very High Capacity Networks. The plan specifically addressed gaps in underserved communities, particularly in rural areas, where commercial offers are less profitable, and operators show less willingness to invest. The Czech government has reacted rapidly to create an adequate framework aimed at incentivising investments in telecommunication infrastructures. It intends to enhance the quality (in terms of speed and latency) of broadband connections to cope with the increased demand of data, which has remained at high levels after the first months of the pandemic. This plan is a good example of a public policy designed to bridge digital access gaps for those countries that still lag behind in connectivity.

NGOs, civil society organisations and telecom operators have collaborated to address two main causes of the digital divides, the lack of equipment and the digital illiteracy. As education moved online, many students were at risk of not being able to follow classes due to lack of devices. Therefore, most of the initiatives developed during the lockdowns were aimed at providing children in economically disadvantaged families with appropriate equipment. Actions to reduce the digital skills gap mainly targeted elderly people. In this case, the NRA has also participated through its “Telecommunication Academy” to help seniors to understand basic concepts of telecommunications services and to be more confident when subscribing these services.

In summary, initiatives implemented in Czech Republic address the two first levels (access and skills) of the digital divide and stand out for the high degree of collaboration between the various actors involved.

5.3 Hungary

5.3.1 Digital divides through their main indicators

5.3.1.1 Digital divide in access

Coverage

Broadband coverage

Indicator	Value
Standard fixed broadband coverage (% households, 2020) *European Commission - Digital Agenda Key Indicators*	97.5%
Rural Standard fixed broadband coverage (% households, 2020)	95.4%

European Commission - Digital Agenda Key Indicators	
NGA broadband coverage (% of households, 2020) *European Commission - Digital Agenda Key Indicators*	89.5%
Rural NGA broadband coverage (% of households, 2020) *European Commission - Digital Agenda Key Indicators*	79.4%

Mobile coverage

Indicator	Value
Population covered by a mobile-cellular network *(%, 2019)* ***ITU***	99.2%
Population covered by at least a 3G mobile network *(%, 2019)* ***ITU***	99.2%
4G mobile broadband (LTE) coverage (% of households, 2020) *European Commission - Digital Agenda Key Indicators*	99.3%
Rural 4G mobile broadband (LTE) coverage (% of households, 2020) *European Commission - Digital Agenda Key Indicators*	98.2%

Take-up

Broadband take-up

Indicator	Value
Households having a broadband connection (%, 2020) *European Commission - Digital Agenda Key Indicators*	**87.2%**
– **Low income households (1st quartile)**	60%
– **High income households (4th quartile)**	98.9%
– **Urban areas**	91.8%
– **Rural areas**	81.1%

Mobile take-up

Indicator	Value
Take-up of mobile broadband (subscriptions/100 people, 2020) *European Commission - Digital Agenda Key Indicators*	**75.2%**

Access

Households

Indicator	Value
Households with access to the internet at home (%, 2020) *European Commission - Digital Agenda Key Indicators*	**87.6%**
– **Low income households (1st quartile)**	60.7%
– **High income households (4th quartile)**	99%
– **Urban areas**	91.8%
– **Rural areas**	81.8%

Individuals

Indicator	Value
Individuals who have used the internet in the last 3 months (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**84.8%**
– **Low income households (1st quartile)**	60.6%
– **High income households (4th quartile)**	95.2%
– **Urban areas**	91.1%
– **Rural areas**	78.7%
– **Male**	84.4%
– **Female**	85.2%
– **Young (16-24)**	98.2%
– **Old (55-74)**	62.9%
– **Low education level**	63.3%
– **High education level**	97%
Individuals who are frequent internet users, every day or almost every day (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**78.6%**
– **Low income households (1st quartile)**	52.8%
– **High income households (4th quartile)**	91.3%
– **Urban areas**	86.3%
– **Rural areas**	71.5%
– **Male**	78.2%
– **Female**	78.9%
– **Young (16-24)**	96.6%
– **Old (55-74)**	52.9%

– **Low education level**	57.1%
– **High education level**	93.9%

5.3.1.2 Digital divide in skills

Indicator	Value
Individuals with above basic level of digital skills (% individuals, 2019) *European Commission - Digital Agenda Key Indicators*	**25.4%**
– **Low income households (1st quartile)**	7.9%
– **High income households (4th quartile)**	32%
– **Urban areas**	34%
– **Rural areas**	17%
– **Male**	27.7%
– **Female**	23.2%
– **Young (16-24)**	40.4%
– **Old (55-74)**	7.8%
– **Low education level**	10%
– **High education level**	51.6%
Individuals with low level of digital skills (% individuals, 2019) *European Commission - Digital Agenda Key Indicators*	**31.3%**
– **Low income households (1st quartile)**	22.2%
– **High income households (4th quartile)**	31.3%
– **Urban areas**	25.9%
– **Rural areas**	34.7%
– **Male**	29.3%
– **Female**	33.2%
– **Young (16-24)**	29.9%
– **Old (55-74)**	32.8%
– **Low education level**	30.9%
– **High education level**	16.3%

5.3.1.3 Digital divide in outcomes

Indicator	Value
Individuals who have used the internet, in the last 3 months, for internet banking (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**51.3%**
– **Low income households (1st quartile)**	19.7%

– **High income households (4th quartile)**	70.6%
– **Urban areas**	65.1%
– **Rural areas**	38.6%
– **Male**	52.1%
– **Female**	50.6%
– **Young (16-24)**	50.8%
– **Old (55-74)**	29%
– **Low education level**	14.9%
– **High education level**	80.8%
Individuals who have used the internet, in the last 3 months, for doing an online course (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**12.3%**
– **Low income households (1st quartile)**	4.9%
– **High income households (4th quartile)**	18.9%
– **Urban areas**	18.5%
– **Rural areas**	7.8%
– **Male**	12.1%
– **Female**	12.6%
– **Young (16-24)**	22.3%
– **Old (55-74)**	5.7%
– **Low education level**	6.2%
– **High education level**	24.4%
Individuals ordering goods or services online (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**60%**
– **Low income households (1st quartile)**	32.2%
– **High income households (4th quartile)**	75.3%
– **Urban areas**	70.4%
– **Rural areas**	50.9%
– **Male**	60.2%
– **Female**	59.8%
– **Young (16-24)**	77.5%
– **Old (55-74)**	32.8%
– **Low education level**	32.7%
– **High education level**	81.4%

Individuals who have used the internet, in the last 3 months, for making an appointment with a practitioner via a website, e.g. of a hospital or a health care centre (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**23.4%**
– **Low income households (1st quartile)**	8.5%
– **High income households (4th quartile)**	33.4%
– **Urban areas**	34.6%
– **Rural areas**	13.7%
– **Male**	19.9%
– **Female**	26.8%
– **Young (16-24)**	16.9%
– **Old (55-74)**	16%
– **Low education level**	7.2%
– **High education level**	42.4%

5.3.2 Initiatives implemented to close digital divides

Stakeholders of the digital sector in Hungary actively collaborated with disadvantaged groups (elderly people, children in families with low incomes, ethnic minorities) to promote their digital inclusion. The national regulatory authority launched diverse communications campaigns to guide Hungarians on an effective, responsible and safe use of digital technologies during the pandemic. Some campaigns targeted specific groups (for instance, the elderly) and others the general public. Government efforts were focused on helping people with difficulties to access online services, either due to lack of equipment or lack of skills. Finally, diverse telecom operators offered extra capacity in data services for free to their customers to cope with the increased needs during lockdowns.

5.3.2.1 NRA

In 2021, the National Media and Infocommunications Authority (*Nemzeti Média- és Hírközlési Hatóság*, hereinafter: NMHH) has launched a national communications campaign entitled "*Netre fel!*", targeting elderly citizens and their helpers (often their younger relatives).[164] The central part of this campaign is a website, which intends to provide an easily understandable knowledge base for senior internet users. The website also provides coverage maps and customer service contact information, among other things, prepared in consultation with Hungarian service providers. The website has a simple and easy-to-understand structure, complying with accessibility standards to make it easier for the elderly to access information. In addition to this website, traditional and social media tools (including podcasts) are used to promote the digital inclusion of elderly citizens. According to a recent survey conducted by NMHH, 82% of elderly women and

[164] A short summary is available at: https://english.nmhh.hu/article/219869/Infocommunications_Authority_launches_national_campaign_to_develop_digital_skills_of_the_elderly (in English)

78% of elderly men have a mobile phone, but only 12% of elderly women and 14% of men are capable of using the functions of a smartphone on their own. Hence why the primary goal of the initiative is to equip these "digitally disadvantaged" elderly citizens with the knowledge they need to navigate the digital world confidently. This is particularly important at a time when lockdowns might leave the internet as their only window to the outside world.

In September 2020, NMHH launched a campaign to help internet users (especially members of the older generations) recognise dis- or misinformation.[165] The campaign videos on the nmhh.hu/alhirek website warned users of the dangers of fake news (*álhír[ek]* means fake news in Hungarian), while the infographics and explanations highlighted the critical elements of verifying news. NMHH's survey from 2019 revealed that 53% of domestic internet users over the age of 15 claimed to have encountered fake news, most often in social media.[166] As fake news often manipulates people by appealing to emotions, even usually prudent, prepared readers can end up impulsively sharing such news. In addition to this website, the campaign was also promoted through social media platforms (which are themselves often full of disinformation).

NMHH also maintains and operate the website gyerekaneten.hu, defined to help parents to understand digital habits of young people. This website intends to bridge the digital divide between young generations and their parents.

During the first national lockdown, NMHH published a range of solutions that can help establish a stable and fast home internet connection at the nmhh.hu/gyorsabbnet website.[167] The website provides users of Wi-Fi routers with useful technical tips: information on the types of devices, setting the frequency used for communication purposes, positioning the device within one's home, checking the proper connection of cables and detecting an overheated device. Apart from narrowly defined technical solutions, the website also provides guidelines for creating a family bandwidth schedule in order to avoid congestion issues. In addition to these, the website shares recommendations on measuring the speed of internet connections, for which NMHH's szelessav.net provides an independent and reliable tool.[168]

While not directly related to the pandemic, by the end of 2020 Hungary transposed the European Electronic Communications Code into national law.[169] Apart from amending the Electronic Communications Act, nine NMHH decrees were amended, and thirteen new decrees were introduced by the end of December 2020 in order to complete the transposition. These included NMHH Decree 19/2020 of 18 December 2020 on the detailed rules of the provision of the universal electronic communications service, which

[165] A short summary is available at: https://english.nmhh.hu/article/214381/The_NMHHs_September_campaign_calls_for_caution_in_the_sharing_of_news (in English)

[166] A short summary is available at: https://english.nmhh.hu/article/213077/NMHH_market_research_fake_news_is_most_prominent_on_social_media_websites (in English)

[167] The name of the website translates to „Faster internet". A short summary is available at: https://english.nmhh.hu/article/211427/Wifi_routers_cables_and_a_daily_schedule_the_NMHHs_advice_to_assist_home_internet_use (in English)

[168] The site is also available in English at https://szelessav.net/en/

[169] A short summary in English is available at: https://english.nmhh.hu/article/216959/The_Hungarian_transposition_of_the_European_Electronic_Communications_Code_is_completed

specified the criteria for the adequate broadband internet access in Hungary that should be provided at an affordable price, specially to consumers with low-income or special social needs. Adequate broadband internet access was defined as an internet access service available at a fixed location providing normally available download speeds of at least 8 Mbps and normally available upload speeds of at least 2 Mbps. Within a "geographic numbering area", internet access service meeting these criteria should be nearly universally available, otherwise a numbering area would be classified as an uncovered area (≈ white area). Near universal availability meant that a maximum of 1% of locations (addresses) would not be covered by internet service providers within the geographic numbering area.

This legislative work has laid the foundations for further addressing the challenge of the digital divide in Hungary.

5.3.2.2 Telecom operators and digital companies

In March 2020, Magyar Telekom gifted a 10GB free mobile internet option to its customers, which could be activated and used up until the end of May.[170] From May, customers could also purchase twice the previous amount of data for the original price, and retail and small business customers could purchase the company's "Unlimited Extra Net" tariff on discounted terms. In addition to these discounts, the company gifted free minutes to elderly citizens (zero usage fee when initiating calls from their fixed line telephones to normal fixed line and base fee mobile telephones) and general practitioners (1000 free minutes, which could be used to call domestic base fee mobile and fixed line numbers).

Magyar Telekom also helped socially disadvantaged groups with donations during the pandemic. The company delivered food to those in need through the Hungarian Interchurch Aid and provided digital tools raised through internal donations through Unicef to support digital education in children's homes. Telekom's subsidiary, T-Systems Hungary, also donated laptops to the SOTE II Children's Clinic to support the digital education of children treated in the hospital. In cooperation with the Hungarian Interchurch Aid organisation, the company supported e-learning of children in deprived families with digital devices worth HUF 4 million.

At Telenor, customers with residential post-paid and pre-paid subscriptions were gifted a free mobile internet option for domestic use until the end of March.[171] In the summer, the company doubled the monthly data allowance of its retail customers (at no extra cost). The company also provided summaries and video tutorials on the productive use of mobile internet and tips for creating an efficient home office environment. In addition to these, Telenor also worked with the Hungarian Red Cross to ensure widespread public access to advice and information on basic precautions related to the pandemic.

In March, April and May 2020, Vodafone tripled the monthly data allowance of its residential and small business customers. In addition to this general discount, pre-paid customers over the age of 65 were given 90 days of talk time for free. The company also made websites and applications with free learning materials available to its retail

[170] https://www.telekom.hu/about_us/press_room/press_releases/2020/april_27

[171] https://nmhh.hu/cikk/212992/Meltanyos_szolgaltatoi_intezkedesek_a_veszelyhelyzet_idoszakaban (in Hungarian)

customers without data usage fees until the end of the school year. Through its foundation, Vodafone has also created an "E-school digital competency development" course free for educators, and made hundreds of free learning apps available in a zero-rated scheme. Furthermore, with its Digital Classroom service, which is suitable for supporting primary, secondary and university-level courses, the company enabled the interactive use of virtual and real classrooms. The programme has so far benefitted 49,000 students and teachers.

In April 2020, Huawei Technologies donated smart devices (phones and notebooks) to digitally excluded children from deprived families in Ózd (a Hungarian city with high unemployment) through the Digital Solidarity scheme to enable them to engage in online learning activities at home (with the help of free mobile internet services offered by other partners and mentors from a local charitable organization, *Van helyed! Alapítvány*).[172] Huawei also has its own programme with goals related to digital equity, entitled "Tech for All – 1000 Álom [*Dreams*]". In April 2020, Magyar Telekom also donated 616 smartphones to underprivileged children, which were equipped with prepaid SIM cards with the help of the Governmental Agency for IT Development (*Kormányzati Informatikai Fejlesztési Ügynökség [KIFÜ]*).[173] The latter also donated 30 of its own notebooks to underprivileged Roma families.[174] In May 2020, Edutus University donated 16 of its own laptops to an orphanage.

During the pandemic, some service providers have been more careful in handling customer complaints or have changed their complaint handling processes. Some operators have offered deferred payment or instalment plans in the event of late payment or refrained from limiting or terminating their services in case of overdue charges.

5.3.2.3 Public bodies

Activities of the Hungarian government concerning the digital divides were usually coordinated in the framework of Hungary's "Digital Success Programme" (*Digitális Jólét Program*) by the Digital Success Non-profit Ltd. (*Digitális Jólét Non-profit Kft.*), hereinafter collectively referred to as "DJP".[175] Some of these activities pre-date the pandemic, like the reduction of VAT rates for fixed and mobile internet access services (to 5%) or the establishment of a DJP Network consisting of (bricks-and-mortar) DJP Points offering online access to digital public services for free and DJP Mentors (volunteers).

At the beginning of the first lockdown in early 2020, DJP published short guidelines on the responsible and productive use of internet services for a general audience and parents with young children, and a detailed (online and printable) manual for the

[172] https://digitalisjoletprogram.hu/hu/hirek/digitalis-eszkozokkel-segitik-a-leginkabb-raszorulok-oktatasat (in Hungarian)
[173] https://digitalisjoletprogram.hu/hu/hirek/ha-digitalisan-is-osszefogunk-egyutt-barmire-kepesek-vagyunk (in Hungarian)
[174] https://digitalisjoletprogram.hu/hu/hirek/koronavirus-mar-tobb-mint-350-felajanlas-a-digitalis-osszefogas-akcioban (in Hungarian)
[175] A brief summary in English is available at: https://digitalisjoletprogram.hu/en/about (Unfortunately, only a small portion of the website is available in English)

elderly.[176] While the detailed manual is suitable for individual learning, DJP invited the younger relatives of elderly citizens to help them overcome the first "mental hurdles" and technical problems when using the internet, while also offering assistance and counselling by DJP Mentors.

In March 2020, the Ministry for Innovation and Technology (ITM) announced a "Digital Solidarity" (*Digitális Összefogás*) scheme, inviting digital companies and other stakeholders to share digital solutions, services and devices with those in need (especially families with young children and the elderly, but they could also offer home office solutions etc.), thereby enabling formerly digitally excluded people to stay at home.[177] At the same time, DJP launched a "matchmaking" platform, where companies and individuals could donate devices or offer free digital solutions/applications, which would then be offered to charities or those looking for help.[178] By the time of the public announcement on 25 March 2020, the programme had already received 80 donations or pledges from 58 companies.[179]

In May 2020, the Ministry for Innovation and Technology (ITM) launched a new programme for elderly citizens, entitled "*Napi 100 Jó Szó*" (which roughly translates to "100 kind words every day").[180] Through this programme, Mentors of the DJP Network primarily assisted elderly citizens in contacting their friends and distant relatives through social networks and online interpersonal communications services to help ease their loneliness and isolation during the lockdown and improve their well-being. Volunteers also helped the elderly with other chores, such as using digital public services, purchasing goods and services, or paying bills online. The programme was also active during the second lockdown in 2020-2021.[181] In addition to helping elderly citizens (and unrelated to this programme), the Mentors of the DJP Network also offered help to teachers, parents or churches of their local communities in organising online learning activities or streaming religious services, etc.[182]

In November 2020, the Hungarian government introduced an extraordinary measure aimed at preventing the exclusion of poor children from online education during the lockdown, requiring internet service providers (ISPs) to offer free internet access to teachers and families with children enrolled in secondary education for the duration of

[176] https://digitalisjoletprogram.hu/hu/hirek/a-digitalis-jolet-program-ajanlasa (in Hungarian)
https://digitalisjoletprogram.hu/hu/hirek/a-koronavirussal-kapcsolatos-hasznos-oldalak (in Hungarian)
https://digitalisjoletprogram.hu/hu/hirek/idosek-digitalis-tamogatasa (in Hungarian)
[177] https://digitalisjoletprogram.hu/hu/hirek/digitalis-osszefogassal-a-koronavirus-jarvany-ellen (in Hungarian)
[178] https://felajanlas.digitalisjoletprogram.hu/
[179] The full list of contributors and solutions is available at: https://felajanlas.digitalisjoletprogram.hu/felajanlasok/
[180] https://digitalisjoletprogram.hu/hu/hirek/tobb-mint-felezer-telepules-idos-lakoin-segit-a-napi-100-jo-szo-mozgalom (in Hungarian)
https://digitalisjoletprogram.hu/hu/hirek/a-jarvanyhelyzet-alatt-is-bizonyitotta-eredmenyesseget-a-digitalis-jolet-program (in Hungarian)
[181] https://digitalisjoletprogram.hu/hu/hirek/a-napi-szaz-jo-szo-mozgalom-nem-pihen-a-masodik-hullam-alatt-sem (in Hungarian)
https://digitalisjoletprogram.hu/hu/hirek/egy-eve-segitik-az-idoseket-csaladokat-a-digitalis-jolet-program-onkentesei (in Hungarian)
[182] https://digitalisjoletprogram.hu/hu/hirek/a-kormany-szamit-a-djp-halozat-mentorainak-munkajara (in Hungarian)

the second lockdown.[183] The measure was later extended to families with children in primary schools, but smaller ISPs (with less than 300 employees and annual revenues under HUF 12 billion in the previous 2 years) were offered a compensation scheme for their lost revenues.[184]

In January 2021, DJP published free software packages (*Digitális Jólét Szoftver Alapcsomag*) with Hungarian manuals and menus to help digitally excluded individuals by offering them solutions tailored to their needs.[185] In the package for families, the default settings include a parental web filter and applications suitable for children. For elderly individuals, the user-friendly software package comes with special icons and enlarged fonts for accessibility.

5.3.2.4 Civil Society organisations and NGOs

One interesting example of the work done by civil society organisations and NGOs to bridge digital divides is the project implemented by the HospitalSchool Foundation (KórházSuli)[186]. During the lockdowns, the foundation drew on its 6 years of experience in distance education to develop an online education program, which was offered to children of healthcare workers. Given the demands imposed on these professionals, many were not able to attend adequately to their children's learning. The HospitalSchool Foundation wanted to compensate healthcare professionals by helping their children adapt to online education. The NGO did not do this on its own, however; HospitalSchool provided the professional background and coordination, while Telenor Hungary (as a long-term partner of the Foundation) ensured the participation of the children of 120 healthcare workers nationwide in Hipernet. The program was titled “I Teach Online”.

5.3.3 Lessons learnt from the initiatives

The analysis of the main indicators related to internet access, digital skills and internet uses shows that significant digital divides persist in Hungary. Stakeholders have paid special attention to disadvantaged groups like the elderly people and students with difficulties to access online education services.

The NRA has addressed the issue of digital exclusion from different perspectives, including communication campaigns to raise awareness about disinformation, to help seniors accessing the digital society and to foster a responsible use of internet. These communication campaigns fall under the NMHH's consumer protection competencies and might be replicated by BEREC member countries with those same competencies.

The NRA, taking advantage of the transposition of the European Electronic Communications Code into the Hungarian national legislation by the end of 2020, has also defined new rules to cope with the challenges posed by the pandemic to bridge digital divides, particularly those related to the affordability of broadband services for low-income consumers. Although the deadline for transposing the Code was 21 December 2020, only three Member States (Greece, Hungary and Finland) had completed the

[183] https://kormany.hu/hirek/ingyenes-lesz-az-internet-a-diakoknak-a-kovetkezo-harminc-napban (in Hungarian)
[184] https://kormany.hu/hirek/ingyenes-internet-megjelent-a-szolgaltatok-kompenzaciojarol-szolo-felhivas (in Hungarian)
[185] https://szoftveralapcsomag.hu/index.php/en/digital-success-software-package/ (in English)
[186] https://korhazsuli.hu/

transposition by that date.[187] This way, most Member States can still take advantage of the experience accumulated during the pandemic on difficulties in accessing internet services in order to design a regulatory framework capable of responding to these problems.

The Hungarian government also adopted diverse approaches to cope with the challenges of digital exclusion. Measures combined information campaigns, mentorship programs, and subsidies to families with children enrolled in primary and secondary education who could not afford internet services. This last one is of special relevance, as it implies a direct government involvement to help children from families with financial difficulties.

Most of the initiatives developed by all stakeholders to close digital gaps are based on the solidarity of tech-savvy generations, who offer their time and knowledge to the service of digital excluded groups. The scheme of young volunteers helping digital disadvantaged people (children, seniors, migrants, etc.) to use online services is easily replicable and can benefit all groups involved.

In summary, all participants in the Hungarian digital sector became aware of the diverse digital divides in the country and implemented several measures to alleviate their impacts in vulnerable population. Most of the initiatives were aimed at improving digital skills among people with low digital competence.

5.4 The Netherlands

5.4.1 Digital divides through their main indicators

5.4.1.1 Digital divide in access

Coverage

Broadband coverage

Indicator	Value
Standard fixed broadband coverage (% households, 2020) *European Commission - Digital Agenda Key Indicators*	99.5%
Rural Standard fixed broadband coverage (% households, 2020) *European Commission - Digital Agenda Key Indicators*	98.9%
NGA broadband coverage (% of households, 2020) *European Commission - Digital Agenda Key Indicators*	98.3%
Rural NGA broadband coverage (% of households, 2020) *European Commission - Digital Agenda Key Indicators*	96.9%

Mobile coverage

Indicator	Value
Population covered by a mobile-cellular network *(%, 2019)*	100%

[187] https://ec.europa.eu/commission/presscorner/detail/en/IP_21_206

ITU	
Population covered by at least a 3G mobile network *(%, 2019)* *ITU*	99%
4G mobile broadband (LTE) coverage (% of households, 2020) *European Commission - Digital Agenda Key Indicators*	99.5%
Rural 4G mobile broadband (LTE) coverage (% of households, 2020) *European Commission - Digital Agenda Key Indicators*	99.3%

Take-up

Broadband take-up

Indicator	Value
Households having a broadband connection (%, 2020) *European Commission - Digital Agenda Key Indicators*	**97%**
– **Low income households (1st quartile)**	92.9%
– **High income households (4th quartile)**	98.9%
– **Urban areas**	96.6%
– **Rural areas**	96.2%

Mobile take-up

Indicator	Value
Take-up of mobile broadband (subscriptions/100 people, 2020) *European Commission - Digital Agenda Key Indicators*	**95.5%**

Access

Households

Indicator	Value
Households with access to the internet at home (%, 2020) *European Commission - Digital Agenda Key Indicators*	**97%**
– **Low income households (1st quartile)**	92.9%
– **High income households (4th quartile)**	98.9%
– **Urban areas**	96.6%
– **Rural areas**	96.2%

Individuals

Indicator	Value

Individuals who have used the internet in the last 3 months (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**94%**
– **Low income households (1st quartile)**	86.4%
– **High income households (4th quartile)**	97.7%
– **Urban areas**	93.6%
– **Rural areas**	95.1%
– **Male**	94.2%
– **Female**	93.9%
– **Young (16-24)**	96.2%
– **Old (55-74)**	91.9%
– **Low education level**	88.7%
– **High education level**	98%
Individuals who are frequent internet users, every day or almost every day (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**90.7%**
– **Low income households (1st quartile)**	83.2%
– **High income households (4th quartile)**	96%
– **Urban areas**	90.8%
– **Rural areas**	90.9%
– **Male**	91.6%
– **Female**	89.8%
– **Young (16-24)**	95.6%
– **Old (55-74)**	83.7%
– **Low education level**	81.7%
– **High education level**	97.1%

5.4.1.2 Digital divide in skills

Indicator	Value
Individuals with above basic level of digital skills (% individuals, 2019) *European Commission - Digital Agenda Key Indicators*	**49.6%**
– **Low income households (1st quartile)**	44.4%
– **High income households (4th quartile)**	58.4%
– **Urban areas**	53.3%
– **Rural areas**	42.6%
– **Male**	54.5%

– **Female**	44.6%
– **Young (16-24)**	78.2%
– **Old (55-74)**	24.7%
– **Low education level**	29.5%
– **High education level**	68.3%
Individuals with low level of digital skills (% individuals, 2019) *European Commission - Digital Agenda Key Indicators*	**16.4%**
– **Low income households (1st quartile)**	20.7%
– **High income households (4th quartile)**	10.5%
– **Urban areas**	14.6%
– **Rural areas**	19.4%
– **Male**	13.9%
– **Female**	19%
– **Young (16-24)**	5.4%
– **Old (55-74)**	28.4%
– **Low education level**	32.5%
– **High education level**	4.5%

5.4.1.3 Digital divide in outcomes

Indicator	Value
Individuals who have used the internet, in the last 3 months, for internet banking (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**89.4%**
– **Low income households (1st quartile)**	79.9%
– **High income households (4th quartile)**	95.1%
– **Urban areas**	89.1%
– **Rural areas**	89.2%
– **Male**	90.3%
– **Female**	88.5%
– **Young (16-24)**	90.7%
– **Old (55-74)**	84%
– **Low education level**	78.8%
– **High education level**	96.5%
Individuals who have used the internet, in the last 3 months, for doing an online course (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**17.5%**

– **Low income households (1st quartile)**	14%
– **High income households (4th quartile)**	19.7%
– **Urban areas**	19.1%
– **Rural areas**	14.7%
– **Male**	18.7%
– **Female**	16.2%
– **Young (16-24)**	25.4%
– **Old (55-74)**	9.2%
– **Low education level**	9.3%
– **High education level**	23.3%
Individuals ordering goods or services online (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**86.6%**
– **Low income households (1st quartile)**	76.2%
– **High income households (4th quartile)**	92.9%
– **Urban areas**	86.6%
– **Rural areas**	86.1%
– **Male**	87.7%
– **Female**	85.5%
– **Young (16-24)**	92.7%
– **Old (55-74)**	75.7%
– **Low education level**	74.5%
– **High education level**	95.2%
Individuals who have used the internet, in the last 3 months, for making an appointment with a practitioner via a website, e.g. of a hospital or a health care centre (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**33.7%**
– **Low income households (1st quartile)**	30.6%
– **High income households (4th quartile)**	36.6%
– **Urban areas**	35.8%
– **Rural areas**	28.9%
– **Male**	34.1%
– **Female**	33.2%
– **Young (16-24)**	29%
– **Old (55-74)**	32.7%
– **Low education level**	27%
– **High education level**	37.6%

5.4.2 Initiatives implemented to close digital divides

Digital divides in the Netherlands mainly affect elderly people, particularly when it comes to divides relating to digital skills and unequal digital outcomes. In terms of access, however, the digital divide between rural and urban areas is almost non-existent. The Netherlands is a relevant case study due to its comprehensive digitalisation strategy, updated in 2021 to meet the challenges posed by the pandemic. The Dutch regulator (Authority for Consumers and Markets) has collaborated with the Government to address this issue, in particular by promoting competition and network rollouts, as well as helping consumers to take better informed decisions when purchasing digital services and products.

5.4.2.1 NRA

The Authority for Consumers and Markets (ACM)[188] is the Dutch regulator responsible for ensuring competition in diverse markets (including telecom services) and protecting consumer interest. During the pandemic, ACM conducted market research, and provided information to consumers regarding digital services. These initiatives were aimed to increase awareness on relevant issues related to digital inclusion such as price information, characteristics of digital devices or comparability of telecom services. The final goal was to help consumers to take better informed decisions when subscribing to telecommunications services or purchasing digital equipment during the pandemic.

In 2019, ACM launched an investigation on the information provided by online suppliers to consumers about the characteristics of smart devices, including, among others, their functionalities, interoperability with other devices, the needs of software updates and the treatment of personal data. ACM found that major online suppliers failed to comply with their obligations of information and reminded them their duty to inform. In 2020, and given the surge in devices sales during pandemic, ACM checked again the information provided by online suppliers about digital equipment and found that they had added additional information. Thanks to these efforts, consumers were able to identify the most suitable equipment, at a time when the urgent need for equipment might have led to unwise purchases. ACM has also worked to improve the quality of the information provided by telecom operators regarding their services. In 2020, ACM conducted research about the behaviour of consumers of the Dutch telecom market and found that many consumers believed that the information provided by telecom operators was difficult to compare between different providers.[189] This obstacle is a hindrance to consumers' ability to switch suppliers. Following the findings of their research, ACM called on telecom operators to increase comparability of the information provided to consumers on their offers. As a result, in the 2021 telecom market consumer survey[190], respondents confirmed that the information provided by telecom operators on prices and conditions was easier to understand than it was in previous years. The work undertaken by ACM can therefore be seen as an indirect way to improve digital inclusion in the Netherlands. Better informed users can make more efficient use of the telecom services and digital devices.

[188] https://www.acm.nl/en
[189] https://www.acm.nl/sites/default/files/documents/2020-09/consumentenonderzoek-telecommarkt-2020.pdf
[190] https://www.acm.nl/nl/publicaties/consumentenonderzoek-telecommarkt-2021

e-Commerce is one of the online services that has grown the most during the pandemic. e-Commerce services became the only way to purchase all kind of products when physical stores were closed due to the lockdowns imposed by public authorities to contain the spread of the coronavirus. In order to increase consumer confidence in accessing e-commerce services ACM published guidelines for digital providers on how consumer protection rules apply to online marketing.[191] The guidelines outlined the boundaries to mechanisms that can be implemented to influence decision-making process of consumers. The guidelines also detailed the basic principles to be followed by e-Commerce providers when designing their services to comply with consumer protection rules and avoid unfair commercial practices: (1) give full information on products/services; (2) give correct information of products/services; (3) give information that is easy to understand; (4) give the information prior to purchase; (5) make sure that the information can be accessed easily; (6) make sure the design is logical and fair; (7) make sure the default settings are favourable to consumers; (8) be mindful of vulnerable consumers; (9) test the effects of your online choice architecture. With these guidelines ACM helps to reduce consumers' reluctance to use e-commerce services in the Netherlands which, in the end, contributes to enhance their digital inclusion.

In the field of mobile networks rollouts, ACM has also published guidelines to encourage collaboration between telecom operators aimed to ensure that investments are done in an efficient manner.[192]

In summary, ACM efforts to ensure digital inclusion of Dutch citizens have been focused on enhancing the information they received about key elements of digitisation like telecom and e-commerce services and digital devices.

5.4.2.2 Telecom operators

The activity of telecom operators in tackling digital divides was aimed at helping seniors to break digital exclusion. This was the objective of the program "Welcome online"[193], which was launched in 2019 by The National Foundation for the Elderly, VodafoneZiggo and Samsung, and reinforced during the pandemic. The "Welcome online" program targeted elderly people and sought to encourage them to become aware of the opportunities of the internet. The program was also intended to help elderly people feel more comfortable in the digital society. It consists of free online courses structured in four main domains: daily life; active life; social life; healthy life. The online courses were intended for people who have rarely or never been online and were supervised by students, children, grandchildren and volunteers. In 2021, ASML, one of the world's leading manufacturers of chips and semiconductors, joined the coalition to leads the program. During the lockdowns, the Welcome Online Help Desk was established along with the online courses. The Help Desk assisted elderly people with any issues related to digital technologies they experienced. The Help Desk was managed by volunteers from the National Foundation for the Elderly and employees of ASML and VodafoneZiggo.

191 https://www.acm.nl/sites/default/files/documents/2020-02/acm-guidelines-on-the-protection-of-the-online-consumer.pdf
192 https://www.acm.nl/nl/publicaties/consultatie-leidraad-voor-het-delen-van-mobiele-netwerken
193 https://welkomonline.nl/

5.4.2.3 Public bodies

Digital inclusion has been one of the top priorities of the Dutch Government in the last years. In a letter addressed to the Parliament at the end of 2018, the State Secretary for the Interior, Raymond Knops, outlined the Government's efforts to foster digital inclusion for all citizens. The two main plans implemented were the Dutch Digitalisation Strategy[194] and the Digital Government Agenda[195]. Both plans include initiatives aimed at removing barriers to digital inclusion for specific groups.

Within the Dutch Digitalisation Strategy, revisited in 2021 to cope with the new challenges identified during the pandemic, the Government defined diverse programs to help people affected by the school closures during the pandemic, especially families with low incomes in which students had difficulties accessing online learning due to the lack of adequate equipment. The Government invested €24 million to provide 75,000 devices to these students in order to help them to fully participate in online education. In addition to the acquisition of digital devices, the Government was also engaged with other public and private institutions (NLdigital[196], Alliantie Digitaal Samenleve[197] and Recover-E[198]) in the initiative "#allemaaldigitaal"[199], focused on the collection and refurbishment of digital devices to be distributed to people who lacked them. In 2020, 5,700 refurbished laptops were provided to people digitally excluded.

The lack of accessibility of many websites represents a huge barrier for people with disabilities. This was more evident during the lockdowns, when the lack of accessibility of online services impeded people with disabilities to work, interact with others, or manage administrative procedures. In September 2020, the temporary Digital Accessibility Decree, which obliged government websites to be accessible to people with disabilities, entered into force. In addition, 93 physical Digital Government information points were opened across the country to help people access digital government services.

A safe use of online services was also seen as crucial for increasing confidence in the digital ecosystem. For that reason, the Dutch Digitalisation Strategy also envisaged the program "Safe Online" (Veilig online) to promote the safe use of the internet.

In the field of digital skills, the "Tel mee met Taal" program[200] was launched in 2020. The scope of the program exceeds digital skills, as it is also focused on language and math skills as well. In 2021, the Dutch Government was to invest more than €92 million in preventing and reducing low literacy, in particular low digital literacy.

Digital reskilling and upskilling of people at risk of losing their jobs as a result of the pandemic was another priority of the Dutch government. The main challenge was to scale up effective initiatives already in place.[201] Within the framework of the Human

194 https://www.rijksoverheid.nl/binaries/rijksoverheid/documenten/rapporten/2018/06/01/nederlandse-digitaliseringsstrategie/nederlandse-digitaliseringsstrategie.pdf
195 https://www.digitaleoverheid.nl/overzicht-van-alle-onderwerpen/nldigibeter/
196 https://www.nldigital.nl/
197 https://digitaalsamenleven.nl/over-de-alliantie/
198 http://recover-e.nl/
199 https://www.allemaal-digitaal.nl/
200 https://www.telmeemettaal.nl/
201 Make IT work; Cloud IT Academy; Brightlands Services Campus

Capital Agenda for ICT the Government collaborated with other public and private organisations in a scaling-up plan for these initiatives. The Government also created a retraining scheme (using €37.5 million in funds to create 10,000 places) to help employers in sectors with difficulties in finding skilled people, like the ICT sector, to hire and retrain people from other sectors.

SMEs have especially suffered the negative economic consequences of the pandemic, and most of them have to accelerate their digital transformation to survive. The government has created 16 SME workshops in which SMEs managers are guided by volunteers from educational institutions in areas such as online marketing or data processing. The government expects to reach more than 50,000 companies by 2024.

5.4.2.4 Civil Society organisations and NGOs

The aforementioned Digital Society Alliance (Alliantie Digitaal Samenleve) was launched in 2019. Public and private institutions participate in this initiative to make the Netherlands more digitally proficient. The Alliance carries out three main initiatives in the field of digital inclusion:[202]

- The already mentioned initiative "#allemaaldigitaal", aimed at collecting and refurbishing digital equipment to be donated to people at risk of digital exclusion.
- DigiHelpline (Digi Hul plijn), a help desk staffed with volunteers to answer doubts about the functioning of digital devices and services.
- #ÉchtContact, to connect isolated people during the pandemic through digital means.

In addition, the Digital Society Alliance manages diverse working groups focused on specific communities that are unable to fully participate in the digital society. The working groups analyse the causes impeding those groups from being integrated in the digital society and propose specific solutions to remove barriers. Currently, five working groups have been defined: (1) techno stress among (young) workers; (2) elderly; (3) educators and children; (4) 18-year-old; (5) single people.

The University of Twente created the Centre for Digital Inclusion[203], which is focused on researching the evolution of the digital inclusion in the Netherlands. In 2021, researchers from this organisation have published a report on digital skills among Dutch citizens. They conclude that the level of critical information navigation (for instance to recognise scams or fake news), communication and content creation skills is still quite low in the country. Researchers demand appropriate policies to increase digital skills.

The Foundation Day!enDoen![204], supported by the Province of Overijssel, ZonMw, Orange Fonds and the RCOAK Foundation, developed in 2020 the app and portal Dag!enDoen! (Bye!andDo!). It helps elderly people to centralise all their digital activity in an easy and accessible platform, contributing to improve their digital inclusion.

5.4.3 Lessons learnt from the initiatives

In the Netherlands, stakeholders of the digital sector have addressed the issue of digital inclusion from different perspectives. While public bodies, particularly the Dutch

[202] https://digitaalsamenleven.nl/over-de-alliantie/wat-we-doen/
[203] https://www.utwente.nl/en/centrefordigitalinclusion/
[204] https://www.dagendoen.nl/

Government, and civil society organisations have been focused on helping specific groups to fully participate in the digital society, the telecom regulatory agency has mainly worked on improving information provided by telecom operators and digital suppliers to consumers of digital services and products. As such, the regulator has allowed citizens to be better informed on key aspects such as prices and terms and conditions of telecom services, comparability of telecom offers and characteristics of digital devices. The guidelines to create trusted e-commerce services might also have played a relevant role in increasing consumers' confidence. Although ACM's work to improve information does not constitute, perhaps, a direct contribution to the digital inclusion of citizens, these measures can have an indirect positive effect, as better informed consumers are more willing to make greater use of digital services.

The replicability of the initiatives undertaken by the Dutch regulator in other BEREC member countries requires competences in consumer protection. As most BEREC member countries hold competences on transparency and publication of information, the Dutch initiatives to encourage telecom and digital service providers to enhance the information provided might be easily replicated in other European countries.

The indicators on coverage, take-up and access to internet in the Netherlands show slight differences depending on socioeconomic variables. Digital divides in access are of little relevance, even between rural and urban areas which is usually the variable that affects such divide the most. Therefore, the efforts of the Dutch stakeholders analysed have been focused on closing digital divides in skills. According to the data collected, less than a quarter of people aged between 55 and 74 had above basic digital skills in 2019, while the national average was 49.6%. The lack of digital skills is the main barrier impeding elderly people to fully benefit from the digital society and most of the programs implemented by public bodies and civil society organisations were aimed to tackle this problem. However, these programs are at risk of becoming one-off actions with low impact if they are developed in isolation and with little coordination with similar initiatives. In the Netherlands, most of them are implemented under the Dutch Digitalisation Strategy, which ensures coordination between them and provides enough resources to scale-up the initiatives. The Dutch Digitalisation Strategy has been reviewed in 2021 in light of the impact of the coronavirus pandemic on the digital transformation process and has become one of the most comprehensive strategies for driving digitalisation across European countries.

The final lesson worth noting is the intense public-private cooperation to tackle digital divides on skills. Public administrations have relied on civil society organisations to manage digital inclusion programs, providing funds and support to meet their objectives. Civil society organisations are more aware on the needs of the digital excluded groups, as they work hand in hand with them, and can define better adapted solutions. However, they usually lack the necessary economic resources, requiring public support for their implementation. This scheme of public-private collaboration in which civil society organisations define programs adapted to the specific needs of the groups affected and public administrations intervene by funding the initiatives seems an efficient way to address the digital divide.

5.5 Spain

5.5.1 Digital divides through their main indicators

5.5.1.1 Digital divide in access

Broadband coverage

Indicator	Value
Standard fixed broadband coverage (% households, 2020) *European Commission - Digital Agenda Key Indicators*	95.5%
Rural Standard fixed broadband coverage (% households, 2020) *European Commission - Digital Agenda Key Indicators*	92.9%
NGA broadband coverage (% of households, 2020) *European Commission - Digital Agenda Key Indicators*	92.3%
Rural NGA broadband coverage (% of households, 2020) *European Commission - Digital Agenda Key Indicators*	70.1%

Mobile coverage

Indicator	Value
Population covered by a mobile-cellular network *(%, 2019)* *ITU*	99.8%
Population covered by at least a 3G mobile network *(%, 2019)* *ITU*	99.7%
4G mobile broadband (LTE) coverage (% of households, 2020) *European Commission - Digital Agenda Key Indicators*	99.9%
Rural 4G mobile broadband (LTE) coverage (% of households, 2020) *European Commission - Digital Agenda Key Indicators*	99.3%

Take-up

Broadband take-up

Indicator	Value
Households having a broadband connection (%, 2020) *European Commission - Digital Agenda Key Indicators*	**95.3%**
– Low income households (1st quartile)	85.9%
– High income households (4th quartile)	99.8%
– Urban areas	96.6%
– Rural areas	91%

Mobile take-up

Indicator	Value
Take-up of mobile broadband (subscriptions/100 people, 2020) *European Commission - Digital Agenda Key Indicators*	101.8%

Access

Households

Indicator	Value
Households with access to the internet at home (%, 2020) *European Commission - Digital Agenda Key Indicators*	**95.4%**
– Low income households (1st quartile)	85.9%
– High income households (4th quartile)	99.8%
– Urban areas	96.6%
– Rural areas	91.2%

Individuals

Indicator	Value
Individuals who have used internet in the last 3 months (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**93.2%**
– Low income households (1st quartile)	84.6%
– High income households (4th quartile)	99%
– Urban areas	94.8%
– Rural areas	88.2%
– Male	93.2%
– Female	93.2%
– Young (16-24)	99.8%
– Old (55-74)	81.1%
– Low education level	84.5%
– High education level	99.2%
Individuals who are frequent internet users, every day or almost every day (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**83.1%**
– Low income households (1st quartile)	68.6%
– High income households (4th quartile)	95.3%

– Urban areas	85.8%
– Rural areas	75.8%
– Male	82.4%
– Female	83.8%
– Young (16-24)	97%
– Old (55-74)	63.4%
– Low education level	68.8%
– High education level	94.2%

5.5.1.2 Digital divide in skills

Indicator	Value
Individuals with above basic level of digital skills (% individuals, 2019) *European Commission - Digital Agenda Key Indicators*	**36.1%**
– Low income households (1st quartile)	20.7%
– High income households (4th quartile)	58.8%
– Urban areas	40.7%
– Rural areas	29.8%
– Male	37.3%
– Female	34.9%
– Young (16-24)	67.8%
– Old (55-74)	13.5%
– Low education level	14.7%
– High education level	58.1%
Individuals with low level of digital skills (% individuals, 2019) *European Commission - Digital Agenda Key Indicators*	**31.5%**
– Low income households (1st quartile)	41.1%
– High income households (4th quartile)	15.2%
– Urban areas	28.7%
– Rural areas	35.5%
– Male	30.2%
– Female	32.7%
– Young (16-24)	13.3%
– Old (55-74)	41.2%
– Low education level	47.2%
– High education level	14.5%

5.5.1.3 Digital divide in outcomes

Indicator	Value
Individuals who have used the internet, in the last 3 months, for internet banking (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**62.1%**
– Low income households (1st quartile)	43.3%
– High income households (4th quartile)	81.4%
– Urban areas	66%
– Rural areas	53.3%
– Male	64.1%
– Female	60.1%
– Young (16-24)	53.1%
– Old (55-74)	45%
– Low education level	37.6%
– High education level	83.9%
Individuals have used the internet, in the last 3 months, for doing an online course (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**26.4%**
– Low income households (1st quartile)	15.6%
– High income households (4th quartile)	44%
– Urban areas	29.9%
– Rural areas	21.3%
– Male	26%
– Female	26.8%
– Young (16-24)	49%
– Old (55-74)	9.7%
– Low education level	10.3%
– High education level	42.5%
Individuals ordering goods or services online (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**62.6%**
– Low income households (1st quartile)	42.3%
– High income households (4th quartile)	85.2%
– Urban areas	66.3%
– Rural areas	55.1%
– Male	63.8%

– Female	61.5%
– Young (16-24)	74.4%
– Old (55-74)	37.1%
– Low education level	39.3%
– High education level	83.2%
Individuals who have used the internet, in the last 3 months, for making an appointment with a practitioner via a website, e.g. of a hospital or a health care centre (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**40.3%**
– Low income households (1st quartile)	32.5%
– High income households (4th quartile)	49.5%
– Urban areas	41.9%
– Rural areas	30.1%
– Male	36.9%
– Female	43.6%
– Young (16-24)	29.4%
– Old (55-74)	31.1%
– Low education level	28.2%
– High education level	51.5%

5.5.2 Initiatives implemented to close digital divides

Digital divides in Spain are similar to those in the Netherlands in that a wide majority of the population has both broadband and mobile coverage. Nevertheless, the larger and more complicated Spanish topography means that there exists a divide between urban and some rural areas. Take-up across regions and income levels is also quite high, highlighting once more, the second digital divide, or the divide in knowledge and skills. Only 13.5% of those aged between 55 and 74 have above basic level of digital skills with a national average of 36.1%. Much of the focus of national regulators and public bodies, particularly the national government in its digitisation plan, has thus been on this area.

5.5.2.1 NRAs

The Spanish NRA (*Comisión Nacional de los Mercados y la Competencia – CNMC)* is one of the regulators with the most limited competences of all BEREC member countries. Nevertheless, CNMC has been active ensuring competition and the proper functioning of telecommunications networks during the pandemic. Previous work of the CNMC has been very useful in bridging digital divides, as it has led to the creation of one of the most extensive fibre networks in Europe. In order to accelerate the deployment of these networks, in December 2020 the CNMC proposed a reduction in the recurrent prices that operators pay to the incumbent (Telefónica) for the use of its physical infrastructure

(ducts, duct boxes, poles, etc.).[205] The conditions, prices, deadlines and processes guiding the relationship between alternative operators and the incumbent when the former wants to use incumbent's infrastructure to deploy their own fibre optic networks are set out in the MARCo offer.[206] This pro-competitive regulation has been acknowledged as a best practice in Europe.

During 2020 and 2021, the CNMC analysed one market with relevant implications in digital inclusion, online advertising.[207] Confidence in digital services, one of the main drivers for their intensive use, heavily depends on the information provided to users and the appropriate processing of personal data when online advertisers personalise the ads shown. The CNMC's analysis showed that the online advertisement market is quite opaque and lacks transparency. It also highlighted diverse competition issues that can ultimately affect consumers, reducing their willingness to access digital services, which may be detrimental for their digital inclusion. The CNMC recommends adopting a cooperative approach between regulators, data protection authorities and consumer protection agencies to address the challenges posed by online advertisement to the digital inclusion of Spanish users.

5.5.2.2 Telecom operators

Telecommunications operators have implemented several measures to reduce digital divides in Spain. Three of the major operators (Orange[208], Vodafone[209] and Masmovil[210]) offered social tariffs to access the internet for people with financial difficulties. Social tariffs included 100 Mbps fibre or DSL connection and mobile broadband subscription at a cost of around €10-15 per month. The duration of the social tariffs was 12 months. Applicants had to be beneficiaries of the minimum living income defined by the government or not exceeding certain income levels. Other offers also benefitted young jobseekers, as internet is an essential tool for job seeking.

Telecom operators also contributed to reduce digital gaps derived from the lack of adequate equipment in low-income families and other disadvantaged groups. Telefonica donated 10,000 tablets that were distributed among retirement homes, hospitals and children at risk of social exclusion. Telefonica Foundation's program "ProFuturo" opened its online learning platform in April 2020, enabling free access to 160 courses for teachers and 1,800 content hours (STEM, life skills, etc.).

Vodafone Foundation launched the program "DigiCraft" during the academic course 2020/21 to alleviate the negative consequences of the pandemic in the acquisition of digital skills.[211] The program was focused on teaching digital competences to children aged 6-12 years. Children learnt the fundamentals of Artificial Intelligence, augmented

[205] https://www.cnmc.es/prensa/cnmc-oferta-MARCo-20201214
[206] https://www.cnmc.es/ambitos-de-actuacion/telecomunicaciones/concrecion-desarrollo-obligaciones
[207] https://www.cnmc.es/sites/default/files/3626347_10.pdf
[208] https://blog.orange.es/responsabilidad-social-corporativa/orange-lanza-la-segunda-convocatoria-de-su-tarifa-social-para-ayudar-a-paliar-la-falta-de-conectividad-en-los-hogares-mas-vulnerables/
[209] https://www.vodafone.es/c/particulares/es/productos-y-servicios/tarifa-social-vodafone/
[210] https://innicia.org/services/gestion-de-la-tarifa-masolidaridad-del-grupo-mas-movil/
[211] https://www.saladeprensa.vodafone.es/c/notas-prensa/np_digicraft_curso2021/

reality or 3D design. The program was implemented in 400 schools and benefited 32,000 pupils.

Orange Foundation presented in June 2021 the initiative “Orange Digital Center”,[212] an online education platform developed in cooperation with the *Universidad Politécnica de Madrid*. The Orange Digital Center offers a wide range of courses related to four main topics: (1) Climate Change; (2) Digital Inclusion; (3) Responsible use of technology; (4) Entrepreneurship. Courses in the field of digital inclusion are focused on improving digital skills for life and work and helping specific groups (particularly persons with disabilities) to be digitally included.

5.5.2.3 Public bodies

The Spanish Government undertook several initiatives to prevent digital divides from widening during the pandemic. Shortly after the outbreak of the coronavirus crisis, the government implemented urgent legislation[213] to tackle the social and economic impacts of the pandemic. Among the measures aimed at ensuring digital inclusion for all citizens, the government prohibited telecommunications operators from cutting off electronic communications services to customers, even if they were unable to pay their subscriptions. In a subsequent decision, the government defined a procedure that made it easier for subscribers to pay pending invoices in a flexible way. Operators were obliged to offer instalment and deferment of any debt incurred by their subscribers, who had six months to pay back their debts.[214]

The Spanish Government elaborated in 2020 the Plan Digital Spain 2025,[215] taking into account the lessons learnt during the pandemic regarding the weaknesses of digital transformation in the country. The plan identified the digital skills gap as a relevant barrier for digital inclusion and competitiveness of the country, highlighting those groups with greater difficulties in acquiring digital skills: the elderly, retired people, low-income individuals and persons living in rural areas. The plan defined the following goals in the field of digital skills:

- At least 15 million people with basic digital skills by 2025.
- At least 7 million people with advanced digital skills by 2025.
- At least 8 million people with digital skills for work by 2025.
- At least 250,000 people with digital skills for designing, developing and running digital systems by 2025.

The plan included several measures (“Educa en Digital” program,[216] National Plan of Digital Competences,[217] “UNI-Digital” plan) to achieve these goals.

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[212] https://orangedigitalcenter.es/

[213] https://www.boe.es/diario_boe/txt.php?id=BOE-A-2020-3824

[214] https://www.europapress.es/economia/noticia-gobierno-elimina-restricciones-portabilidades-telefonia-impuestas-crisis-covid-19-20200526142832.html

[215] https://www.lamoncloa.gob.es/presidente/actividades/Documents/2020/230720-Espa%C3%B1aDigital_2025.pdf

[216] https://www.educacionyfp.gob.es/en/prensa/actualidad/2020/06/20200616-educaendigital.html

[217] https://portal.mineco.gob.es/RecursosArticulo/mineco/ministerio/ficheros/210127_plan_nacional_de_competencias_digitales.pdf

Through the mentioned “Educa en Digital” program, the national government planned to allocate up to €260 million to provide 500,000 digital devices and subsidise internet connections for students at risk of digital exclusion. As competences in education, one of the sectors most disrupted by the pandemic, are transferred to the regional governments, they were responsible for the management of the acquisition and distribution of digital equipment among digital disadvantaged pupils. Regional governments used the money allocated by the national government and co-financed with their own funds the purchase of digital equipment for students who did not have such devices.

Regional and local governments have developed several programs to foster the digital inclusion of the most vulnerable groups. For instance, the city council of Barcelona recently launched the program “Connectem Barcelona” (Conecting Barcelona)[218], aimed at closing digital divides by providing digital equipment and training to vulnerable households. The program has been designed as a pilot test to assess the impact of digital training. The conclusions drawn will make it possible to define and quantify digital policies for the reduction of the digital divide throughout the city.

Respect for privacy and the correct treatment of personal data are essential aspects for advancing digital inclusion, as they give users confidence when accessing digital services. Aware of the necessity to reinforce people’s rights in the digital ecosystem, the Spanish agency of data protection launched the Digital Pact for the Protection of Persons (*Pacto Digital para la Protección de las Personas).* [219] The pact calls for promoting transparency of online services so that citizens know what data are being collected and how they are being used. The pact also seeks to strengthen the protection of children and vulnerable people on the internet and to avoid algorithmic discrimination based on race, origin, belief or gender, among others.

5.5.2.4 Civil Society organisations and NGOs

In June 2020, many NGOs started an awareness-raising campaign called “*#InternetEsUnDerecho*” (Internet is a Right).[220] The campaign included a manifesto in which the signatories stated that the lack of access to the internet prevents people's fundamental rights from being guaranteed. The manifesto proposes diverse measures to eradicate digital divides:

- Enhance coverage and quality of free Wi-Fi hotspots.
- Provide subsidies or vouchers for the purchase of connected devices for people with economic difficulties.
- Create loan services for connected equipment in public institutions (libraries, schools, senior centres, etc.).
- Enhancing digital education for adults.
- Provide free assistance and training to people with economic difficulties and/or at risk of social exclusion on the use of devices and the web for document management and job search.

[218] https://www.barcelona.cat/infobarcelona/es/conectamos-barcelona-para-reducir-la-brecha-digital_1086944.html
[219] https://www.aepd.es/es/documento/pacto-digital.pdf
[220] https://asociacionportimujer.org/manifiesto-por-la-inclusion-digital/

- Ensure that all asylum seekers in reception centres have access to an internet connection and the appropriate devices to do so.
- Ensure that all measures aimed at bridging the digital divide have a gender approach.

Another interesting initiative launched in 2020 is the program “Balmis Digital”, [221] implemented by the association Down Spain, which works for the social inclusion of people affected by Down’s syndrome. The pandemic has shown the lack of accessibility faced every day by groups such as people with Down's syndrome, exacerbating their social exclusion. The program “Balmis Digital”, funded by the Pelayo Foundation, intended to provide accessible digital equipment to persons with such disabilities.

5.5.3 Lessons learnt from the initiatives

In Spain, the NRA has identified the need to boost the rollout of very high-capacity networks in order to further advance digital inclusion. Although Spain has one of the most extensive fibre networks in Europe, there is still many places (mainly in rural areas) with low broadband coverage. In addition, the affordability of telecommunication services plays a key role to reducing digital divides in access. One of the best ways to ensure such affordability is to boost competition in the telecom market. In order to meet both objectives (foster network deployment and increase competition), the CNMC has undertaken a review of the conditions and prices that the incumbent charges alternative operators for the use of its physical infrastructure. As mentioned above, the MARCo offer regulates all aspects related to the access of alternative operators to the incumbent’s physical infrastructure and it has been considered a best practice to foster competition and investments in fixed broadband.

The analysis conducted by the CNMC on the online advertisement market can be deemed as an indirect way of promoting digital inclusion. Understanding the economic dynamics that drive the online advertising market, particularly the use that advertisers and intermediary platforms make of consumers’ data, can help internet users to take better informed decisions when operate online and to feel more confident in the digital world. Initiatives like the one implemented by the CNMC, aimed at providing more information to users on the functioning of digital markets, can have positive effects to reduce the digital divides related to outcomes. However, it is important that these analyses are done in a way that can be understood by the general public and not only by specialists.

Spanish authorities have also been aware of the problems stemming from the digital divides that have emerged during the pandemic. The Plan Digital Spain 2025 is the institutional response to the challenges posed by the pandemic for further advancing digital inclusion. Given that most of the measures are designed for the medium term, it will be necessary to wait and see how effective they will be.

Telecom operators have been active actors in the fight against digital divides. Particularly relevant were the social tariffs defined to help people with limited financial means not to be digitally disconnected. This measure, although voluntary, may be widely replicable in other BEREC member countries to improve affordability of telecommunication services.

[221] https://www.sindromedown.net/programa/programa-balmis-digital/

Finally, the civil society in Spain has actively promoted the consideration of internet access as an essential requirement to guarantee people's fundamental rights such as access to information, education, healthcare or work. Raising-awareness campaigns about the relevance of the internet access for all life aspects are also interesting measures that might contribute to all digital sector agents being engaged in the fight against digital divides.

5.6 Sweden

5.6.1 Digital divides through their main indicators

5.6.1.1 Digital divide in access

Coverage

Broadband coverage

Indicator	Value
Standard fixed broadband coverage (% households, 2020) *European Commission - Digital Agenda Key Indicators*	97.7%
Rural Standard fixed broadband coverage (% households, 2020) *European Commission - Digital Agenda Key Indicators*	81.3%
NGA broadband coverage (% of households, 2020) *European Commission - Digital Agenda Key Indicators*	87.5%
Rural NGA broadband coverage (% of households, 2020) *European Commission - Digital Agenda Key Indicators*	48.4%

Mobile coverage

Indicator	Value
Population covered by a mobile-cellular network *(%, 2019)* ***ITU***	100%
Population covered by at least a 3G mobile network *(%, 2019)* ***ITU***	100%
4G mobile broadband (LTE) coverage (% of households, 2020) *European Commission - Digital Agenda Key Indicators*	100%
Rural 4G mobile broadband (LTE) coverage (% of households, 2020) *European Commission - Digital Agenda Key Indicators*	100%

Take-up

Broadband take-up

Indicator	Value
Households having a broadband connection (%, 2020) *European Commission - Digital Agenda Key Indicators*	**91%**
– **Low income households (1st quartile)**	77.8%
– **High income households (4th quartile)**	96.7%
– **Urban areas**	94.8%
– **Rural areas**	87%

Mobile take-up

Indicator	Value
Take-up of mobile broadband (subscriptions/100 people, 2020) *European Commission - Digital Agenda Key Indicators*	126.5%

Access

Households

Indicator	Value
Households with access to the internet at home (%, 2020) *European Commission - Digital Agenda Key Indicators*	**93.9%**
– **Low income households (1st quartile)**	83.9%
– **High income households (4th quartile)**	99%
– **Urban areas**	96.6%
– **Rural areas**	90.3%

Individuals

Indicator	Value
Individuals who have used internet in the last 3 months (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**97.1%**
– **Low income households (1st quartile)**	89.8%
– **High income households (4th quartile)**	99.7%
– **Urban areas**	98.4%
– **Rural areas**	96.8%
– **Male**	97.2%

– **Female**	96.9%
– **Young (16-24)**	96.8%
– **Old (55-74)**	94.1%
– **Low education level**	92.6%
– **High education level**	99.4%
Individuals who are frequent internet users, every day or almost every day (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**92.2%**
– **Low income households (1st quartile)**	79.6%
– **High income households (4th quartile)**	99%
– **Urban areas**	94.8%
– **Rural areas**	90.6%
– **Male**	92.4%
– **Female**	92.1%
– **Young (16-24)**	93.3%
– **Old (55-74)**	83%
– **Low education level**	85.2%
– **High education level**	97.8%

5.6.1.2 Digital divide in skills

Indicator	Value
Individuals with above basic level of digital skills (% individuals, 2019) *European Commission - Digital Agenda Key Indicators*	**46%**
– **Low income households (1st quartile)**	32.7%
– **High income households (4th quartile)**	74.3%
– **Urban areas**	56.3%
– **Rural areas**	35%
– **Male**	48.3%
– **Female**	43.7%
– **Young (16-24)**	63.6%
– **Old (55-74)**	20.1%
– **Low education level**	28.9%
– **High education level**	68.3%
Individuals with low level of digital skills (% individuals, 2019)	**39.8%**

European Commission - Digital Agenda Key Indicators	
– **Low income households (1st quartile)**	35.8%
– **High income households (4th quartile)**	7.1%
– **Urban areas**	18.7%
– **Rural areas**	31.4%
– **Male**	22.1%
– **Female**	25.2%
– **Young (16-24)**	13.6%
– **Old (55-74)**	39.2%
– **Low education level**	39.8%
– **High education level**	9.02%

5.6.1.3 Digital divide in outcomes

Indicator	Value
Individuals who have used the internet, in the last 3 months, for internet banking (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**84.7%**
– **Low income households (1st quartile)**	65.6%
– **High income households (4th quartile)**	93.1%
– **Urban areas**	87%
– **Rural areas**	80.1%
– **Male**	85,3%
– **Female**	84.1%
– **Young (16-24)**	62%
– **Old (55-74)**	83.8%
– **Low education level**	69.3%
– **High education level**	93%
Individuals who have used the internet, in the last 3 months, for doing an online course (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**22.7%**
– **Low income households (1st quartile)**	17.4%
– **High income households (4th quartile)**	29.3%
– **Urban areas**	29%
– **Rural areas**	21.5%
– **Male**	22.2%
– **Female**	23.1%

– **Young (16-24)**	30.5%
– **Old (55-74)**	11%
– **Low education level**	17.9%
– **High education level**	28%
Individuals ordering goods or services online (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**84.2%**
– **Low income households (1st quartile)**	65.1%
– **High income households (4th quartile)**	95.3%
– **Urban areas**	88%
– **Rural areas**	81.2%
– **Male**	83.5%
– **Female**	84.9%
– **Young (16-24)**	79.7%
– **Old (55-74)**	70.8%
– **Low education level**	68%
– **High education level**	93.7%
Individuals who have used the internet, in the last 3 months, for making an appointment with a practitioner via a website, e.g. of a hospital or a health care centre (% individuals, 2020) *European Commission - Digital Agenda Key Indicators*	**28.3%**
– **Low income households (1st quartile)**	22.4%
– **High income households (4th quartile)**	33.8%
– **Urban areas**	34.6%
– **Rural areas**	21.6%
– **Male**	26.3%
– **Female**	30.3%
– **Young (16-24)**	25.2%
– **Old (55-74)**	19.5%
– **Low education level**	20.1%
– **High education level**	35.9%

5.6.2 Initiatives implemented to close digital divides

Most of the programs and measures carried out in Sweden in the field of digital inclusion targeted elderly people, the social group most affected by the digital divide in the country. During lockdowns and periods of social distance, elderly people faced severe risk of isolation and digital technologies were the unique tools to stay connected with friends and family. However, most of them did not have the digital skills or adequate equipment.

The initiatives developed by both public and private agents were mainly aimed at providing elderly Swedes with the right skills to be able to handle digital services.

Although broadband coverage is not considered a big issue in the country, given the high coverage achieved, in rural areas the digital gap in access still persists. Some initiatives are aimed at raising awareness about this problem.

5.6.2.1 NRAs

PTS, the Swedish Post and Telecom Authority oversees the electronic communications sector. Its competences include market regulation and wholesale disputes, the management of roaming and universal service, ensuring net neutrality and the management of authorisations for providers and spectrum management. Other key competences such as numbering and consumer protection are shared between PTS and other national bodies.

Within the realm of its competences, PTS has undertaken diverse initiatives during the pandemic, which have contributed to improve digital inclusion. During the Covid-19 crisis, PTS' major responsibility was to collect information about the functioning of telecom services in Sweden, and report to the Government and the Swedish Civil Contingencies Agency on the networks' performance.

PTS has historically carried out an annual innovation competition. In 2019, the competition was focused on digital inclusion. One of the main mandates of PTS is ensuring that all citizens can access telecommunication services, including people with disabilities, and the competition was aimed to fund the development of accessible products and services. There were 116 participants, and the eight winners shared SEK 15.6 million in prize money.[222]

Other measure implemented by the Swedish regulator to tackle digital divides during the pandemic was the creation of the website "Digitalhjalpen"[223], specially aimed to help elderly people to understand and use digital services. Through tips and guides, the website offers useful information for using digital services in daily life. "Digitalhjalpen" is part of a more comprehensive assignment to fight against digital exclusion during Covid-19 pandemic, as PTS was appointed by the Swedish Government the public body in charge of ensuring availability and encouraging the use of digital services among the elderly to avoid their isolation. In addition to the creation of "Digitalhjalpen", PTS carried out other activities (communication campaigns, development of a network of collaborators to improve digital participation of elderly people, etc.)[224] aimed at improving digital inclusion of elderly people in Sweden.

In June 2020, PTS was also commissioned by the Swedish Government to analyse the acceleration of the digital transformation due to the pandemic, especially in four sectors (culture, education, health and social care, and e-commerce) and from four perspectives (digital inclusion and accessibility, teleworking, electronic communication and

[222] https://www.telecompaper.com/news/swedish-regulator-awards-sek-16-mln-prize-fund-to-8-winners-of-digital-inclusion-project--1344197
[223] https://www.pts.se/sv/digitalhjalpen/
[224] PTS (2021). Bryt isoleringen – så kan vi minska det digitala utanförskapet för äldre https://www.pts.se/globalassets/startpage/dokument/ovrigt/funkdok/bryt-isoleringen/slutrapport-bryt-isoleringen-20-5219_t.pdf

leadership)[225]. This analysis was aimed at providing support and advice to policy makers in order to guide government action on digital transformation. The analysis identified areas in which further support is needed and proposed specific measures. The analysis was conducted in close cooperation with another public agency, the Swedish Agency for Digital Government.

5.6.2.2 Telecom operators

Telecommunication operators have developed diverse initiatives to mitigate the effects of the pandemic on digital divides. Telia Company has implemented two programs to help elderly persons and SMEs leveraging the benefits of digital technologies. The program “Mer Digital” (More Digital)[226] was launched in 2017 in Sweden and Norway and reinforced during the pandemic. The program offers, in collaboration with municipalities across the country, a basic IT training to reduce digital exclusion of elderly people. The objectives of the program are:

- Making seniors feel safe and confident when using a computer, smartphone or tablet.
- Making seniors able to use digital services, especially from public authorities.
- Inspiring seniors to take advantage of what the internet can offer.

The teachers are young people who are supported by adult supervisors trained by Telia. Since its launch, around 10,000 senior and 35 municipalities in Sweden and Norway have engaged with the program. The pandemic has substantially increased the demand for this kind of training. The program was assessed in 2018 by the University of Skövde. The researchers concluded that the program helped elderly persons to break isolation of being offline in the digital society.[227]

The program “Bli Digital” (Become Digital)[228] intends to bridge the digital divide between large and small companies. It also involves municipalities interested in increasing the digital maturity of small businesses. The program offers basic IT education for small companies that want to become more digital, teaches entrepreneurs to use digital technologies and provides training to work safely in the digital world. According to Telia numbers, its initiatives to reinforce digital skills reached in 2020 close to 120,000 individuals in all markets where the company operates[229].

Another relevant telecommunication operator in the Swedish market, Telenor, has also implemented diverse initiatives during pandemic to improve digital inclusion. In September 2020, Telenor commissioned Analysis Mason to analyse the readiness for a digital future of 60 Nordic municipalities[230]. The report includes several recommendations

[225] PTS (2021). Digital omställning till följd av covid-19 https://www.pts.se/globalassets/startpage/dokument/icke-legala-dokument/rapporter/2021/uppdrag-digital-omstallning-till-foljd-av-covid/digital-omstallning-till-foljd-av-covid.pdf

[226] https://www.telia.se/foretag/bransch/kommun/mer-digital

[227] https://www.teliacompany.com/sv/nyhetsrum/news-articles/2018/study-shows-old-schoolers-found-new-horizons/

[228] https://www.telia.se/foretag/bransch/kommun/bli-digital

[229] Telia Company (2021). Better connected living. Annual and Sustainability Report 2020 https://annualreports.teliacompany.com/globalassets/pdf/telia-company--annual-and-sustainability-report-2020.pdf

[230] Analysis Mason (2020). Nordic Digital Municipality Index 2020. https://www.telenor.com/wp-content/uploads/2020/09/Nordic-Digital-Municipality-Index-2020.pdf

to ease the coming 5G rollouts in these municipalities to further advance in their digitalisation.

5.6.2.3 Public bodies

National, regional and local authorities have led several initiatives to reduce digital gaps before and during the pandemic. At national level, the Agency for Digital Government[231] was created to improve digital accessibility of all public websites and digital platforms. The Agency allows users to report any public body which may be in breach of the legal requirements for accessibility of its websites.

The pandemic has revealed the need of relevant investments to accelerate the digital transition of services provided at local level, such as social services and healthcare. In order to increase the efficiency of these investments, the Swedish Association of Local Authorities and Regions (SALAR) is coordinating with Sweden's municipalities a roadmap for joint digital investments. SALAR has also submitted a proposal to the Government to establish a long-term model for cooperation and financing of essential digital investments.[232]

SmåKom, a national network of small municipalities, noted that the pandemic has shown that fast broadband is a prerequisite to thrive in the digital ecosystem for both individuals and business. This is the reason why they have included among their priorities for 2021 raising awareness among policymakers at national level about the difficulties with broadband expansion in rural areas[233].

An example of collaboration between the Swedish regulator, PTS, and a local authority to improve digital skills can be found in the project Funk-IT Lyftet[234]. The project, funded by PTS, is run by Uppsala Municipality and aims to increase digital competences among citizens through guides and courses, which encompasses a wide range of digital activities: finding information, online banking, access to e-Government services, making videocalls, etc.

As the pandemic has pushed towards a cashless economy, the digital financial inclusion has become a relevant issue for people with low digital skills. Diverse counties (Dalarna, Örebro, Skåne, Södermanland) have produced audio-visual contents (short films, presentations, etc.) to teach people how to use digital payment services[235].

Within the CORA (Connecting Remote Areas with digital infrastructure and services) project, funded by the European Regional Development Fund, the Region of Värmland carried out the program "Till Dig" (For You) aimed at increasing digital inclusion among the elderly[236]. It followed the multi-generational approach applied in the Telia's program "Mer Digital" explained above. Young people aged between 13 and 15 years were recruited from the local schools and, after being coached on how to support the elderly, they trained seniors on the use of digital technologies. The project not only contributed

[231] https://www.digg.se/en
[232] Swedish Association of Local Authorities and Regions (2020). The Economy Report https://webbutik.skr.se/bilder/artiklar/pdf/7585-559-2.pdf?issuusl=ignore
[233] https://smakom.se/prioriterade-fragor-2021-2/
[234] https://vardochomsorg.uppsala.se/funkit?hide-cookie-alert=Close
[235] https://digidel.se/nyheter/stod-for-att-anvanda-digitala-betaltjanster/
[236] CORA (2021). Improving the digital ecosystem in a border region https://www.lansstyrelsen.se/download/18.6c5a54c6179f5bfadf411094/1625149273733/Summary%20report%20CORA%20pilot%20Sweden_Norway.pdf

to bridge the digital gap for elderly persons but also helped to reduce the generational gap between young and senior citizens.

5.6.2.4 Civil Society organisations and NGOs

Civil society organisations and NGOs are mainly focused on closing digital gaps by improving digital skills of specific social groups. However, there are institutions which also work on bridging the digital divide on access to fast broadband that already persist between urban and rural areas. The non-profit organisation Byanätsforum was previously an initiative within the framework of the Government's Broadband Forum. In March 2021 the organisation was created by four entities (Coompanion, Hela Sverige skal leva, LRF and Stadsnätsföreningen) to gather diverse broadband associations that build and run village broadband networks. The organisation offers advice (legal, economic, etc.) and training to manage village networks. It is also a forum in which broadband associations exchange experiences and best practices. Byanätsforum's mission also includes to raise awareness about the issue of the lack of fast broadband in rural areas in media and policy forums.

The Internet Foundation, together with the Swedish Government, has granted diverse municipalities funds and technical support to create local Digidelcenter. These centres carry out actions and programs to tackle the specific needs of each municipality for improving digital inclusion.[237]

5.6.3 Lessons learnt from the initiatives

Sweden can be considered as one of the most digitalised countries in the world, as it usually ranks at the top of the most representative indexes on digital transformation such as the Network Readiness Index[238] or the World Digital Competitiveness Ranking[239]. However, even in one of the most digitalised countries in the world there are still social groups digitally excluded. The Swedish Government, and other institutions have identified elderly people as the social group most at risk of being digitally excluded. This digital exclusion in the times of pandemic has led seniors to a severe isolation, which has led to worsening mental health for many of them. For that reason, Swedish authorities, companies and civil society organisations have focused all their efforts on bridging the digital gap among elderly people, especially the digital gap on skills. Most of the programs and initiatives described in previous sections pursued that goal. Therefore, the first lesson that can be drawn from the analysis of the initiatives is that the main issue related to digital divides in Sweden was well identified and addressed.

Although a priori the type of digital divide addressed (skills) and the target group (elderly people) may seem far from the competences of a telecom regulator, PTS has played a very relevant role after being commissioned by the Swedish Government to promote the use of digital services by seniors in order to reduce their isolation. The appointment of PTS as a central agent to fight against digital divides among elderly people, and the support provided by the Swedish regulator to local programmes aimed at bridging such digital divide, represent good examples of cooperation between public administrations.

[237] https://digidel.se/om-oss/
[238] https://networkreadinessindex.org/
[239] https://www.imd.org/centers/world-competitiveness-center/rankings/world-digital-competitiveness/

Is this cooperation model between public administrations appropriate to be replicated in other EU countries? It mostly depends on the competences of each regulator. Those NRAs with consumer protection competences, that often communicate with end users, might be able to take on the responsibility of training specific groups to improve their digital skills. However, in general it is a task far away from the traditional competences of telecom regulators.

Another lesson that is worth to note is the intergenerational approach adopted by some of the initiatives described in previous sections. Tech-savvy young people helping seniors to navigate the digital world is an interesting example of "digital solidarity" that can be easily replicated in other countries. This win-win approach not only benefits elderly people by improving their digital skills but also helps adolescents feel useful to society.

Digital gaps in access, particularly considering fast broadband, is limited to rural areas in Sweden. The great growth of teleworking and online education during the pandemic, to cite two of the most relevant internet uses, has shown the need for fast connections. Some of the initiatives described seek to raise more awareness about the difficult of having fast-speed connections in rural areas. In this case, the high level of associationism of the agents affected (small villages and local broadband providers) allow them raising their demands at the highest political level, which can be considered a smart way of lobbying for a problem that can be blurred by the national average broadband coverage and penetration figures.

5.7 General conclusions of case studies

The response to the digital divide during the pandemic, particularly by public bodies or governments, closely followed the problems identified in each country. In those countries where an access divide persists, actions were focused on enhancing the development of Very High-Capacity Networks in underserved communities, particularly in rural areas, where commercial offers were less profitable, and operators showed less willingness to invest. In countries with higher levels of coverage, or where such rural/urban divides were not significant, actions were focused on monitoring the network performance and the quality of the service offered, as well increasing digital skills and awareness, particularly amongst vulnerable groups.

For those countries in the first group, the creation of a Broadband Competence Office, such as it exists in the Czech Republic (although it is not unique to this country) can be highlighted as a best practice for driving network deployment in underserved areas. Another measure useful to this end was the systematic review of the conditions and prices on access of alternative telecom operators to the incumbent's physical infrastructure, as was done in Spain, in order to bolster competition, and thus investment in these areas.

In contrast with the findings from the literature review, which highlight a general digital gender gap at global level, the case studies show that this gap is almost inexistent considering internet usage in the European context.

For those countries more concerned with digital skills and awareness than access, the establishment of a "Telecommunication Academy" or some sort of consulting body for those lacking basic digital skills can be highlighted as a good initial practice. In Sweden,

however, measures to this end combined information campaigns, mentorship programs, and subsidies, a more wholistic approach which is likely to deliver increased results.

Affordability has also been a key issue widely addressed during the pandemic, regardless of the national context. Measures by regulators have been mainly focused on providing information and demanding transparency from telecom operators for prices, offerings, coverage, and quality of service. For example, official price comparison and quality mapping tools were created as an effort to maintain competitive pressure, enhancing affordability of telecom services and informing users about the quality of service they could obtain from each operator. Although price comparison tools from private agents already exist, these same tools implemented by NRAs guarantee a degree of truthfulness and completeness of information which may not be present in private tools. The price comparison tool and the quality mapping portal from CTU are interesting examples, easily replicable in most BEREC countries. Many telecom operators as well, on their own volition, adopted several measures to increase the capacity of their services, up to, and including, free services or extended data offerings. Some governments have taken a more interventionist approach in this area, however, concluding that the above measures were not sufficient, including limiting the ability of operators to cut off supply to vulnerable or needy people during the pandemic. Such measures were of an emergency nature only, however.

Another field of intense activity was education. As education moved online, many students were at risk of not being able to follow classes due to lack of access or (in most cases) appropriate devices. Therefore, most of the initiatives developed during the lockdowns across countries were aimed at providing children in economically disadvantaged families with appropriate equipment and access.

Many of such measures came as a result of a private/public partnership. Indeed, across all countries analysed public authorities, particularly at a regional and local level, have cooperated with NGOs and telecom operators to address two of the main elements of the digital divide: the lack of equipment amongst students and the digital illiteracy, particularly among the elderly. In many instances, public administrations have even relied on civil society organisations to manage digital inclusion programs, providing funds and support to meet their objectives while letting these organisations run the programs themselves. Most of these initiatives were also reliant on the solidarity of tech-savvy generations, who offered their time and knowledge in a voluntary fashion in many of these programs.

Lastly, and to answer the particular challenges posed by the pandemic on the elderly, communication campaigns to help seniors accessing the digital society and to foster a safe use of internet, as well as to raise awareness about disinformation, were also undertaken by several stakeholders, including regulators.

In summary, these were some of the key measures taken to address digital divides during the pandemic in the five countries examined.

- Monitoring on the networks' performance and the quality of the service.
- Information on prices, offers and quality of service, developing official price and QoS comparison tools to enhance competition.
- Transparency to enhance trust.
- Campaigns to increase awareness, particularly among the elderly.

- Campaigns to provide students with appropriate digital equipment.
- Strong cooperation with stakeholders: local and other national authorities, NGOs, telecom operators, etc.
- Protecting internet access for all, impeding operators to disconnect vulnerable and disadvantaged groups for economic reasons.

6 Recommendations

The literature review has presented a comprehensive overview of the digital divide, with the description of the concept, its different levels, causes and consequences. The quantitative analysis has shown the evolution of the digital divides in statistical terms, while interviews have provided additional expertise to complement the information derived from the literature review. Finally, the case studies have described examples of useful initiatives to tackle the diverse levels of the digital divide. All the information collected through the previous chapters is aimed at answering the key question which has guided the elaboration of the study: **What can NRAs do in an effective way to promote digital inclusion in practice and in the short and medium terms?**

This chapter, based on the previous findings, offers a comprehensive list of recommendations to answer the previous question. Each recommendation is described and assessed qualitatively considering the following criteria:

- **Costs and benefits**: whether the benefits obtained from the implementation of the recommendation outweigh the costs and whether the recommendation is affordable for both public and private agents.
- **Feasibility**: whether the recommendation can be easily implemented, and it is likely to be supported by diverse stakeholders (politicians, NRAs, civil society, economic sector) at both EU and national levels.
- **Effectiveness**: whether the policy is expected to achieve its goals.
- **Risks and future uncertainties**: whether there are risks or uncertainties that can hinder the impact of the recommendation or create negative externalities.

For each criterion, a qualitative score is provided (high, medium, or low), explaining the rationale for this score.[240]

The proposed recommendations are divided into two main groups. The first one includes specific recommendations that NRAs can implement within the scope of their competences. The second group proposes more general recommendations in which NRAs can participate in cooperation with other actors of the digital sector. Within each group, recommendations are structured according to the challenges they intend to address. Previously to the description and assessment of each recommendation, a brief overview of these challenges is presented.

6.1 Summary of the challenges to bridge digital divides

6.1.1 Lack of broadband coverage and need to accelerate network rollouts in underserved areas

The quantitative analysis has shown the persisting differences in broadband coverage between urban and rural areas. Although the broadband coverage gap is narrowing year

[240] For the criterion “Cost and benefits” a high score means that the benefits far outweigh the costs, a medium score means that the benefits slightly outweigh the costs, and a low score means that the costs outweigh the benefits. For the criterion “Risks and future uncertainties” a high score means that significant risks and uncertainties could threaten the implementation of the recommendation, a medium score means that some risks and uncertainties could diminish the potential benefits of the recommendations, and a low score means that no risks and uncertainties have been identified.

by year it is necessary to accelerate network rollouts in underserved areas to allow people living in those areas having the same opportunities regarding digitalisation as those living in urban areas.

In mid-2019, the gap between the overall fixed broadband coverage in the EU and the rural fixed broadband coverage was 7.4 percentage points (97.1% and 89.7%, respectively).[241] However, as we move to faster connections, necessary for key activities such as telework, distance education or webstreaming, the gap widened significantly. Considering EU average for NGA coverage versus rural NGA coverage, the gap was 26.5 percentage points (85.8% vs. 59.3%). VHCN coverage in EU rural areas was 23.9 points lower than overall VHCN coverage in the EU (44% vs. 20,1%).

According to Eurostat, in 2018 29.1% of EU population lived in rural areas.[242] It implies that more than 130 million people[243] in the EU may be at risk of having lower quality internet connections than inhabitants of urban areas if no further actions are taken to accelerate high-capacity networks' rollouts in those areas.

6.1.2 Low affordability of telecom services for disadvantaged groups

In general terms, telecom services in Europe can be considered as affordable. Prices exceed the target of 2% of average monthly incomes only for a few countries (Bulgaria, Montenegro and North Macedonia),[244] and for certain baskets of telecommunications services. However, the economic crisis resulting from the pandemic has meant that some disadvantaged groups cannot afford to connect to the internet. In fact, in the interview phase, experts ranked this problem as the second cause of the digital divide, only surpassed by the lack of digital skills.

According to the quantitative analysis, affordability of telecom services has improved during the pandemic. However, there is still room for more improvement, especially considering economic disadvantaged groups.

6.1.3 Lack of motivation and low level of digital skills

From the demand side, two main issues contribute towards widening digital divides. The first one is the lack of motivation to use the internet. It mainly affects elderly people, who lack interest in accessing digital services. The lack of motivation is closely linked to the lack of confidence in the use of digital services. The fear of making mistakes or falling victim of online fraud leads to a reluctance to use digital services.

The complexity and low usability of digital services are also factors driving the lack of motivation. Both factors are also related to the lack of digital skills. In the end, a vicious cycle in which lack of digital skills feeds back into lack of motivation and vice versa is created. To achieve full digital inclusion for all it is therefore crucial to break this vicious cycle.

[241] European Commission (2020). Broadband coverage in Europe 2019. Mapping progress towards the coverage objectives
[242] Eurostat (2020). Urban and rural living in the EU
[243] Based on the EU's 447 million inhabitants at the beginning of 2021
[244] See Annex 2: Graphs of the quantitative analysis: Table 32

6.1.4 Lack of accessibility of digital services

Lack or low accessibility of digital services is a big issue that impedes many people benefiting from the internet. According to Eurostat, almost 1 in 4 people in the EU have long-standing limitations in usual activities due to health problems.[245] The European Disability Forum estimated that over 100 million persons with disabilities live in the EU.[246] Although not all types of disability are an impairment to accessing digital services, deaf people, blind or visually impaired people and people with mental issues, among others, experience serious problems in benefiting from the internet on an equal footing with other users.

The lack of accessibility of many digital services leads to a worsening of the digital divide for people with disabilities.

6.2 Specific recommendations for NRAs

6.2.1 Recommendations to improve broadband coverage and accelerate network rollouts

6.2.1.1 Foster infrastructure sharing to reduce costs of deploying broadband networks in depopulated and remote areas.

Infrastructure sharing in both mobile and fixed networks is an optimal way to reduce costs of deployment, both CapEx and OpEx, and accelerate rollouts in remote areas. Infrastructure sharing not only refers to the sharing of active and passive network components between telecom operators but also between them and other service providers (electricity companies, railway companies, etc.). In European countries, infrastructure-based approaches, in which each telecom operator deployed its own network, have provided appropriate competition and consumer benefits. However, this approach might not be so useful to provide connectivity in depopulated and remote areas, due to the huge investments needed to deploy several networks and the reduced profitability of the provision of telecom services in such areas. The example of the Spanish NRA (CNMC), analysed in the case studies, which incentivise infrastructure sharing by reducing the prices that alternative operators pay to the incumbent for using its fixed infrastructure (the most extensive fixed telecommunications network in Spain) is an interesting way of promoting infrastructure sharing to enhance competition and provide people in remote areas with more telecommunication offers.

Table 8: Assessment matrix for the recommendation "Foster infrastructure sharing to reduce costs of deploying broadband networks in depopulated and remote areas"

Criterion	Adequacy	Rationale
Costs and benefits	High	While infrastructure sharing allows providing better offers to people in remote areas, the costs of deployment decrease significantly.

[245] Eurostat. Data from 2019. Self-perceived long-standing limitation in usual activities due to health problem (hlth-silc-06).
[246] https://www.edf-feph.org/newsroom-news-how-many-persons-disabilities-live-eu/

Feasibility	High	Competent authorities (NRAs or other bodies) may mandate infrastructure sharing. Only networks' owners could show reluctance to this approach.
Effectiveness	High	People in underserved areas could benefit swiftly from a wider offer of telecommunication services.
Risks and future uncertainties	Medium	Infrastructure sharing might reduce incentives to invest in telecom networks, and thus affect the level of competition. Coordination between undertakings sharing the infrastructure is crucial. Network resilience could be affected if many operators share the same infrastructures and there is no alternative network.

6.2.1.2 Foster dialogue between NRAs and international organisations to promote Open RAN architectures to accelerate network deployment in remote areas

Open RAN (Radio Access Network) is an innovative approach for the deployment of the network segment connecting end users to the core part of the network. It is based on the disaggregation between hardware and software in the RAN and the use of open interfaces and standards to ensure interoperability. Among its benefits is worth to highlight the reduction of dependency on unique telecom equipment providers to deploy the network, as open RAN architecture allows more suppliers to design and fabricate equipment. More competition in the telecom vendor market would lead to a reduction of the costs, allowing for cheaper and faster deployments. This approach is not without risks, such as those arising from interoperability needs between equipment from different vendors and the potential security risks arising from open interfaces.

Open RAN may be considered a possible approach to accelerate network deployment in remote areas, particularly for future rollouts of 5G networks in those areas.

Diverse organisations (O-RAN alliance,[247] Open RAN Policy Coalition,[248] and Telecom Infra Project,[249] among others) are promoting Open RAN approaches by developing and testing standards, specifications, and technological solutions. It should be advisable to foster dialogue between NRAs and those organisations to understand all the implications of this architecture and how it may contribute to accelerate network deployment, particularly in remote areas.

[247] https://www.o-ran.org/
[248] https://www.openranpolicy.org/
[249] https://telecominfraproject.com/

Table 9: Assessment matrix for the recommendation "Foster dialogue between NRAs and organisations promoting Open RAN architectures to accelerate network deployment in remote areas"

Criterion	Adequacy	Rationale
Costs and benefits	High	NRAs can approach these organisations to better understand this new technological architecture, its potential benefits, and drawbacks, as well as potential competition issues. While the costs of this exploratory work would be low, its potential future benefits in terms of network deployment in remote areas could be high.
Feasibility	High	Collaboration between NRAs and other organisations to promote digital inclusion is one of BEREC's priorities. Therefore, dialogue with the Open RAN architecture's promoters is perfectly feasible.
Effectiveness	High	Fostering dialogue with organisations promoting Open RAN architectures will help all digital actors to better understand these new approaches for network deployments.
Risks and future uncertainties	Medium	As these new approaches for network deployments could be detrimental to some digital agents (mainly current network equipment providers), fostering dialogue from public bodies could be interpreted as market meddling.

6.2.1.3 Foster collaboration among stakeholders to identify bottlenecks and obstacles to network deployment, and to accelerate it.

Bridging digital divides cannot be done by a single agent of the ecosystem. Collaboration among all stakeholders, particularly NRAs, public bodies, and telecom operators, has been highlighted by several interviewees as the only way to effectively tackle the complex phenomenon of the digital divide. In the area of network deployments, local authorities are best suited to identify connectivity issues and obstacles to network rollouts. However, they require support and advice from national authorities and NRAs to solve these problems.

NRAs, as independent bodies, could take on the role of driving collaboration between stakeholders, developing communication and meeting forums where agents can share their experiences and concerns. NRAs can act as a catalyst for dialogue between telecommunications service providers and public authorities to find the best alternatives for network deployment in underserved areas.

International cooperation with regulators from other regions is also advisable, as obstacles to network deployment in underserved areas are also being addressed outside Europe and there may be alternative approaches that can be used in the European context.

There are many initiatives across Europe, implemented by public authorities and other organisations to address the diverse levels of the digital divide, in which NRAs can cooperate providing advice and sharing information. Annex 5 presents a benchmarking of these initiatives.

Table 10: Assessment matrix for the recommendation "Foster collaboration among stakeholders to identify bottlenecks and obstacles to network deployment, and to accelerate it"

Criterion	Adequacy	Rationale
Costs and benefits	Medium	Fostering collaboration between actors and regulators outside Europe can involve a lot of coordination work, meeting management, etc. However, the intended benefits (deployment of very high-capacity networks in underserved areas) depend to a large extent on external factors.
Feasibility	High	NRAs can lead initiatives for collaboration between sector actors. Most NRAs have the necessary competences to carry out this work.
Effectiveness	High	The recommendation can be very effective in achieving the rapid deployment of very high-capacity networks if all actors are genuinely involved in finding collaborative mechanisms.
Risks and future uncertainties	Medium	While collaboration between industry players may be more or less effective, it will always contribute to a better understanding between the parties involved in network rollouts, which will undoubtedly facilitate future deployments. However, in certain circumstances, collaboration between NRAs and telecom operators might risk some form of regulatory capture.

6.2.1.4 Establish mobile coverage obligations on telecom operators to address underserved areas.

The European Commission has recently set out its digital targets for the next decade. In the communication “Digital Compass 2030”, the key objectives in the area of digital infrastructures are:

- All European households should be covered by a Gigabit network by 2030.
- All populated areas should be covered by 5G by 2030.

Both objectives are very ambitious. However, they do not represent short-term solutions for the problems that emerged during the pandemic: inability to access distance learning services, difficulty in teleworking, in accessing audio-visual services, etc. In the short and medium term, NRAs may establish coverage obligations when, for example, licensing spectrum. While this coverage will not yet provide speeds such as those proposed by the European Commission for 2030, it should be sufficient to facilitate access to today's digital services. For instance, the German regulator (BNetzA) set the target that at least 98% of households in each federal state should have mobile broadband connexions with at least 100 Mbps (downlink) by the end of 2022. This objective was part of the conditions imposed on the winners of the 5G spectrum auction. Other examples of coverage obligations are those imposed by the French regulator (Arcep) when allocated the 3.4-3.8 GHz band,[250] and the Austrian regulator (RTR) after the auction of the 700, 1,500 and 2,100 MHz bands in 2020.[251] Telecom operators consider that a fair trade-off between coverage obligations and the cost of spectrum auctions would be ideal to accelerate deployment in underserved areas.

Although coverage obligations are usually related to the allocation of frequency bands for mobile broadband, similar obligations may be imposed to accelerate deployment of fixed broadband networks.

Table 11: Assessment matrix for the recommendation “Establish mobile coverage obligations on telecom operators to address underserved areas"

Criterion	Adequacy	Rationale
Costs and benefits	High	Create specific obligations to accelerate the deployment of very high-capacity networks would undoubtedly benefit people and enterprises located in underserved areas. The obligations would have minimum impact in costs for NRAs, although other agents (mainly telecom operators) might incur significant costs.

[250] https://en.arcep.fr/news/press-releases/view/n/5g-17.html

[251] https://www.rtr.at/TKP/was_wir_tun/telekommunikation/spectrum/procedures/Multibandauktion_700-1500-2100MHz_2020/FRQ5G_2020_coverage.en.html

Feasibility	High	Both NRAs and other public bodies with competences in network deployment can impose this kind of obligations.
Effectiveness	High	Establish short and medium-term coverage obligations would be very effective to alleviate current coverage gaps.
Risks and future uncertainties	Medium	It is not clear what would happen if operators failed to comply with coverage obligations. Possible fines would not solve the problem of lack of coverage for citizens and companies in underserved areas.

6.2.2 Recommendations to improve affordability of telecom services

6.2.2.1 Develop or support the creation and use of comparison public tools of telecom services (on prices, coverage and QoS, for instance) to allow end-users to make informed decisions and maintain competitive pressure on providers.

The European Electronic Communications Code (EECC) establishes, in Article 103.2, end user's right to have access free of charge to, at least, one independent comparison tool, stating that this tool should enable users to compare and evaluate different internet access services, not only with regard to prices and tariffs but also the quality-of-service performance. It would also be very useful to provide comparison tools to convey information about the different providers' coverage, considering the differences between rural and urban areas pointed out in Section 3 (quantitative analysis), for instance, in the frame of EECC, Article 22. In this regard, coverage mapping tools, such as the one provided by ARCEP,[252] offer useful statistical information about internet services to users with a geographical perspective. Furthermore, other types of comparison tools, focused on quality of service, can be implemented.

This data-driven approach to regulation could reduce searching costs for end-users and can potentially increase take up of internet services by orientating the market: since people would have at their disposal an aggregation of the different options available, the decision-making process will be quicker, simpler and more tailored to each household needs, which may ultimately increase penetration. Moreover, by jointly publishing providers' offers, competition in the market will be nourished, the tool can serve as a sort of ranking to final users, and hence telecom operators will be incentivised to offer the best conditions. The prices comparison and the quality mapping tool launched by CTU in 2021 could be taken as an example, which can be extended to include information about coverage.

[252] https://www.arcep.fr/cartes-et-donnees/nos-cartes/visualisations-ma-connexion-internet.html

Table 12: Assessment matrix for the recommendation "Develop or support the creation and use of comparison public tools of telecom services (on prices, coverage and QoS for instance) to allow end-users to make informed decisions and maintain competitive pressure on providers"

Criterion	Adequacy	Rationale
Costs and benefits	High	Costs of the tools for NRAs would be low, while many people, especially those with financial difficulties, could benefit from it. An additional benefit would be the increase in competition.
Feasibility	High	NRAs could easily implement the same or similar tools to those described above since they have an established relation with the operators and can access the information easily. There are already some who have developed them.
Effectiveness	Medium	Although comparison tools can help final users to make more informed decisions, if those are not conveniently advertised most people would remain unaware of their existence.
Risks and future uncertainties	Medium	There exists the risk that the design of the comparison tool is not user friendly and remains unused. Also, it might be the case that the tool facilitates the existence of cooperation between the operators since potential deviations from a cartel would be discovered much faster.

6.2.3 Recommendations to improve take-up of telecom services and digital skills

6.2.3.1 Conduct systematic research into the motivations of those who do not access the internet, or choose not to engage in the digital world, in order to better understand why they prefer to remain offline.

As it has been analysed in previous chapters, the lack of motivation to use digital services is one of the main causes for being disconnected. However, the reasons for remaining offline are largely unexplored. Official statistics barely include indicators on this issue. For instance, Eurostat only provide statistical information on the reasons for not having internet access at home, considering aspects such as access and equipment costs, absence of necessity, lack of skills, lack of coverage, lack of accessible services, etc. Official statistics do not delve into the underlying motivations that prevent disconnected

people from benefiting from digital services. Without knowing these motivations, any program dedicated to trying to connect them might prove useless.

NRAs, within their market analysis competencies, may lead the research on the reasons why some people prefer to be disconnected. In this way, NRAs could provide other public bodies with useful information to define more accurate programs to foster digital services' take-up.

BEREC and NRAs can also cooperate with international organisations like ITU and the OECD to define common ways and methodologies to obtain information on the motivations of people who do not use the internet.

Table 13: Assessment matrix for the recommendation "Conduct systematic research into the motivations of those who do not access the internet, or choose not to engage in the digital world, in order to better understand why they prefer to remain offline"

Criterion	Adequacy	Rationale
Costs and benefits	Low	The costs of this type of research should be very high and it is not clear that such research will increase the use of digital services.
Feasibility	High	The NRAs are familiar with similar research in the field of telecommunications markets, and they could assume this task without problem.
Effectiveness	Low	Knowing the motivations that prevent some people from connecting to the internet does not directly imply that these can be changed.
Risks and future uncertainties	Medium	A lot of money can be spent on research to discover the motivations for not using the internet for people who are unlikely to change their behaviour towards digital services.

6.2.3.2 Promote communication and awareness campaigns on the benefits, safety and accessibility of the internet.

Dealing with digital services for the first time is a challenge for people who have never accessed them before. The lack of confidence of inexperienced users can be a major obstacle towards internet and lead to a decrease in motivation to use it at all. To avoid this, it is advisable to promote awareness campaigns on the benefits that the internet can provide, as well as on internet safety. In order to increase their effectiveness, these campaigns should be focused on specific groups. According to some interviewees and case studies, most of the campaigns already done targeted elderly people and they usually achieved the objective of increasing take-up of digital services among seniors.

In addition to continuing to raise awareness among elderly people about the benefits of the internet, it would be necessary to focus these campaigns on other vulnerable groups, such as people living in rural areas, people with disabilities or people at risk of social exclusion (homeless people, migrants, etc.).

Once people are aware of the benefits of the internet, it is necessary to provide them with the adequate digital skills. Therefore, awareness campaigns should evolve into training programs to get people engaged in the digital world.

Several NRAs (for instance, the Hungarian and Swedish regulators), have been involved in the management of awareness campaigns. These NRAs should continue these initiatives, maybe targeting other disadvantaged groups. Other NRAs with the appropriate competences which have not implemented such measures could try to define specific campaigns in collaboration with agents who are aware of the current internet take-up gaps (NGOs and civil society organisations).

Table 14: Assessment matrix for the recommendation "Promote communication and awareness campaigns on the benefits, safety and accessibility of the internet"

Criterion	Adequacy	Rationale
Costs and benefits	Medium	Costs of communication campaigns can be very high and results in terms of increased take-up of the internet by target groups may not match the expense.
Feasibility	High	Either NRAs or other public bodies can undertake the launch of communication campaigns to incentivise internet use.
Effectiveness	Medium	Communication and awareness-raising campaigns do not ensure that internet use grows among target groups.
Risks and future uncertainties	Low	No special risks and uncertainties have been identified.

6.2.4 Recommendations to improve accessibility of digital services

6.2.4.1 Include specific programs to address digital inclusion for persons with disabilities in Universal Service obligations and mandate NRAs to monitor the accessibility of services.

According to the proposals made by World Bank experts to foster ICT accessibility, detailed in the literature review, grants and programs aimed at fostering digital inclusion for persons with disabilities may be considered within the Universal Service obligations. Persons with disabilities are one of the groups most at risk of social exclusion, which can increase if they cannot enjoy accessible and affordable electronic communications services. For this reason, defining special tariffs and financing the purchase of accessible digital equipment could be necessary. These measures would allow to ensure equivalent

access to electronic communications services for this group and may be part of the Universal Service obligations.

Depending on their national context, NRAs could also undertake the collection of accessibility demands on ICT services raised by organisations representing persons with disabilities and analyse whether they could be considered with the scope of the Universal Service obligations.

Table 15: Assessment matrix for the recommendation "Include specific programs to address digital inclusion for persons with disabilities in Universal Service obligations and mandate NRAs to monitor the accessibility of services"

Criterion	Adequacy	Rationale
Costs and benefits	High	The costs of collecting and managing accessibility demands on ICT services would not be high. The involvement of the regulator as an overseer of the accessibility of services would be an incentive for providers to make progress in improving accessibility. Including specific programs for persons with disabilities in the Universal Service obligations can be costly but benefits for this group far outweigh such costs.
Feasibility	Medium	Taking on the competences to monitor the accessibility of services may not be possible in some countries.
Effectiveness	High	Just as the role of regulators in maintaining competition in the sector can be seen as successful, their involvement in improving accessibility could also be very effective. Improve affordability of accessible electronic communications services will be very effective to foster digital inclusion of persons with disabilities.
Risks and future uncertainties	Medium	Considering programs to improve digital inclusion of persons with disabilities in Universal Service obligations should not lead to any market distortion.

6.3 General recommendations in which NRAs can cooperate

6.3.1 Recommendations to improve broadband coverage and accelerate network rollouts

6.3.1.1 Create a permanent European forum to make progress in bridging the digital divide.

The Covid-19 pandemic has exacerbated the effects of the digital divide worldwide. Although the digital divide has different causes and manifests itself differently in different European regions, it is a global phenomenon that could be addressed at such a level.

The creation of a permanent European forum aimed at addressing the causes of the digital divide could help to tackle this issue in a coordinated way. This forum would allow for the identification of shared problems between European regions, as well as the solutions implemented. It would also serve to exchange knowledge on good practices, which can serve as inspiration to adapt them to the specific reality of each region. BEREC and European NRAs could lead the creation of this forum, which should involve European institutions such as the European Commission and the European Committee of the Regions, EU agencies such as ENISA and CINEA,[253] European standardisation organisations (ETSI, CENELEC), other international organisations (ITU, OECD, UNESCO), and other European bodies (JRC,[254] Communications Committee, NIS cooperation group), among others. Representatives of the rest of the stakeholders in the digital sector (associations of telecommunications operators, associations of digital companies, consumer organisations, associations representing specific groups - the elderly, people with disabilities, migrants, etc.) should also participate in this forum.

Table 16: Assessment matrix for the recommendation "Creation of a permanent European forum to make progress in bridging the digital divide"

Criterion	Adequacy	Rationale
Costs and benefits	Medium	The costs of creating a permanent European forum could be very high. The benefits in terms of reduction of digital divides would only be achieved in the medium and long term.
Feasibility	Low	The design and implementation of such a forum is a very complicated task. Moreover, not all actors may be willing to participate.
Effectiveness	High	The forum would allow for greater coordination to tackle the digital divide at the global level. The exchange of ideas among participants would be very useful to implement new strategies to bridge the digital divide.

[253] European Climate, Environment and Infrastructure Executive Agency
[254] Joint Research Centre

Risks and future uncertainties	High	In fora of a similar nature, it is very difficult to achieve tangible results, as many of them merely adopt declarations of intent that do little to help solve the problem. The forum should be very operational in order to contribute to narrowing the digital divide.

6.3.1.2 Create incentives to facilitate network deployment in underserved areas.

Public bodies can define diverse incentives to facilitate network deployment in underserved areas. According to the experts consulted by ITU,[255] considering the field of taxation public administrations could reduce, either permanently or temporarily, property taxes for telecom infrastructures or taxes for the acquisition of telecom equipment to be deployed in remote areas.

Another interesting incentive could be the aggregation of the demand for telecommunications services from public administrations in underserved areas: libraries, city councils, schools, healthcare centres, etc. In this way, telecom operators could have regular users and the return on investments could be easier to achieve.

Reducing administrative burdens may also contribute to accelerate network deployment in underserved areas. Both accelerating administrative procedures (building permits., rights of way, etc.) and reducing administrative costs can contribute to faster rollouts. The EECC already includes provisions to this effect.

Public bodies should synchronise infrastructure developments (for instance by implementing “dig-one” policies) to help telecom providers to reduce costs.

Finally, public administrations could incentivise network deployments by easing the access to cell deployment sites on their own properties.

NRAs could cooperate with public administrations by advising them on the decision-making process for each incentive, analysing the pros and cons, its impact on the telecom services market and potential distortions on competition.

Table 17: Assessment matrix for the recommendation “Create incentives to facilitate network deployment in underserved areas"

Criterion	Adequacy	Rationale
Costs and benefits	High	Costs of the incentives for public bodies would be low while many people and companies could benefit from enhanced telecommunication services.
Feasibility	High	Public bodies could easily implement the same or similar incentives to those described above. These measures would be very welcomed in political terms.

[255] (Katz R., 2021)

Effectiveness	Medium	Although incentives can help to accelerate deployments, there are other constraints that may delay or prevent deployment in certain areas (low profitability of investments).
Risks and future uncertainties	Medium	Most incentives depend on political priorities and could be cancelled. This could lead to increase again the costs of network deployment, reducing the interest of telecom providers in investing in remote areas.

6.3.1.3 Leverage coronavirus recovery funds to accelerate deployment of VHCN in underserved areas.

The European Union has defined the most ambitious recovery plan in history to deal with the economic crisis resulting from the coronavirus pandemic. The Recovery and Resilience Facility (RRF)[256] is the most important mechanism of the recovery plan. The RRF makes €672.5 billion available to Member States (€312.5 billion in grants and €360 billion in loans) to support the investments and reforms needed in the aftermath of the pandemic. National recovery and resilience plans must include a minimum of 20% of expenditure to foster digital transition. The Commission defined several flagship areas for investments and reforms to guide Member States when drafting their national plans. One of these flagship areas is the rollout of rapid broadband services.

Some Member States (Austria, Croatia, Cyprus, Czechia, Denmark, France, Greece, Ireland, Italy, Latvia, Lithuania and Slovenia)[257] have defined measures to improve broadband infrastructure in underserved areas. The recommendation for these countries would be to prioritise the deployment of this broadband infrastructure, as connectivity is the basis for any further digitalisation project.

Other countries have not included specific programs to cover underserved areas in their national recovery and resilience plans. In this case, countries should continue to foster the deployment of VHCN in underserved areas by using their own financial resources.

One major issue is that the use of RRF funds may be limited by the current regime for State aid control. It could be the case of the deployment of 5G networks in rural areas partially covered with 4G. If the European Commission does not consider the upgrade from 4G to 5G networks as a “step change”, the use of RRF funds to invest in 5G deployments in those areas (mainly rural and semi-rural areas) could be restricted by State aid rules.[258] It finally could lead to a delay of 5G deployments in rural areas, reinforcing again digital divides. BEREC and NRAs can cooperate with the European

256 https://ec.europa.eu/info/business-economy-euro/recovery-coronavirus/recovery-and-resilience-facility_en

257 Press releases on the endorsement of national plans by the European Commission have been reviewed to complete this list.

258 https://ec.europa.eu/competition/state_aid/what_is_new/template_RFF_broadband_roll_out_and_demand_side_measures.pdf See recitals 77 and 78.

Commission to find appropriate ways to use RRF funds to accelerate network deployments in underserved areas respecting State aid regime.

Table 18: Assessment matrix for the recommendation "Leverage coronavirus recovery funds to accelerate deployment of VHCN in underserved areas"

Criterion	Adequacy	Rationale
Costs and benefits	High	The initial costs of deployments in underserved areas will be borne by the EU (loans must be repaid in several decades) while countries will rapidly benefit from more people and companies connected.
Feasibility	High	Countries that have included projects for VHCN deployments in their national recovery and resilience plans can prioritise them to further advance in the digitalisation of the whole society and economy. Those countries that have not foreseen such investments in VHCN in their plans should implement financial mechanisms with their own resources to achieve universal coverage.
Effectiveness	High	The use of RRF funds will undoubtedly accelerate the deployment of VHCN in underserved areas. Without these funds and in the current context of economic crisis, these deployments would have been delayed.
Risks and future uncertainties	Low	No risks have been identified, as RRF conditions are clear and countries are willing to cooperate with the EU in the proper management of funds.

6.3.2 Recommendations to improve affordability of telecom services

6.3.2.1 Define public aid programs for acquiring digital equipment and accessing telecom services for people with financial difficulties.

As the case studies have shown, several countries urgently implemented public support programmes for the purchase of digital equipment and to subsidise internet access for people with financial difficulties. However, many of these grants were of a one-off nature and were withdrawn after the end of the most stringent restrictions. Although these grants partially alleviated the difficulties in accessing essential digital services during the lockdowns (educational services, teleworking, e-health, etc.), economically disadvantaged people remain at risk of digital exclusion in the medium and long term. It

is therefore necessary to implement more sustainable aid programmes to ensure that no one is prevented from accessing digital services due to lack of financial resources.

Such support programmes would be targeted directly at eligible end-users to help them afford the cost of internet access or equipment purchases. The programmes could be managed by service providers and NRAs should ensure that such subsidies do not distort the market.

Table 19: Assessment matrix for the recommendation "Define public aid programs for acquiring digital equipment and accessing telecom services for people with financial difficulties"

Criterion	Adequacy	Rationale
Costs and benefits	Medium	The cost of maintaining medium and long-term support programmes for the purchase of equipment and for paying for internet access can be very expensive. However, the benefits in terms of reducing digital exclusion would be high. For NRAs, it would mean additional supervisory work to ensure that aid does not distort the market.
Feasibility	Medium	As digitisation is one of the key priorities at both European and national level, there is full political consensus on the need to advance the e-inclusion of disadvantaged people. However, at the economic level, it can be costly at a time of economic constraints.
Effectiveness	High	The implementation of public subsidies for the cost of internet access and for the purchase of digital equipment would be a major boost to the e-inclusion of the most economically disadvantaged groups.
Risks and future uncertainties	Medium	Public aids should be properly designed and managed so that they do not lead to market distortions and do not affect competition. NRAs should be vigilant to prevent such potential undesirable effects.

6.3.2.2 Collaborate with NGOs to identify socioeconomic vulnerable groups and working with telecom providers to define social tariffs for those groups.

The different lockdowns that have been in place across Europe during the pandemic have shown the importance of being connected for all aspects of life, from communications to work and education. However, as the analysis in Section 3

(quantitative analysis) has shown, there are segments of the population that still remain disconnected. In order to precisely identify which profiles form these groups, NGOs' work is crucial. They have both the experience and the resources to reach the most vulnerable groups in society.

NRAs competences and relation with telecom providers confer on them an advantageous position to design and promote social tariffs. During 2020 there have been some operators that have, by their own initiative, implemented temporary social tariffs.[126] Nevertheless, the eligibility criteria might have prevented some people from applying to them. A collaboration between NGOs and NRAs would enhance the design of social tariffs in two ways. First, the latter will ensure social tariffs are within competition laws and meet coverage and quality of service requirements. On the other hand, the former would ensure social tariffs qualifications are carefully set to reach the maximum number of potential beneficiaries.

Table 20: Assessment matrix for the recommendation "Collaborate with NGOs to identify socioeconomic vulnerable groups and working with telecom providers to define social tariffs for those groups"

Criterion	Adequacy	Rationale
Costs and benefits	High	For NRAs this measure is relatively easy to implement as their role would be more linked to fostering a collaborative environment and ensuring compliance with relevant regulation. The benefits would be significant: a more inclusive society and potential increase in digital skills in the near future.
Feasibility	High	Telecom operators, by private initiative, have already put in place social tariffs. The reputational benefits of maintaining and improving those initiatives by cooperating with NRAs and NGOs will incentivise providers to welcome the measure.
Effectiveness	High	If the correct groups are targeted, social tariffs can significantly increase take-up of internet services.
Risks and future uncertainties	Medium	If the requisites are too stringent, the tariffs might be inaccessible for certain population and digital inclusion would not be guaranteed.

6.3.2.3 *Raise awareness about social tariffs and other facilities from telecom operators for vulnerable groups.*

The development of social tariffs on its own might be an insufficient condition to increase internet service penetration among the most vulnerable groups of the population. NRAs should also design awareness and advertisement campaigns about the different options available especially targeting vulnerable groups, since in many cases people in these groups do not know about these initiatives. In that regard a close cooperation with telecom operators could really make a difference since they already have established communication channels with the public; however, it must be noted that this collaboration must be designed and carried carefully, since, in certain circumstances, this might risk some form of regulatory capture.

Additionally, NRAs can also develop an application that informs the users, based on their personal situation, about whether they are eligible for a social tariff or any kind of benefits telecom operators have in place. This could be more successful than a general advertisement campaign as it is tailored for each user.

Table 21: Assessment matrix for the recommendation "Raise awareness about social tariffs and other facilities from telecom operators for vulnerable groups"

Criterion	Adequacy	Rationale
Costs and benefits	High	The marketing/IT costs could be significant for the NRAs but can potentially be outweighed by the benefits if the targeted population is broad and well-determined.
Feasibility	Medium	NRAs on their own might have some difficulties to implement this initiative based on their mandate and competences. If this were to be developed together with providers, this collaboration could increase its feasibility.
Effectiveness	Medium	Socioeconomic vulnerable groups are usually hard to reach by digital means of communication such as email and internet advertisement which can reduce the success of the initiative.
Risks and future uncertainties	Medium	This measure, if not implemented during a sufficient amount of time, might not have an effect on penetration rates. Vulnerable people might need an adjustment period to analyse if they can accommodate this new expenditure item. Besides, in certain circumstances, collaboration between

		NRAs and telecom operators might risk some form of regulatory capture.

6.3.3 Recommendations to improve take-up of telecom services and digital skills

6.3.3.1 Design usable digital services, especially those related to e-Government, including understandable user guides.

The lack of usability of diverse digital services prevents people from using such services, even people with an adequate level of digital skills. This is particularly worrying when it involves services essential to citizens' lives such as making medical appointments, applying for public subsidies, applying for a job or applying to an educational institution, among others. “Digital-first” (or even “digital-only”) approaches to e-Government services, when such services are not usable enough, may result in many people not being able to access such services.

Designers of e-Government services should create “user journeys”[259] for those services to identify potential roadblocks or difficulties that users may experience in completing the procedures.

Although almost all services include user guides, they are often difficult for most citizens to understand. Service providers should elaborate user guides easier to understand, not written by specialists (engineers, computer scientists, etc.), who tend to use technical concepts not suitable for the general public.

Even though the role of regulators in relation to this recommendation may be limited, they could collaborate assessing the usability of e-Government services and advising public bodies to improve such usability.

Table 22: Assessment matrix for the recommendation “Design usable digital services, especially those related to e-Government, including understandable user guides"

Criterion	Adequacy	Rationale
Costs and benefits	High	Benefits of usable e-government services for all citizens will greatly outweigh the cost of improving their usability.
Feasibility	High	Public bodies are fully committed to the digitalisation of the Administration. Therefore, they will be willing to improve usability of services.

[259] A “user journey” is a methodology which helps service designers to understand all the steps that users take from accessing the service to completing the action (a purchase, an administrative procedure, etc.)

Effectiveness	High	Improving usability of e-Government services will undoubtedly contribute to increase their use.
Risks and future uncertainties	Medium	Although usability of services is a very important requirement to increase their use, this cannot be achieved at the cost of relaxing aspects such as security or privacy.

6.3.3.2 Put stronger focus in school curricula on the acquisition of digital skills that are of specific relevance for the digital age.

The reduction of the second level of the digital divide (lack of digital skills) requires a renewed effort by education authorities to put the acquisition of digital skills at the heart of the educational process from early childhood. The leading countries in the "Human Capital" component[260] of the Digital Economy and Society Index (DESI) incorporated digital competences into the basic competences to be acquired during the educational process some time ago. For instance, the national curriculum in Finland, reformed in 2014, encompasses seven transversal competence areas for basic education including ICT-competence. In Sweden, ranked second in the "Human Capital" component of DESI, digital skills are an essential part of the national curriculum in secondary education since 2018.[261]

NRAs do not have competencies on promoting digital skills in compulsory education stages. However, as relevant stakeholders of the digital ecosystem, they can contribute to the definition of such skills. NRAs, depending on their competences and experience, may have a thorough understanding of the telecommunications and digital services market and could help public bodies in charge of defining the digital skills to be included in official curricula to identify specific competences that would be necessary to consider.

Table 23: Assessment matrix for the recommendation "Put stronger focus in school curricula on the acquisition of digital skills that are of specific relevance for the digital age"

Criterion	Adequacy	Rationale
Costs and benefits	High	Costs for NRAs to collaborate in the reform of school curricula would be low. The benefits of having a high-skilled society in digital topics would be high, as they are crucial to reap all benefits of digitalisation.
Feasibility	Low	There should be wide consensus between political parties to include digital skills in school curricula. However, education is a

[260] The component "Human Capital" includes two sub-dimensions related to digital skills: "Internet User Skills" and "Advanced Skills and Development".

[261] https://eacea.ec.europa.eu/national-policies/eurydice/content/digital-skills-enter-sweden-schools_en

		highly ideological field in some countries and there may be reluctance to reform school curricula. Driving digital training is an activity far outside the usual remit of NRAs. Few regulators can develop such initiatives.
Effectiveness	Medium	The inclusion of digital skills in school curricula would bring results in the medium and long term. Meanwhile, additional measures should be undertaken to improve digital skills for adult population.
Risks and future uncertainties	Medium	Including digital skills in school curricula will not be enough if teachers are not trained to pass them on to pupils and if schools do not have the necessary connectivity and equipment.

6.3.3.3 Incentivise professional training (reskilling and/or upskilling) to those workers whose jobs have become more digitalised.

The pandemic has become an unexpected driver of the digital transformation for many jobs. However, many employees were not sufficiently supported to meet the new challenges posed by the digitisation of their work tasks. Digitalisation of the economy is moving inexorably forward, and a reversal is neither foreseeable nor desirable. For this reason, it is essential to help workers adapt to this new digital environment by providing them with the necessary training to acquire the digital skills required. Depending on their competences and experience, NRAs could collaborate with other digital agents in defining training pathways, especially in those aspects related to the understanding of the telecommunications sector or the essential characteristics to be considered when contracting telecommunications services.

Table 24: Assessment matrix for the recommendation "Incentivise professional training (reskilling and/or upskilling) to those workers whose jobs have become more digitalised"

Criterion	Adequacy	Rationale
Costs and benefits	High	NRAs can collaborate at a low cost in the definition of training pathways to improve the digital skills of workers. This training will undoubtedly be of great help for these workers to be fully incorporated into the digital economy.

Feasibility	Medium	An understanding of the telecommunications and digital services markets can be a very useful skill in making informed decisions regarding the access to those services. NRAs are in the best position to provide, or at least design, such training. However, driving digital training is an activity far outside the usual remit of NRAs. Few regulators can develop such initiatives.
Effectiveness	High	Improving digital skills is an essential prerequisite for workers to be able to adapt to the new ways of working imposed by digitalisation.
Risks and future uncertainties	Medium	Training to cope well in digital working environments must be a lifelong process, as digitisation is a continuous process. However, some workers (e.g., older workers) may feel tired of the constant need for training and may prefer to drop out of the labour market.

6.3.3.4 Consider cybersecurity issues, as well as online privacy concerns, to advise people how to stay safe online.

In both the literature review and the interviews, cybersecurity and privacy concerns were highlighted as causes that deepen the digital divide. People with low digital skills find it difficult to identify malicious online behaviour (phishing, malware, etc.), and when they are victims of online fraud, they may choose not to use digital services again. The case studies have shown some examples of NRAs that have implemented initiatives to help specific groups (mainly older people) to access the internet safely.

Within the competences that many NRAs have in the area of consumer protection, they can develop communication actions aimed at developing safe online behaviour among citizens. These communication actions can be developed in collaboration with other actors in the digital sector (service providers, public administrations, etc.) and with entities that help the most vulnerable groups (elderly people, migrants, people at risk of social exclusion, etc.). BEREC and NRAs could also join efforts with the European Union Agency for Cybersecurity (ENISA) and the European Data Protection Board (EDPB) to coordinate communication actions to improve their effectiveness.

Table 25: Assessment matrix for the recommendation "Consider cybersecurity issues, as well as online privacy concerns, to advise people how to stay safe online"

Criterion	Adequacy	Rationale
Costs and benefits	Medium	Communication actions on cybersecurity issues could be costly while it is unclear how effective they can be.
Feasibility	Medium	Those NRAs with consumer protection competences could take on cybersecurity and privacy awareness as another type of protection. NRAs without such competences would find it more difficult to implement such actions.
Effectiveness	Medium	Cybersecurity awareness campaigns are necessary but not sufficient to ensure safe online behaviour. They should be seen as a first step, to be complemented later by training actions.
Risks and future uncertainties	Medium	As cyber-attacks are becoming increasingly sophisticated, the communication and awareness-raising work of NRAs should be continuous, which may not be possible as it is not a priority competence of regulators.

6.3.3.5 Promote collaboration between employers, schools and other supportive actors (e.g. coding clubs, NGOs) to create digital training programs for disadvantaged students.

Young people from disadvantaged social backgrounds may experience difficulties in accessing digital training to improve their employability. This situation is aggravated when these young people are at risk of social exclusion. In order to provide them with effective digital training for their future, collaboration between diverse parties is essential. On the one hand, potential employers (digital companies, business associations, etc.) should define the digital skills needed for their future workforce. On the other hand, organisations that help these young people (NGOs, civil society organisations, charities, etc.) should closely work with employers to provide appropriate digital training, both through their own digital literacy programmes and through programmes run by third parties (technology companies, non-formal training centres, universities, etc.).

The Digital Skills and Jobs Coalition has been working on improving workability of EU citizens by enhancing their digital skills for many years, bringing together public administrations, companies and social organisations. However, there is still room for improvement, as many digital jobs are not filled due to a lack of qualified professionals.[262]

[262] https://digital-strategy.ec.europa.eu/en/policies/digital-skills-coalition

Market-driven digital training can be an appropriate way to prevent young people from disadvantaged social backgrounds from falling into social exclusion. NRAs, as independent bodies and depending on their competences and experience, can act as promoters of collaborative events between the various actors involved.

Table 26: Assessment matrix for the recommendation "Promote collaboration between employers, schools and other supportive actors (e.g. coding clubs, NGOs) to create digital training programs for disadvantaged students"

Criterion	Adequacy	Rationale
Costs and benefits	Medium	For the NRAs, acting as a facilitator of meetings to encourage the design of digital training programmes to improve employability is a major effort. The benefits of these actions can be high, but it does not only depend on the action of the NRAs.
Feasibility	Low	Driving digital training is an activity far outside the usual remit of NRAs. Few regulators can develop such initiatives.
Effectiveness	Medium	Effective digital literacy requires the active participation of various stakeholders. The involvement of NRAs is marginal, although it could contribute positively by being seen as a neutral actor.
Risks and future uncertainties	High	Digital training is constantly evolving, and the actors involved in it are aware of this. However, for NRAs, participation in training activities is not part of their core services. For this reason, there is a risk that these are one-off actions that do not bring about a substantial change among the target groups.

6.3.4 Recommendations to improve accessibility of digital services

6.3.4.1 Transpose the European Accessibility Act as soon as possible and adequately enforce its implementation.

Some interviewees pointed at the European Accessibility Act (EAC) as the definite regulation to guaranteeing accessibility of digital services. However, they also complained about the long period of transposition into national legislations (mid 2022). In addition, the deadline for Member States to apply the EAC's provisions is 2025. The pandemic has highlighted the growing importance of digital services in many areas of people's daily lives, and the lack of accessibility of many of these services prevents the full digital inclusion of persons with disabilities. It should be therefore advisable that Member States accelerate the transposition and implementation of the EAC.

Once the EAC is transposed and their provisions are implemented, one body should be responsible of enforcing them. NRAs could take on research activities on the accessibility

of digital services, extending its consumer protection powers. In this sense NRAs could collaborate with associations of persons with disabilities, like the European Disability Forum, to undertake this new supervisory mission.

Depending on their national context, NRAs could also be given the competences to fine those providers that do not comply with accessibility obligations.

Table 27: Assessment matrix for the recommendation "Transpose the European Accessibility Act as soon as possible and adequately enforce its implementation"

Criterion	Adequacy	Rationale
Costs and benefits	High	The cost to the NRAs of taking over the powers to control and monitor the accessibility of digital services would not be very high. The benefits, in terms of more people with disabilities being able to access these services, would be very significant.
Feasibility	Medium	NRAs without competences in consumer protection may have obstacles in taking over the monitoring of the accessibility of digital services.
Effectiveness	High	Monitoring and imposing fines for non-compliance with accessibility provisions would be very effective measures to move towards full accessibility of digital services.
Risks and future uncertainties	Low	No special risks and uncertainties have been identified.

6.3.4.2 Oblige governments and government-funded programs to mandate ICT accessibility in public procurement rules.

Many digital services, including e-government services, lack accessibility, which prevents persons with disabilities from accessing and benefiting from them on an equal basis with non-disabled people. One way to make progress on this issue would be to meet certain accessibility criteria for all digital services that rely directly or indirectly on public funding. Accessibility should be a key prerequisite for access to public funds.

NRAs could act as certifying agents for accessibility of publicly funded digital services, in collaboration with associations of persons with disabilities and other public bodies. In this way, only digital services whose accessibility have been certified by the NRA can be eligible for public funding.

Table 28: Assessment matrix for the recommendation "Oblige governments and government-funded programs to mandate ICT accessibility in public procurement rules"

Criterion	Adequacy	Rationale
Costs and benefits	Medium	Certifying the accessibility of digital services can be a complex and costly task. The benefits for people with disabilities would be significant, as they would be able to access a wider range of services, thus advancing their digital inclusion.
Feasibility	Low	Verifying the accessibility of digital services is a necessary task to promote the e-inclusion of persons with disabilities. However, NRAs have very limited competences in this area.
Effectiveness	High	Improving the accessibility of digital services would have an immediate positive impact on people with disabilities, as they would be able to take advantage of all the benefits of internet access.
Risks and future uncertainties	Low	No relevant risks have been identified.

6.4 Summary of recommendations

The following tables summarise the recommendations proposed, taking into account where they stem from, the timeframe of expected impacts and the score given to each criterion.

Table 29: Summary of specific recommendations for NRAs

Recommendation	Stems from	Timeframe of expected impacts	Adequacy to the criterion			
			Costs and benefits	Feasibility	Effectiveness	Risks and future uncertainties
Foster infrastructure sharing	Literature review	Short-medium term	High	High	High	Medium
Foster dialogue between NRAs and international organisations to promote Open RAN architectures	Consultancy	Medium-long term	High	High	High	Medium
Foster collaboration among stakeholders to identify bottlenecks and obstacles to network deployment	Interviews	Medium term	Medium	High	High	Medium
Establish mobile coverage obligations to address underserved areas	Consultancy	Short-medium term	High	High	High	Medium
Develop or support the creation and use of comparison public tools of telecom services	Case studies	Short-medium term	High	High	Medium	Medium
Conduct systematic research into the motivations of those who do not access the internet	Case studies	Medium term	Low	High	Low	Medium
Promote communication and awareness campaigns on the benefits, safety and accessibility of the internet	Literature review – Interviews	Short-medium term	Medium	High	Medium	Low
Include specific programs to address digital inclusion for persons with disabilities in Universal Service obligations and mandate NRAs to monitor the accessibility of services	Interviews	Medium-long term	High	Medium	High	Medium

Table 30: Summary of general recommendations in which NRAs can cooperate

Recommendation	Stems from	Timeframe of expected impacts	Adequacy to the criterion			
			Costs and benefits	Feasibility	Effectiveness	Risks and future uncertainties
Create a permanent European forum to make progress in bridging the digital divide	Interviews - consultancy	Long term	Medium	Low	High	High
Create incentives to facilitate network deployment in underserved areas	Literature review	Short-medium term	High	High	Medium	Medium
Leverage coronavirus recovery funds to accelerate deployment of VHCN in underserved areas	Interviews	Short-medium term	High	High	High	Low
Define public aid programs for acquiring digital equipment and accessing telecom services for people with financial difficulties	Literature review	Short term	Medium	Medium	High	Medium
Collaborate with NGOs to identify socioeconomic vulnerable groups and working with telecom providers to define social tariffs for those groups	Case studies	Medium term	High	High	High	Medium
Raise awareness about social tariffs and other facilities from telecom operators for vulnerable groups	Literature review - Case studies	Medium term	High	Medium	Medium	Medium
Design usable digital services, especially those related to e-Government	Interviews	Short-medium term	High	High	High	Medium
Put stronger focus in school curricula on the acquisition of digital skills	Interviews	Long term	High	Low	Medium	Medium

Incentivise professional training (reskilling and/or upskilling) to those workers whose jobs have become more digitalised	Quantitative analysis – Interviews	Medium-long term	High	Medium	High	Medium
Consider cybersecurity issues, as well as online privacy concerns, to advise people how to stay safe online	Literature review – Interviews	Short-medium term	Medium	Medium	Medium	Medium
Promote collaboration between employers, schools and other supportive actors to create digital training programs for disadvantaged students	Literature review	Medium-long term	Medium	Low	Medium	High
Transpose the European Accessibility Act as soon as possible and adequately enforce its implementation	Interviews	Medium-long term	High	Medium	High	Low
Oblige governments and government-funded programs to mandate ICT accessibility in public procurement rules	Literature review – interviews	Medium-long term	Medium	Low	High	Low

7 General conclusions

The analysis of digital divides from different perspectives, both qualitative and quantitative, has shown that Europe, in particular, and the rest of the world, in general, is facing a complex phenomenon, with multiple causes and adverse effects on society.

The concept of the digital divide is not univocal. In general, the literature on this problem points to the existence of three different levels:

- First level: lack of access to internet and digital services.
- Second level: lack of digital skills
- Third level: differences in the outcomes obtained from the use of internet and digital services.

Although this categorisation of digital divides is the most widely accepted, there are other proposals in the literature, given the difficulty of splitting the divides themselves from their causes and drivers.

The Covid-19 pandemic has had a major impact on the digital divides, playing a dual role. On the positive side, it has accelerated the process of digitisation in many areas that would otherwise have taken years in their digital transformation. On the negative side, the pandemic has brought to light the pre-existing causes of the digital divide (mainly lack of access to high-capacity broadband, lack of adequate equipment in households, lack of affordability of such access and equipment, lack of digital skills to use digital services and lack of accessibility of digital services) and it has accentuated the pernicious effects of digital divides (difficulty or impossibility of accessing key services in the fields of education and health, increased financial exclusion, difficulty or impossibility of interacting online with public administrations, greater exposure to online fraud, increased social exclusion).

The insights drawn from the literature review have been corroborated from a quantitative perspective. The analysis has paid attention to the evolution of digital divides by looking at indicators on both the supply and demand side of digital services. From the supply side, the most relevant variables affecting digital divides (coverage and prices) have improved in all European countries. However, evident differences still persist between them and between the urban and rural areas.

The analysis of the demand side has shown that penetration and usage have improved during the last decade, with a systematic urban/rural divide within countries and a substantial divide between countries which is strongly correlated with the level of incomes. The level of digital skills of the European population has also improved during the last decade, but significant divides have been identified between countries. The divide on digital skills within countries is strongly related to the size of enterprises, since the larger ones tend to train more their personnel to develop/upgrade their ICT skills than the small and medium ones. Regarding the internet uses and outcomes, a higher proportion of people now use the internet, are regular users, and use it for a wide range of outcomes, from education to health and leisure. However, digital divides between young and old people, men and women, people with high and low levels of education, people with high and low levels of income, and urban and rural areas have been encountered.

The results of the literature review and the quantitative analysis have been cross-checked with experts in the research on digital divides. All of them agreed that the pandemic had increased the awareness of digital divides, which is good news, because it is only by acknowledging the existence of a problem that it can be addressed. This increased awareness should lead to action both public bodies and the private and civil society sectors to bridge digital divides.

Experts stressed the importance of digitalisation for society. They considered that access to the internet and attainment of digital skills are essential for the modern citizenship. While experts noted that causes of the digital divides in the supply side (coverage and prices) are being addressed currently thanks to the renewed regulatory framework, especially the European Electronic Communications Code, they were more concerned about the digital skills gap, calling for more efforts to reduce it. They also highlighted relevant issues which contribute to widen digital divides such as the lack of accessibility of digital services and privacy and security concerns that prevent the use of those services.

One of the most relevant ideas drawn from the interviews is the importance of cooperation between all stakeholders (public bodies, service providers, civil society organisations, NRAs, etc.) to address digital divides. Another key concept to bridge digital gaps is ‘coordination’. Interviewees considered that many initiatives have been launched both at national and European level, but without a medium and long-term coordinated strategy to tackle the digital divide more effectively.

The case studies have identified some of the initiatives implemented in several European countries. These examples can serve as inspiration for other countries to implement programmes, both public and private, to bridge the digital divide.

The response to the digital divide during the pandemic, particularly by public bodies or governments, closely followed the problems identified in each country. In those countries where an access divide persists, actions were focused on enhancing the development of Very High-Capacity Networks in underserved communities, particularly in rural areas. In countries with higher levels of coverage, or where such rural/urban divides were not significant, actions were focused on increasing digital skills and awareness, particularly amongst vulnerable groups.

Affordability has been also a key issue widely addressed during the pandemic, regardless of the national context. Measures by NRAs were mainly focused on providing information and demanding transparency from telecom operators for prices and quality of service. For example, official price comparison tools were created as an effort to maintain competitive pressure on prices, enhancing affordability of telecom services.

Many telecom operators adopted several measures to increase the capacity of their services, up to, and including, free services or extended data offerings. Some governments have taken a more interventionist approach in this area, however, concluding that the above measures were not sufficient, including limiting the ability of operators to cut off internet to vulnerable or needy people during the pandemic. Such measures were of an emergency nature only, however.

Another field of intense activity was education. As education moved online, many students were at risk of not being able to follow classes due to lack of access or (in most cases) appropriate devices. Therefore, most of the initiatives developed during the lockdowns across countries were aimed at providing children in economically

disadvantaged families with appropriate equipment and access. Many of such measures came as a result of collaboration in private/public partnerships. Across all countries analysed, public authorities, particularly at a regional and local level, have cooperated with NGOs and telecom operators to address two of the main elements of the digital divide: the lack of equipment and access to internet amongst students and the digital illiteracy, particularly among the elderly. In many instances, public administrations have even relied on civil society organisations to manage digital inclusion programs, providing funds and support to meet their objectives while letting these organisations run the programs themselves.

Lastly, and to answer the particular challenges posed by the pandemic on the elderly, communication campaigns to help seniors accessing the digital society and to foster a safe use of internet, as well as to raise awareness about disinformation, were also undertaken by several stakeholders, including NRAs.

The ideas identified in the literature review and expert interviews, the findings of the quantitative analysis on the evolution of the digital divide and the good practices analysed in the case studies have been used to define a list of recommendations that regulators could implement to contribute to the reduction of the digital divide. The recommendations have been divided into those directly oriented towards NRAs and those where NRAs can cooperate with other actors of the digital sector. The recommendations seek to propose solutions to the major problems underlying the digital divides: lack of very high-capacity broadband infrastructure, low affordability of telecommunications services for economically disadvantaged groups, lack of digital skills, lack of motivation to use the internet and lack of accessibility of digital services.

As a final conclusion, despite the complexity of the phenomenon of the digital divide and the limited competencies that NRAs have in this area, they are a key element in making progress towards bridging such divides. Their role as independent actors, whose basic function is to promote the proper functioning of the telecommunications market, places them in an excellent position to foster and encourage dialogue and cooperation between all stakeholders. Many of the recommendations are oriented in this direction, seeking to enhance the intermediary role that regulators can exercise from their perspective as external observers with no interests of any kind in the digital sector.

Annexes

Annex 1: Desk research's bibliography

Awan A., Aamir A., Diwan M., Ullah I., Pereira-Sanchez V., Ramalho R., Orsolini L., de Filippis R., Ojeahere M., Ransing R., Vadsaria A., & Virani S. (2021). Internet and Pornography Use During the COVID-19 Pandemic: Presumed Impact and What Can Be Done. *Frontiers in Psychiatry*, *12*. https://doi.org/10.3389/fpsyt.2021.623508

Bahia K., & Delaporte A. (2020). *Connected Society—The State of Mobile Internet Connectivity 2020* (p. 12) [Report]. GSMA. https://www.gsma.com/r/wp-content/uploads/2020/09/GSMA-State-of-Mobile-Internet-Connectivity-Report-2020.pdf

Baum F., Newman L., & Biedrzycki K. (2014). Vicious cycles: Digital technologies and determinants of health in Australia. *Health Promotion International*, *29*(2), 349-360. https://doi.org/10.1093/heapro/das062

Beaunoyer B., Dupéré S., & Guitton M. J. (2020). COVID-19 and digital inequalities: Reciprocal impacts and mitigation strategies. *Computers in Human Behavior*, *111*. https://doi.org/10.1016/j.chb.2020.106424

Benni N. (2021). *Digital finance and inclusion in the time of COVID-19: Lessons, experiences and proposals*. FAO. https://doi.org/10.4060/cb2109en

BEREC. (2015). *Update of the report on equivalent access and choice for disabled end-users* (BoR (15) 201). https://berec.europa.eu/eng/document_register/subject_matter/berec/reports/5549-update-of-the-report-on-equivalent-access-and-choice-for-disabled-end-users

BEREC. (2018a). *BEREC Report on infrastructure sharing* (BoR (18) 116). https://berec.europa.eu/eng/document_register/subject_matter/berec/download/0/8164-berec-report-on-infrastructure-sharing_0.pdf

BEREC. (2018b). *Report on NRAs' practices for ensuring equivalence of access and choice for disabled end-users* (BoR (18) 30). https://berec.europa.eu/eng/document_register/subject_matter/berec/reports/8010-report-on-nras-practices-for-ensuring-equivalence-of-access-and-choice-for-disabled-end-users

BEREC. (2019). *Summary report on the Workshop to move towards a vision for Europe's telecoms consumers* (BoR (19) 178). https://berec.europa.eu/eng/document_register/subject_matter/berec/download/0/8843-summary-report-on-the-workshop-to-move-t_0.pdf

BEREC. (2020). *Overview of the Member State experiences related to the regulatory and other measures in light of the COVID-19 crisis*. https://berec.europa.eu/eng/document_register/subject_matter/berec/download/0/9699-overview-of-the-member-states-experience_0.pdf

Botrić V., & Božić L. (2021). The digital divide and E-government in European economies. *Economic Research-Ekonomska Istraživanja*. https://doi.org/10.1080/1331677X.2020.1863828

Braun A., März A., Mertens F., & Nisser A. (2020). *Rethinking education in the digital age*. European Parliament. https://www.europarl.europa.eu/RegData/etudes/STUD/2020/641528/EPRS_STU(2020)641528_EN.pdf

Broom D. (2020). *Billions of people lack internet access during the coronavirus crisis | World Economic Forum*. https://www.weforum.org/agenda/2020/04/coronavirus-covid-19-pandemic-digital-divide-internet-data-broadband-mobbile/

CapGemini. (2020). *The great digital divide. Why bringing the digitally excluded online should be a global priority*. https://www.capgemini.com/se-en/wp-content/uploads/sites/29/2020/05/Report-%E2%80%93-Digital-Divide-19.pdf

Cedefop. (2020). *Digital gap during COVID-19 for VET learners at risk in Europe. Synthesis report on seven countries based on preliminary information provided by Cedefop's Network of Ambassadors tackling early leaving from VET.* https://www.cedefop.europa.eu/bg/printpdf/toolkits/vet-toolkit-tackling-early-leaving/resources/digital-gap-during-covid-19-vet-learners-risk-europe

Chircop D. (2020). *Education in isolation in the pandemic, following the path of Isaac Newton*. European Parliamentary Research Service. http://www.europarl.europa.eu/RegData/etudes/BRIE/2020/651940/EPRS_BRI(2020)651940_EN.pdf

De R., Pandey N., & Pal A. (2020). Impact of digital surge during Covid-19 pandemic: A viewpoint on research and practice. *International Journal of Information Management*, *55*. https://doi.org/10.1016/j.ijinfomgt.2020.102171

Deganis, I., Zohouri, P., Tagashira M., & Alberti A. (2021). *Leveraging digital technologies for social inclusion* (Policy Brief N.º 92). UN. https://www.un.org/development/desa/dpad/publication/un-desa-policy-brief-92-leveraging-digital-technologies-for-social-inclusion/

Delta Partners. (2020). *COVID-19's impact on telecom operators*. https://www.deltapartnersgroup.com/sites/default/files/20200603%20Telcos%20Q1%202020%20results%20announcements%20-%20Covid-19%20Impact.pdf

Digital Future Society. (2019). *Bridging digital divides: A framework for digital cooperation*. https://digitalfuturesociety.com/app/uploads/2020/04/THINK_TANK_I4_BRIDGING_DIGITAL_DIVIDE_EN.pdf

DiMaggio P., & Hargittai E. (2001). From the «Digital Divide» to «Digital Inequality»: Studying Internet Use as Penetration Increases. *Working Paper Series - Center for Arts and Cultural Policy Studies - Princeton University*, *15*. https://digitalinclusion.typepad.com/digital_inclusion/documentos/digitalinequality.pdf

Elena-Bucea A., Cruz-Jesus F., Oliveira T., & Simões P. (2020). Assessing the Role of Age, Education, Gender and Income on the Digital Divide: Evidence for the

European Union. *Information Systems Frontier*. https://doi.org/10.1007/s10796-020-10012-9

Ertl B., Csanadi A., & Tarnai C. (2020). Getting closer to the digital divide: An analysis of impacts on digital competencies based on the German PIAAC sample. *International Journal of Educational Development*, *78*. https://doi.org/10.1016/j.ijedudev.2020.102259

Esteban M. A., García M. A., Morte T., & Nogales A. I. (2020). The Rural Digital Divide in the Face of the COVID-19 Pandemic in Europe—Recommendations from a Scoping Review. *Informatics*. https://www.mdpi.com/2227-9709/7/4/54

European Commission. (2019). *Directive (EU) 2019/882 of the European Parliament and of the Council of 17 April 2019 on the accessibility requirements for products and services*. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L0882&from=EN

European Commission. (2020a). *Broadband Coverage in Europe 2019 Mapping progress towards the coverage objectives of the Digital Agenda*. https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=70034

European Commission. (2020b). *Commission Staff Working Document accompanying the document «Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Digital Education action Plan 2021-2027 Resetting education and training for the digital age»* (SWD(2020) 209 final). https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020SC0209&from=EN

European Commission. (2021a). *2030 Digital Compass: The European way for the Digital Decade* [Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions]. https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52021DC0118/

European Commission. (2021b). *Guidance to Member States Recovery and Resilience Plans* (Commission Staff Working Document SWD(2021) 12 final). https://ec.europa.eu/info/sites/default/files/document_travail_service_part1_v2_en.pdf

Friemel T.N. (2016). The digital divide has grown old: Determinants of a digital divide among seniors. *New Media $ Society*, *18*(2), 313-331. https://doi.org/10.1177/1461444814538648

Gabaldón D., & Vela S. (2020). The Limitations of Distance Education in Spain During the 2020 Covid-19 Pandemic. *Proceedings of the International Conference on Informatics in School: Situation, Evaluation and Perspectives*, *2755*, 160-170. http://ceur-ws.org/Vol-2755/paper14.pdf

Hao M., Hargittai E., & Marler W. (2021). Digital inequality in communication during a time of physical distancing: The case of COVID-19. *Computers in Human Behavior*, *120*. https://doi.org/10.1016/j.chb.2021.106717

Hargittai E. (2002). Second-Level Digital Divide: Differences in People's Online Skills. *First Monday*. https://doi.org/10.5210/fm.v7i4.942

Hargittai E. (2003). Digital divide and what to do about it. *New Economy Handbook*, 822-841.

ITU. (2020). *The affordability of ICT services 2020*. https://www.itu.int/en/ITU-D/Statistics/Documents/publications/prices2020/ITU_A4AI_Price_Briefing_2020.pdf

ITU. (2021). *GSR-21 Best Practice Guidelines. Regulatory uplift for financing digital infrastructure, access and use*. https://www.itu.int/en/ITU-D/Conferences/GSR/2021/Documents/BPG%20Adopted/GSR-21_BestPracticeGuidelines_Adopted_English.pdf

Jorge S., Sarpong E., & Nakagaki M. (2020). *Covid-19 Policy Brief: Internet Access & Affordability*. Alliance for Affordable Internet and Web Foundation. http://webfoundation.org/docs/2020/04/Covid-Policy-Brief-Access_Public.pdf

Katz R. (2020). *Economic impact of Covid-19 on digital infrastructure*. ITU. https://www.itu.int/en/ITU-D/Conferences/GSR/2020/Documents/GSR-20_Impact-COVID-19-on-digital-economy_DiscussionPaper.pdf

Katz R. (2021). *Telecommunications industry in the Post-COVID-19 world* [Discussion Paper]. ITU. https://www.itu.int/en/myitu/Publications/2021/05/11/08/10/The-telecommunication-industry-in-the-post-COVID-19-world

Kuc-Czarnecka M. (2020). COVID-19 and digital deprivation in Poland. *Oeconomia Copernicana*, *11*(3), 415-431. https://doi.org/10.24136/oc.2020.017

Lawton B. (2020). COVID-19 Illustrates Need to Close the Digital Divide. En *Assessing Legal Responses to COVID-19*. Public Health Law Watch. https://www.publichealthlawwatch.org/covid19-policy-playbook

Marabelli M., Vaast E., & Li J.L. (2021). Preventing the digital scars of COVID-19. *European Journal of Information Systems*, *30*(2), 176-192. https://doi.org/10.1080/0960085X.2020.1863752

McDool, E., Powell, P., Roberts J., & Taylor K. (2020). The internet and children's psychological wellbeing. *Journal of Health Economics*, *69*. https://doi.org/10.1016/j.jhealeco.2019.102274

Milasi S., Fernandez-Macias E., & Gonzalez-Vazquez I. (2020). *Telework in the EU before and after the COVID-19: Where we were, where we head to* [Policy Brief]. European Commission. https://ec.europa.eu/jrc/sites/jrcsh/files/jrc120945_policy_brief_-_covid_and_telework_final.pdf

Negreiro M. (2020). *How digital technology is easing the burden of confinement*. European Parliamentary Research Service. https://www.europarl.europa.eu/thinktank/en/document.html?reference=EPRS_BRI(2020)651927

Nishijima M., Macedo Ivanauskas T., & Mori Sarti F. (2016). Evolution and determinants of digital divide in Brazil (2005–2013). *Telecommunications Policy*. https://doi.org/10.1016/j.telpol.2016.10.004

NTIA. (1999). *Falling through the net: Defining the digital divide. A Report on the Telecommunications and Information Technology Gap in America* (p. XIII-XV) [Report]. National Telecommunications and Information Administration - U.S.Department of Commerce. https://www.ntia.doc.gov/legacy/ntiahome/fttn99/FTTN.pdf

OECD. (2001). *Understanding the digital divide*. https://www.oecd.org/digital/ieconomy/1888451.pdf

OECD. (2020a). *Education at a Glance 2020. OECD indicators* [OECD Publishing]. https://doi.org/10.1787/69096873-en

OECD. (2020b). *Learning remotely when schools close: How well are students and schools prepared? Insights from PISA*. https://read.oecd-ilibrary.org/view/?ref=127_127063-iiwm328658&title=Learning-remotely-when-schools-close

OECD. (2020c). *OECD Digital Economy Outlook 2020*. OECD Publishing. https://doi.org/10.1787/bb167041-en

Prensky M. (2001). *Digital Natives, Digital Inmigrants Part 1*. https://doi.org/10.1108/10748120110424816

Räisänen, J., & Tuovinen, T. (2020). Digital innovations in rural micro-enterprises. *Journal of Rural Studies*, *73*, 56-67. https://doi.org/10.1016/j.jrurstud.2019.09.010

Rinderud P. (2021). Seniors and technology during Covid-19: The latest insights. *Ericsson Blog*. https://www.ericsson.com/en/blog/2021/1/seniors-and-technology-during-covid

Robinson L., Schulz J., Dunn H. S., Casilli A., Tubaro P., Carveth R., Chen W., Wiest J., Dodel M., & Stern M. (2020). Digital inequalities 3.0: Emergent inequalities in the information age. *First Monday*, *25*(7). https://doi.org/10.5210/fm.v25i7.10844

Robinson L., Schulz J., Ragnedda M., Ono H., Hogan B., Mesch G., Cotten S., Kretchmer S., & Hale T. (2020). Digital inequalities 2.0: Legacy inequalities in the information age. *First Monday*, *25*(7). https://doi.org/10.5210/fm.v25i7.10842

Samant D. (2016). *Bridging the Disability Divide through Digital Technologies* [Background paper]. World Bank. https://thedocs.worldbank.org/en/doc/123481461249337484-0050022016/original/WDR16BPBridgingtheDisabilityDividethroughDigitalTechnologyRAJA.pdf

Scanlan M. (2021). Reassessing the disability divide: Unequal access as the world is pushed online. *Universal Access in the Information Society*. https://doi.org/10.1007/s10209-021-00803-5

Scheerder A., Van Deursen A., & Van Dijk J. (2017). Determinants of Internet Skills, Uses and Outcomes. A Systematic Review of the Second- and Third-Level Digital Divide. *Telematics and Informatics*, 2. https://doi.org/10.1016/j.tele.2017.07.007

Seljan S., Pejic M., & Miloloza I. (2020). *e-Government in European Countries: Gender and Ageing Digital Divide*. Interdisciplinary Management Research XVI, Opatija,

Croatia. https://www.researchgate.net/publication/341277764_e-Government_in_European_Countries_Gender_and_Ageing_Digital_Divide

Sostero M., Milasi S., Hurley J., Fernandez-Macias E., & Bisello M. (2020). *Teleworkability and the COVID-19 crisis: A new digital divide?* (N.º JRC121193). European Commission. https://ec.europa.eu/jrc/sites/jrcsh/files/jrc121193.pdf

Sultan A. (2019). *Improving Cybersecurity Awareness in Underserved Populations*. Center for Long-Term Cybersecurity. https://cltc.berkeley.edu/wp-content/uploads/2019/04/CLTC_Underserved_Populations.pdf

Tarín, C., Guerra E., Rivera R., Fraile A., Sainz M., & Madinaveitia U. (2018). *Women in the Digital Age* (SMART 2016/025). European Commission. https://op.europa.eu/es/publication-detail/-/publication/84bd6dea-2351-11e8-ac73-01aa75ed71a1

UN. (2020). *E-Government Survey 2020 Digital Government in the Decade of Action for Sustainable Development*. https://publicadministration.un.org/egovkb/Portals/egovkb/Documents/un/2020-Survey/2020%20UN%20E-Government%20Survey%20(Full%20Report).pdf

UNESCO. (2018, marzo 15). *Digital skills critical for jobs and social inclusion*. https://en.unesco.org/news/digital-skills-critical-jobs-and-social-inclusion

UNESCO. (2020). *National Education Responses to COVID-19 Summary report of UNESCO´s online survey*. https://unesdoc.unesco.org/ark:/48223/pf0000373322

Van Deursen A. (2020). Digital Inequality During a Pandemic: Differences in COVID-19-Related Internet Uses and Outcomes among the General Population. *Journal of Medical Internet Research*, *22*(8). https://doi.org/10.2196/20073

Van Deursen A., & Helsper E. (2015). The Third-Level Digital Divide: Who Benefits Most from Being Online? *Communication and Information Technologies Annual: Digital Distinctions and Inequalities. Studies in Media and Communications*, *10*, 29-53. https://doi.org/10.1108/S2050-206020150000010002

Van Deursen A., & Helsper E. (2017). Collateral benefits of Internet use: Explaining the diverse outcomes of engaging with the Internet. *LSE Research Online*, 3. https://doi.org/10.1177/1461444817715282

Van Deursen A., Helsper E., & Eynon R. (2015). Development and validation of the Internet Skills Scale (ISS). *Information, Communication & Society*. https://doi.org/10.1080/1369118X.2015.1078834

Van Deursen A., Van Dijk J., & Ten Klooster P. (2015). Increasing inequalities in what we do online: A longitudinal cross sectional analysis of Internet activities among the Dutch population (2010 to 2013) over gender, age, education, and income. *Telematics and Informatics*. https://doi.org/10.1016/j.tele.2014.09.003

Van Dijk J. (2006). Digital divide research, achievements and shortcomings. *Poetics*, *34*(4-5), 221-235. https://doi.org/10.1016/j.poetic.2006.05.004

Van Dijk J. (2020). *Closing the Digital Divide—The Role of Digital Technologies on Social Development, Well-Being of All and the Approach of the Covid19 Pandemic.* https://www.un.org/development/desa/dspd/wp-

content/uploads/sites/22/2020/07/Closing-the-Digital-Divide-by-Jan-A.G.M-van-Dijk-.pdf

Van Jaarsveld M. (2020). The Effects of COVID-19 Among the Elderly Population: A Case for Closing the Digital Divide. *Frontiers in Psychiatry*, *11*. https://doi.org/10.3389/fpsyt.2020.577427

Vassilakopoulou P., & Hustad E. (2021). Bridging Digital Divides: A Literature Review and Research Agenda for Information Systems Research. *Information Systems Frontiers*. https://doi.org/10.1007/s10796-020-10096-3

Wei K., Teo H., Chan H., & Tan B. (2011). Conceptualizing and Testing a Social Cognitive Model of the Digital Divide. *Informs - Information Systems Research*, *22*, 171. https://doi.org/10.1287/isre.l090.0273

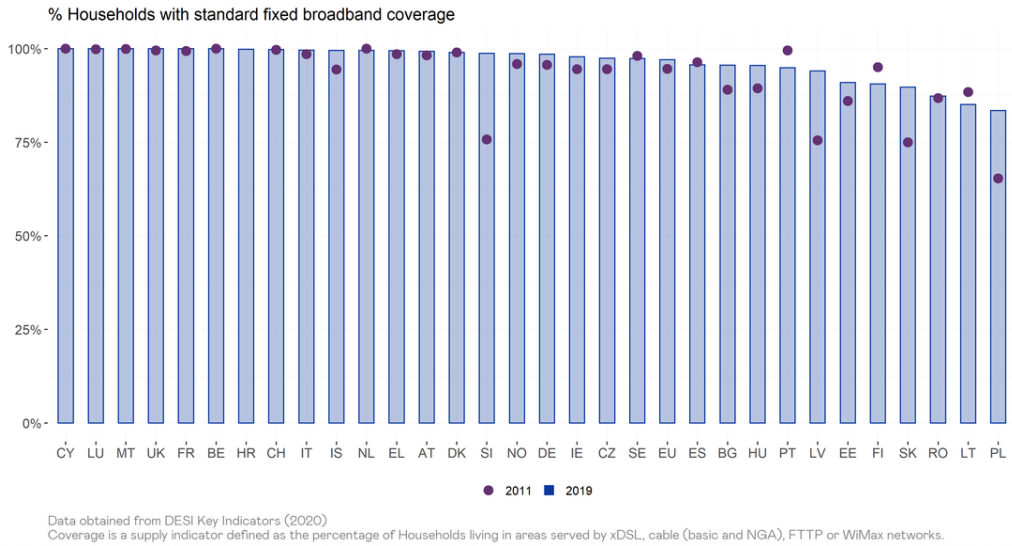
World Economic Forum. (2020). *Accelerating Digital Inclusion in the New Normal*. https://www.weforum.org/reports/accelerating-digital-inclusion-in-the-new-normal

Ye L., & Yang H. (2020). From Digital Divide to Social Inclusion: A Tale of Mobile Platform Empowerment in Rural Areas. *Sustainability*, *12*(6). http://dx.doi.org/10.3390/su12062424

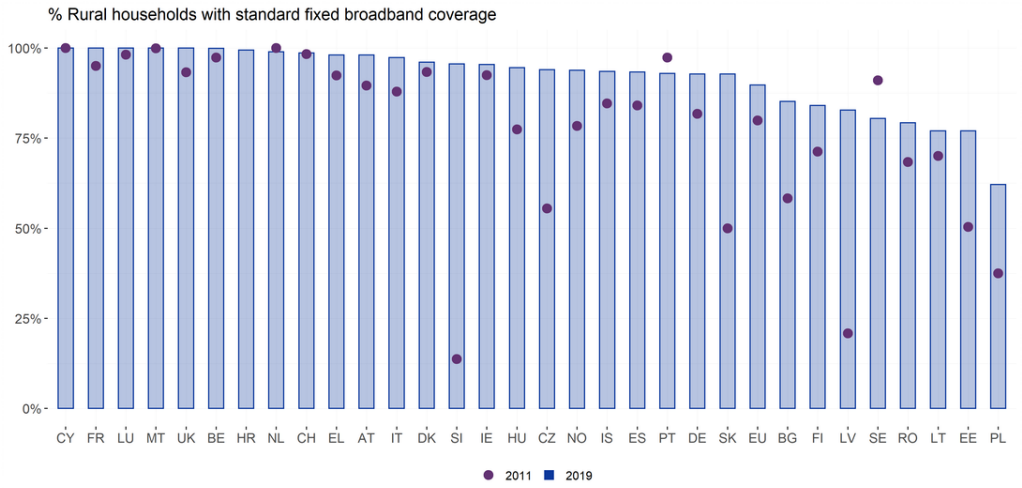
Zheng Y., & Walsham G. (2021). Inequality of what? An intersectional approach to digital inequality under Covid-19. *Information and Organization*, *31*(1). https://doi.org/10.1016/j.infoandorg.2021.100341

Annex 2: Graphs of the quantitative analysis

Graph 1: Households with standard fixed broadband coverage

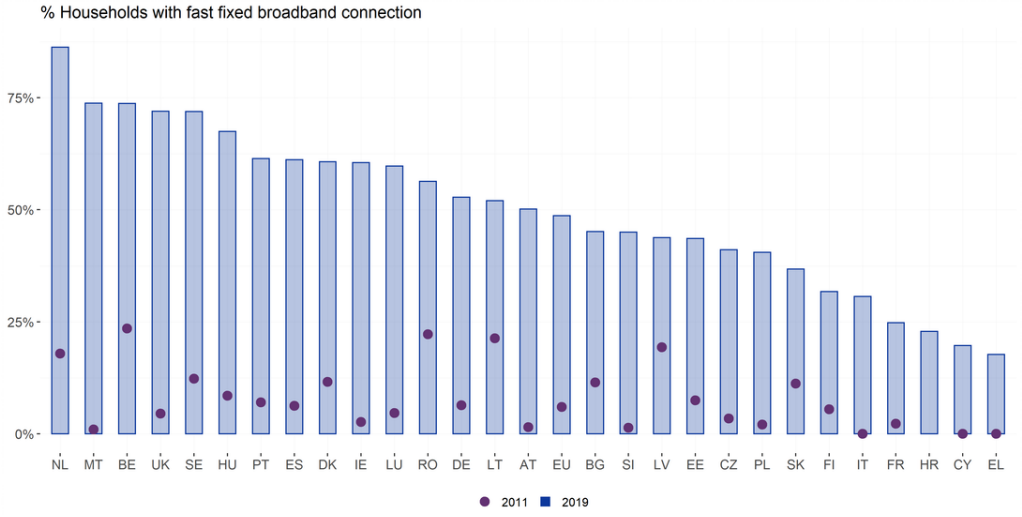


Graph 2: Rural households with standard fixed broadband coverage



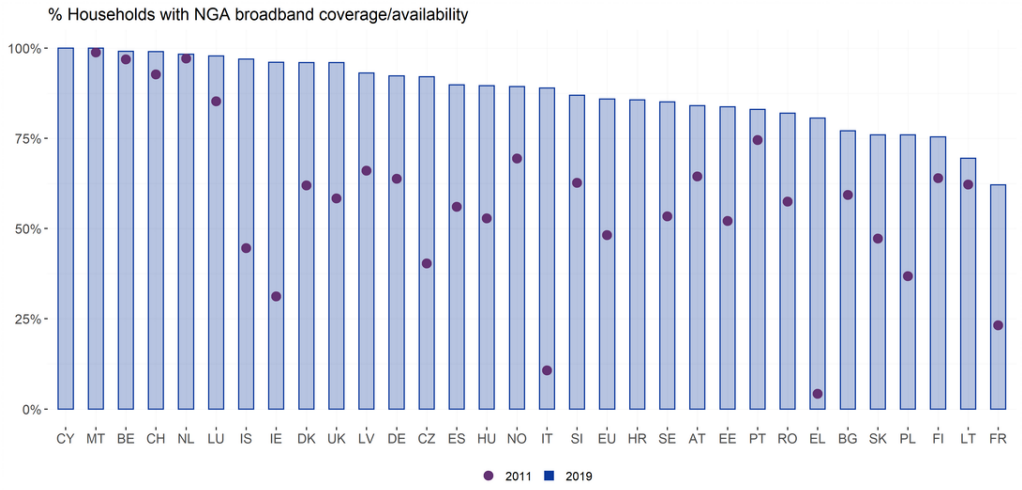
Data obtained from DESI Key Indicators (2020)
Coverage is a supply indicator defined as the percentage of Households living in areas served by xDSL, cable (basic and NGA), FTTP or WiMax networks.
Rural areas are defined as those with less than 100 people per km2.

Graph 3: Households with fast fixed broadband connection



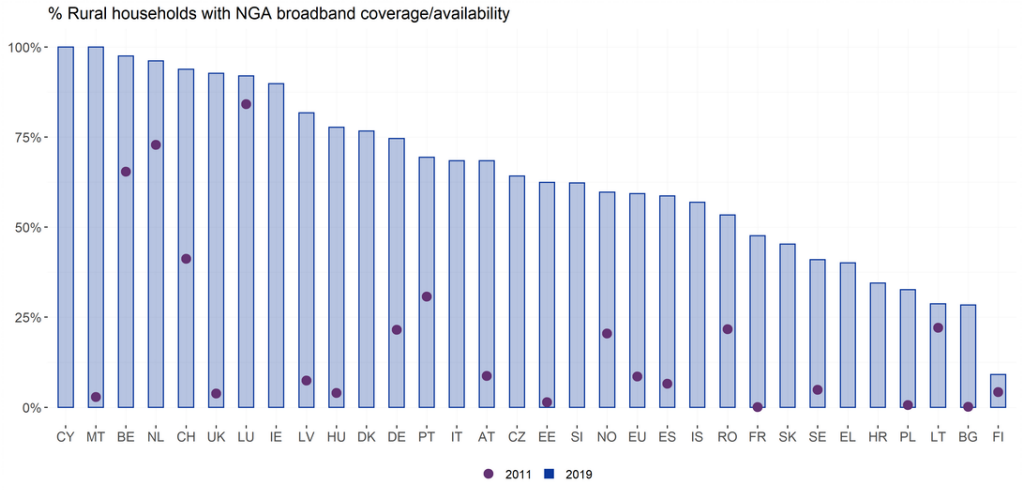
Data obtained from DESI Key Indicators (2020)

Graph 4: Households with NGA broadband coverage/availability



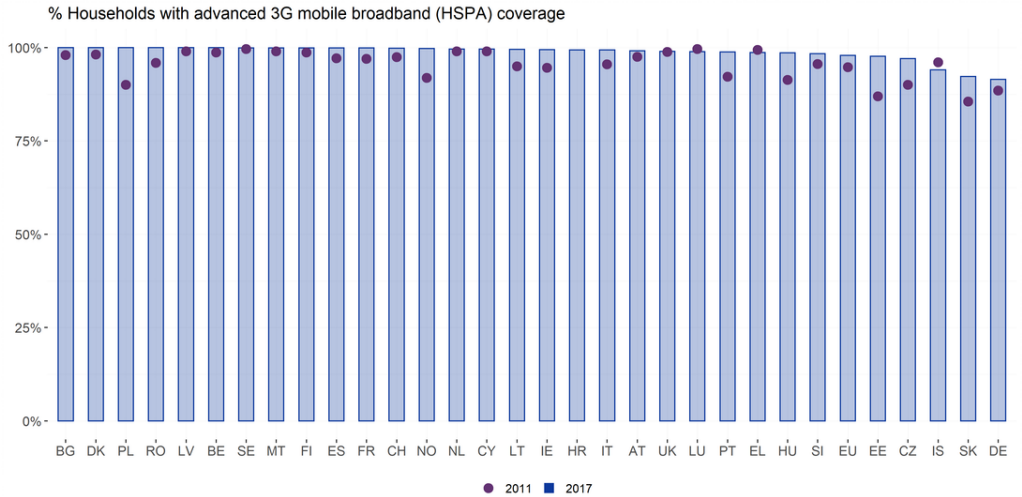
Data obtained from DESI Key Indicators (2020)
Next Generation Access (NGA) includes the following technologies: FTTH, FTTB, Cable Docsis 3.0, VDSL and other superfast broadband (at least 30 Mbps download).

Graph 5: Rural households with NGA broadband coverage/availability



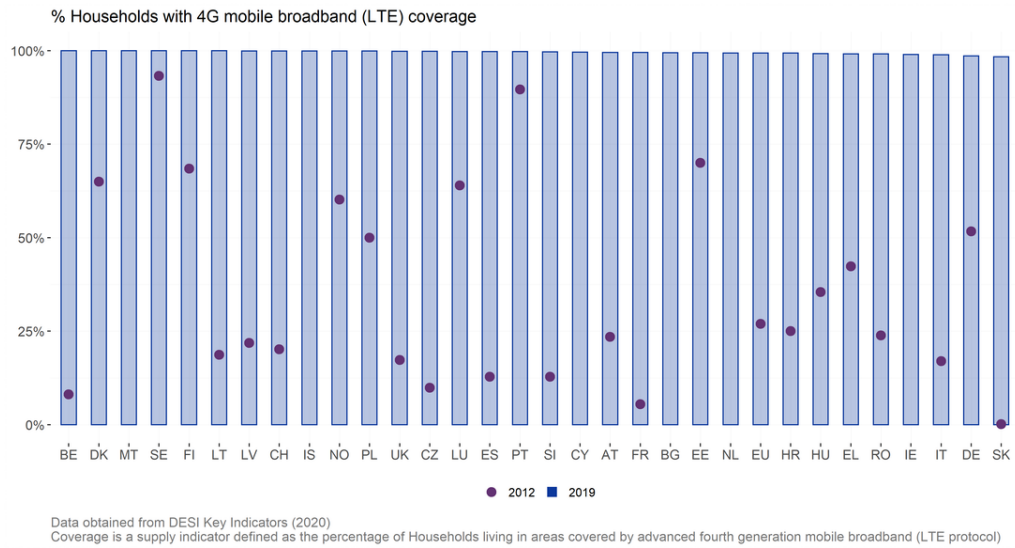
Data obtained from DESI Key Indicators (2020)
Next Generation Access (NGA) includes the following technologies: FTTH, FTTB, Cable Docsis 3.0, VDSL and other superfast broadband (at least 30 Mbps download). Rural areas are defined as those with less than 100 people per km2.

Graph 6: Households with advanced 3G mobile broadband (HSPA) coverage



Data obtained from DESI Key Indicators (2020)
Coverage is a supply indicator defined as the percentage of Households living in areas covered by advanced third generation mobile broadband (HSPA protocol)

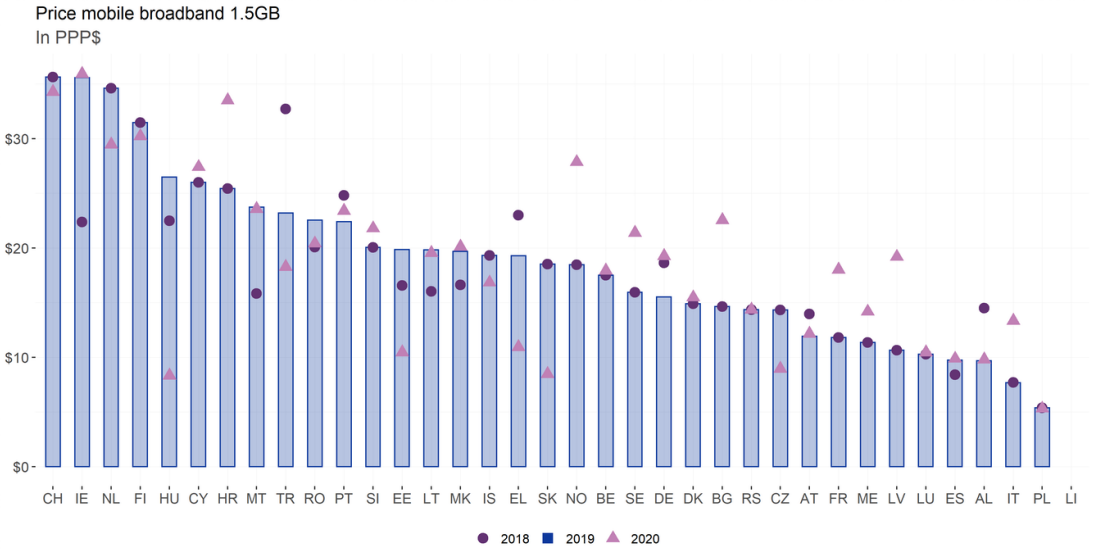
Graph 7: Households with 4G mobile broadband (LTE) coverage

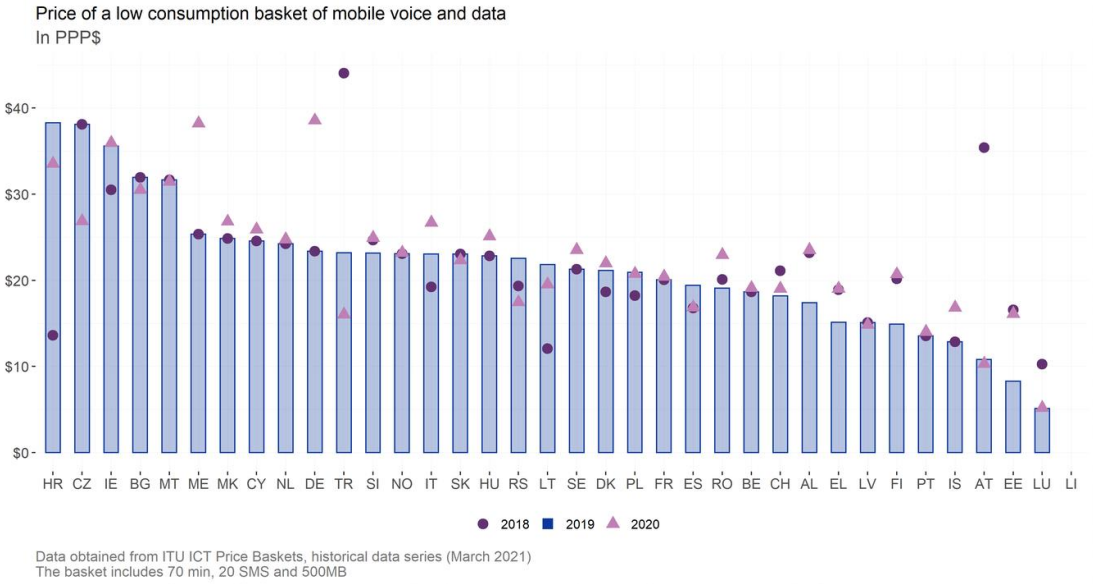


Data obtained from DESI Key Indicators (2020)
Coverage is a supply indicator defined as the percentage of Households living in areas covered by advanced fourth generation mobile broadband (LTE protocol)

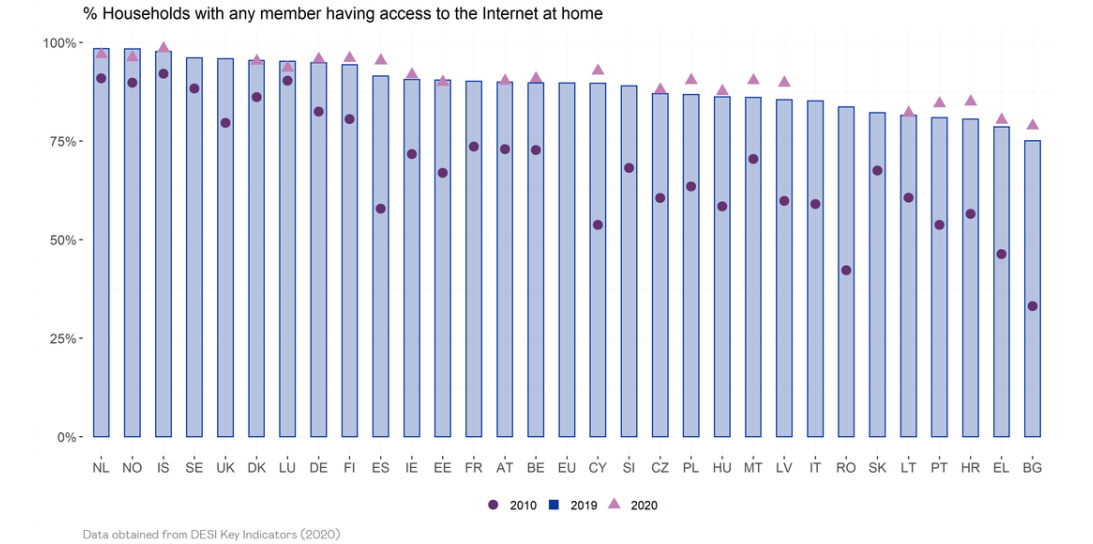
Graph 8: Price of diverse telecom services' baskets

Data obtained from ITU ICT Price Baskets, historical data series (March 2021)

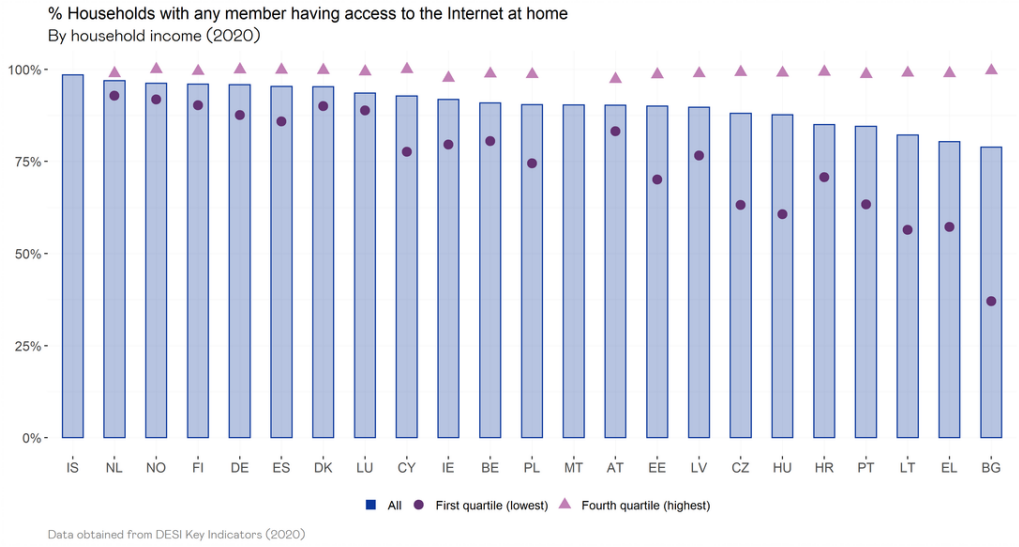




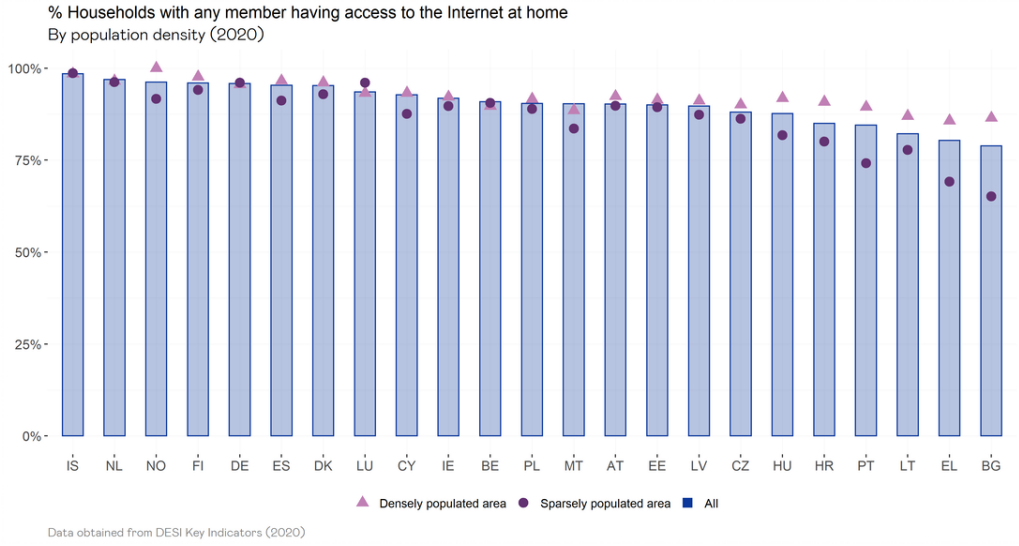
Graph 9: Households with any member having access to the internet at home



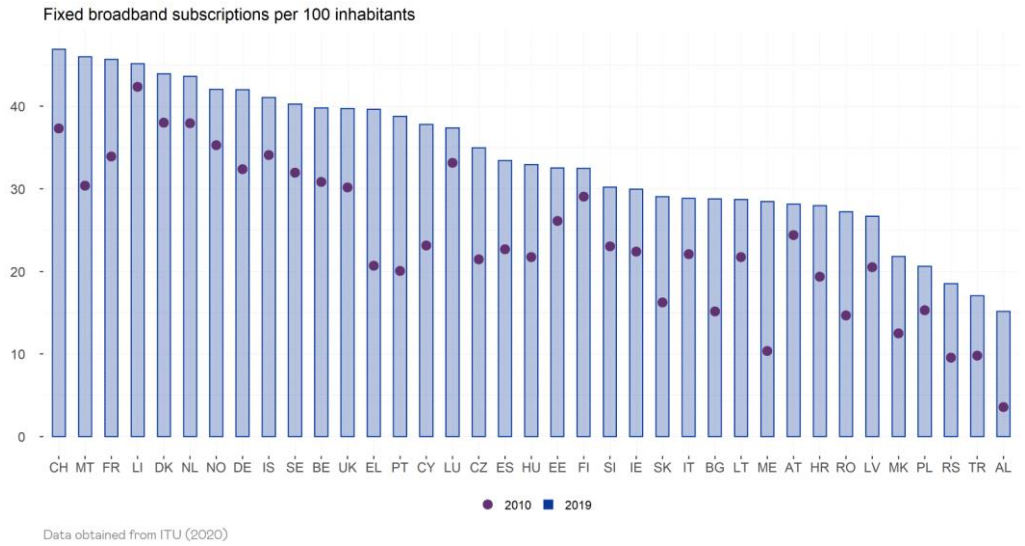
Graph 10: Households with any member having access to the internet at home (by household income)



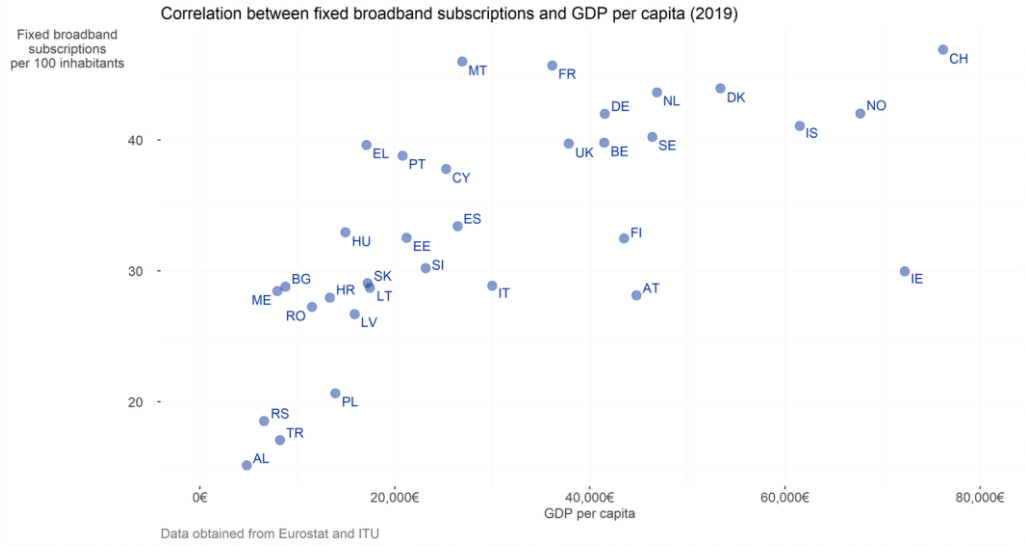
Graph 11: Households with any member having access to the internet at home (by population density)



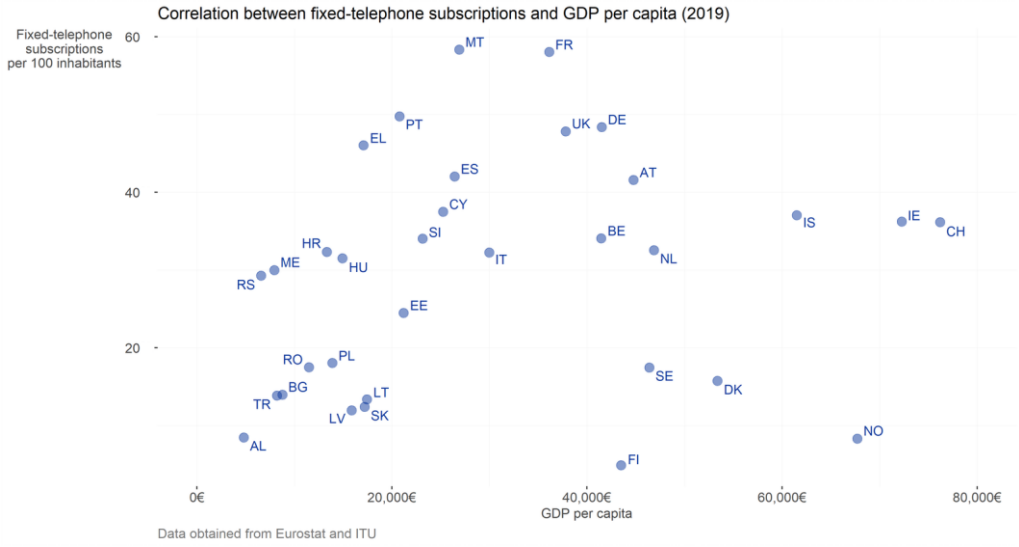
Graph 12: Fixed broadband subscriptions per 100 inhabitants



Graph 13: Correlation between fixed broadband subscriptions and GDP per capita (2019)

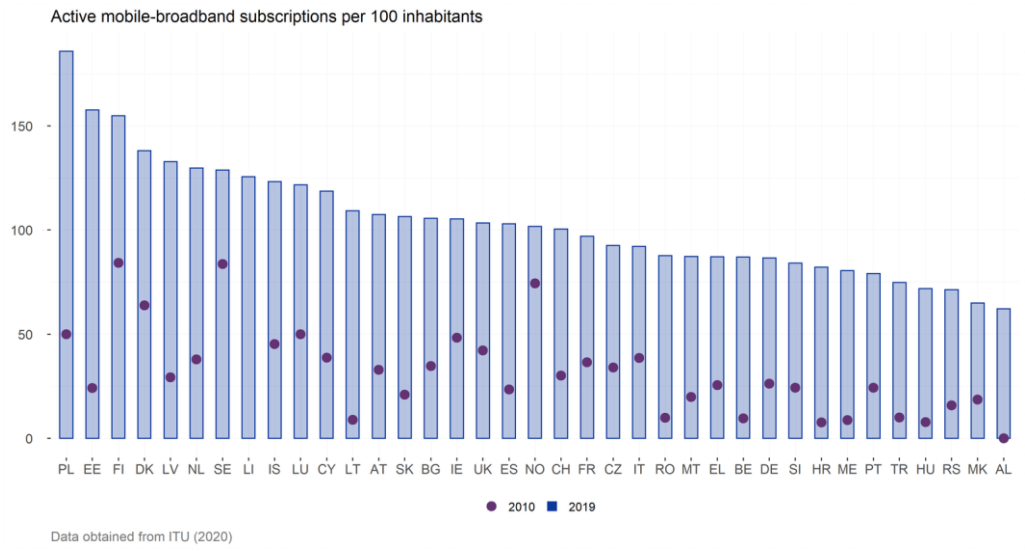


Graph 14: Correlation between fixed-telephone subscriptions and GDP per capita (2019)

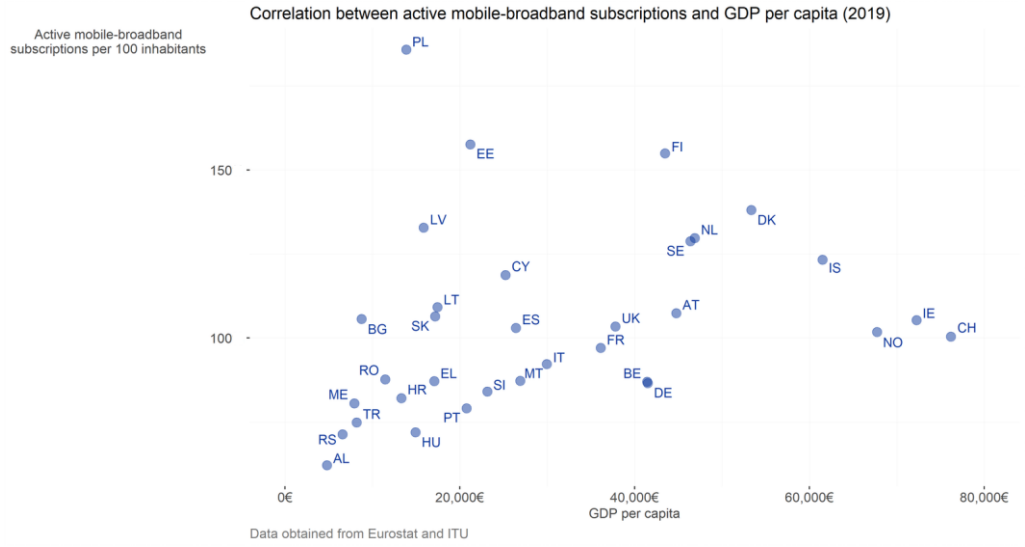


Graph 15: Mobile broadband penetration

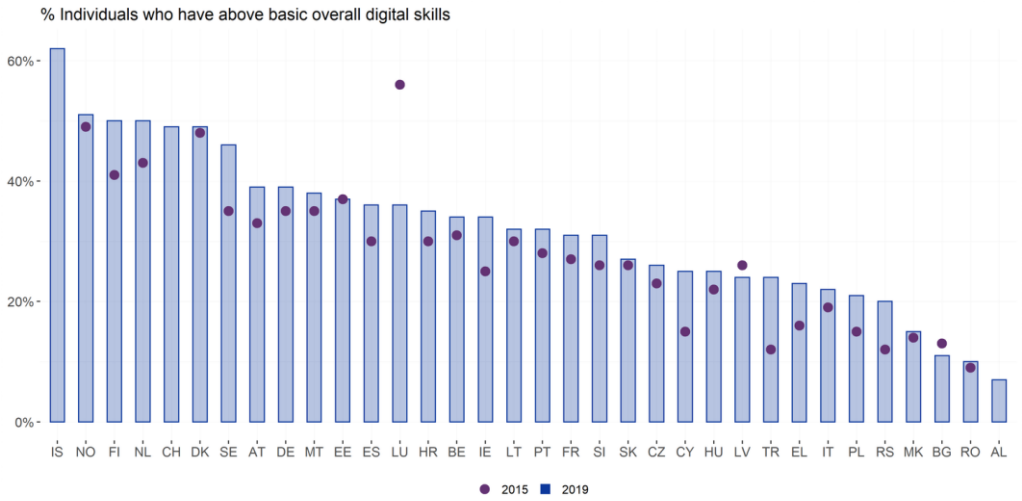
Graph 16: Active mobile-broadband subscriptions per 100 inhabitants



Graph 17: Correlation between active mobile-broadband subscriptions and GDP per capita (2019)

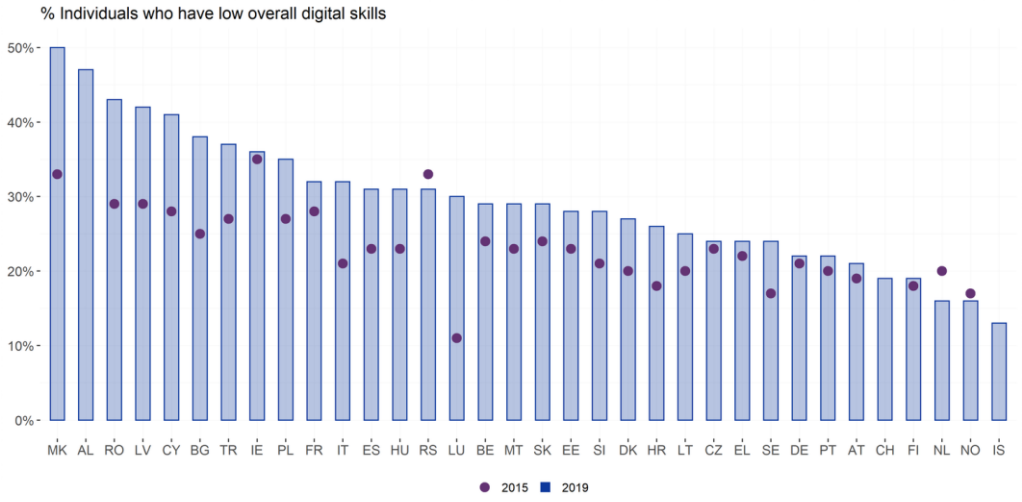


Graph 18: Individuals who have above basic overall digital skills



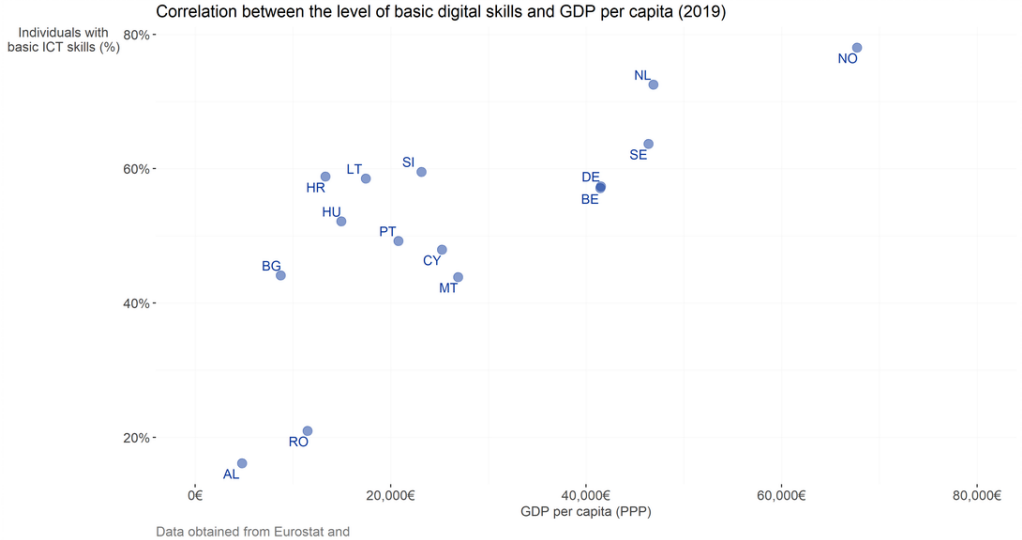
Data obtained from Eurostat
Note: Luxembourg and Latvia have a break in the series due to a change in the survey methodology what causes the low value for 2019 compared to 2015

Graph 19: Individuals who have low overall digital skills



Data obtained from Eurostat
Note: Luxembourg, Latvia and Czech Republic have a break in the series due to a change in the survey methodology and the national questionnaires

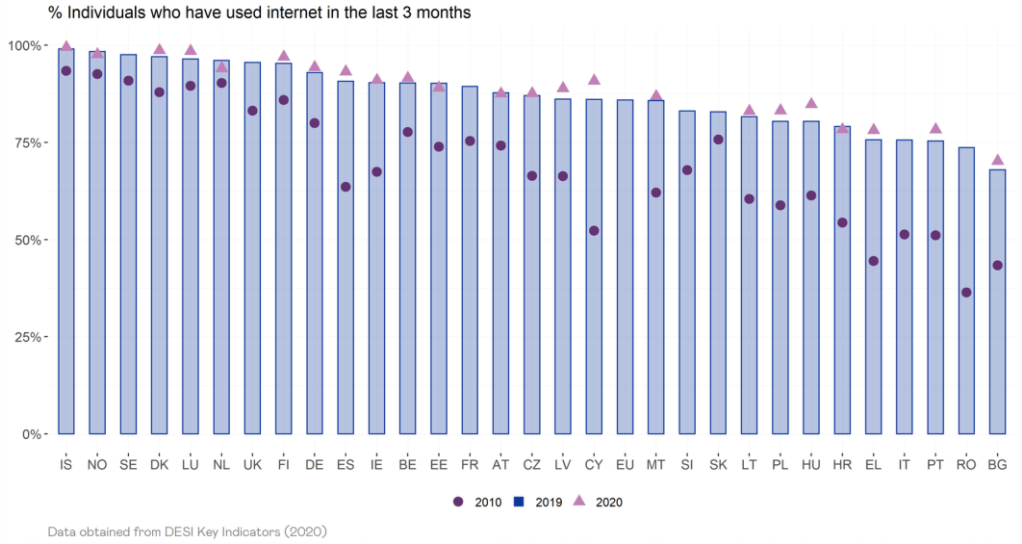
Graph 20: Correlation between the level of basic digital skills and GDP per capita (2019)



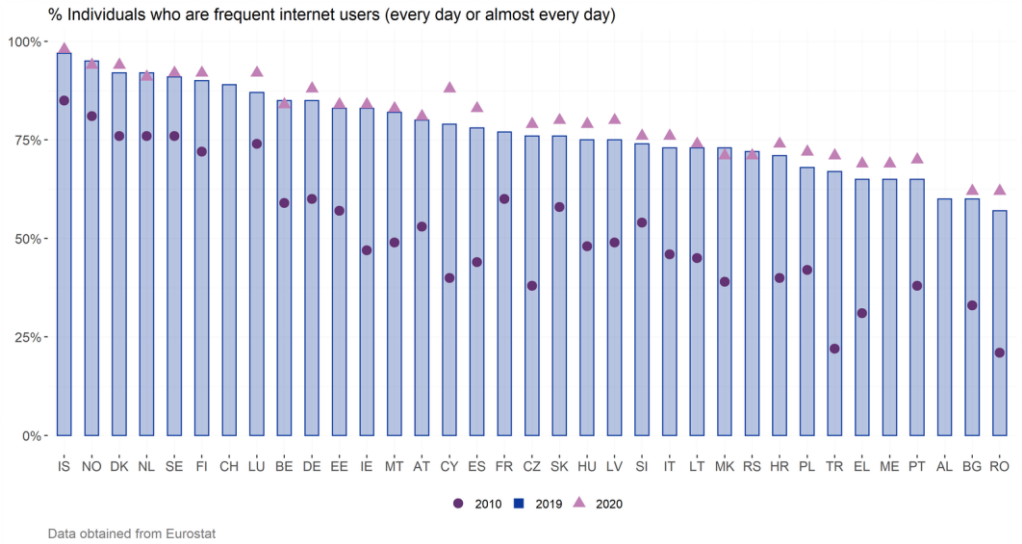
Data obtained from Eurostat and

Graph 21: Enterprises employing ICT specialists

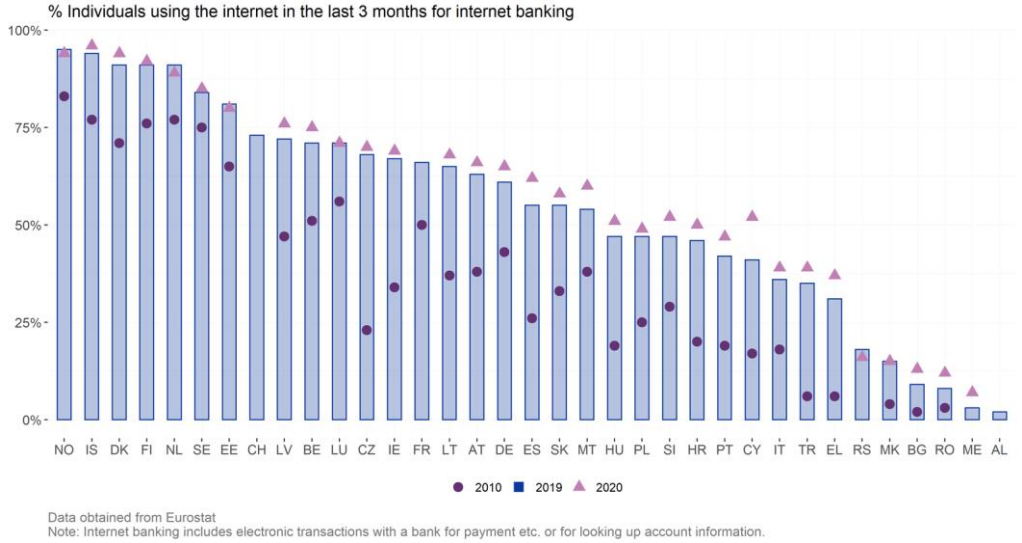
Graph 22: Individuals who have used internet in the last 3 months



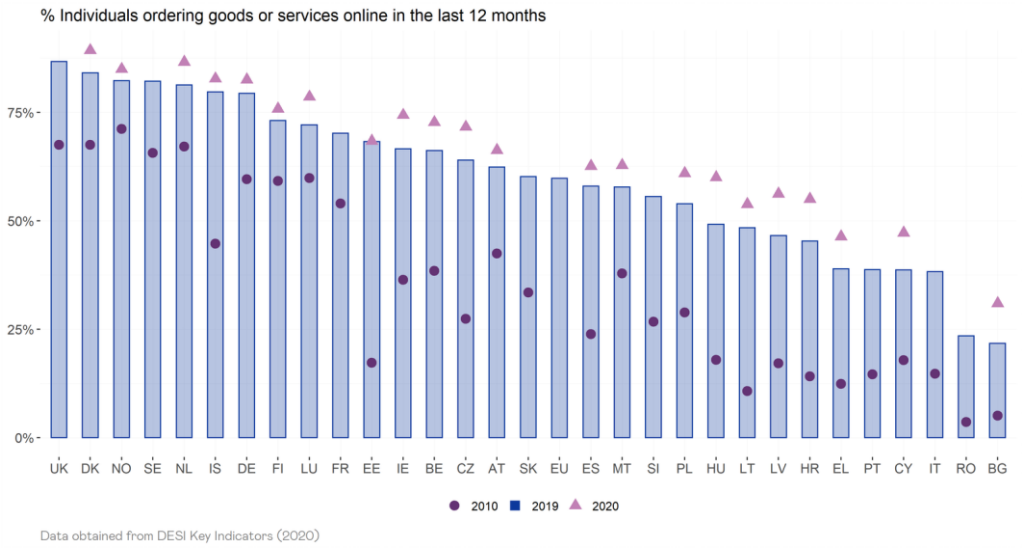
Graph 23: Individuals who are frequent internet users (every day or almost every day)



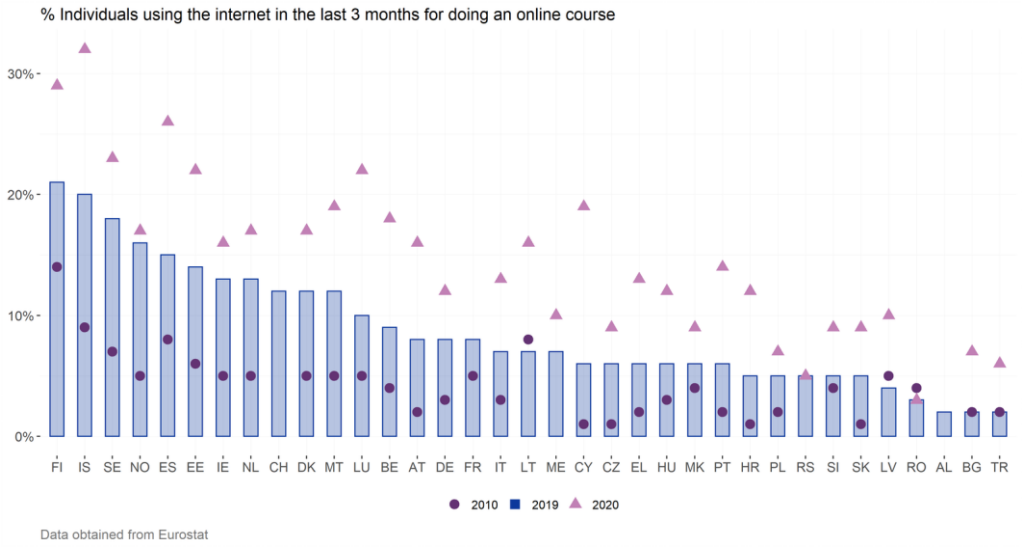
Graph 24: Individuals using the internet in the last 3 months for internet banking



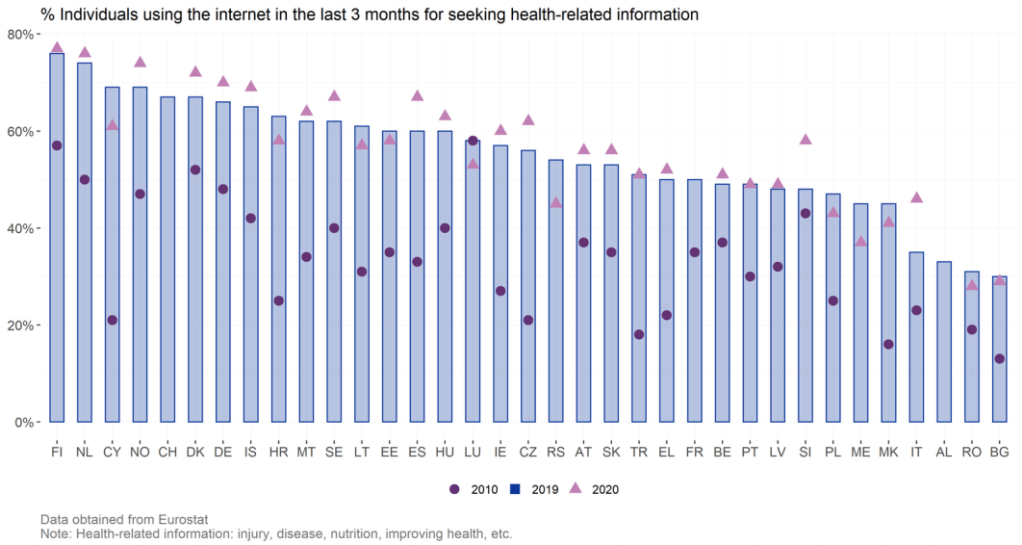
Graph 25: Individuals ordering good or services online in the last 12 months



Graph 26: Individuals using the internet in the last 3 months for doing an online course

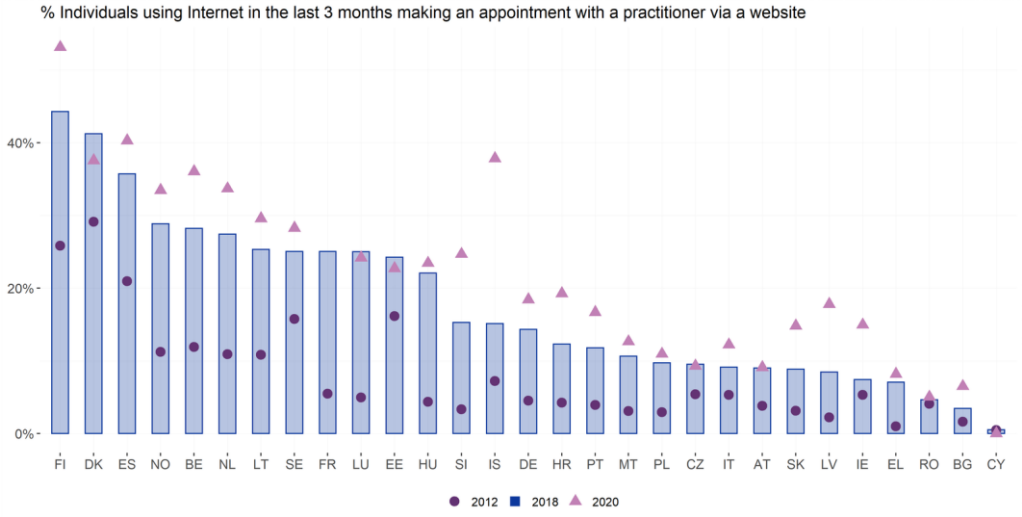


Graph 27: Individuals using the internet in the last 3 months for seeking health-related information



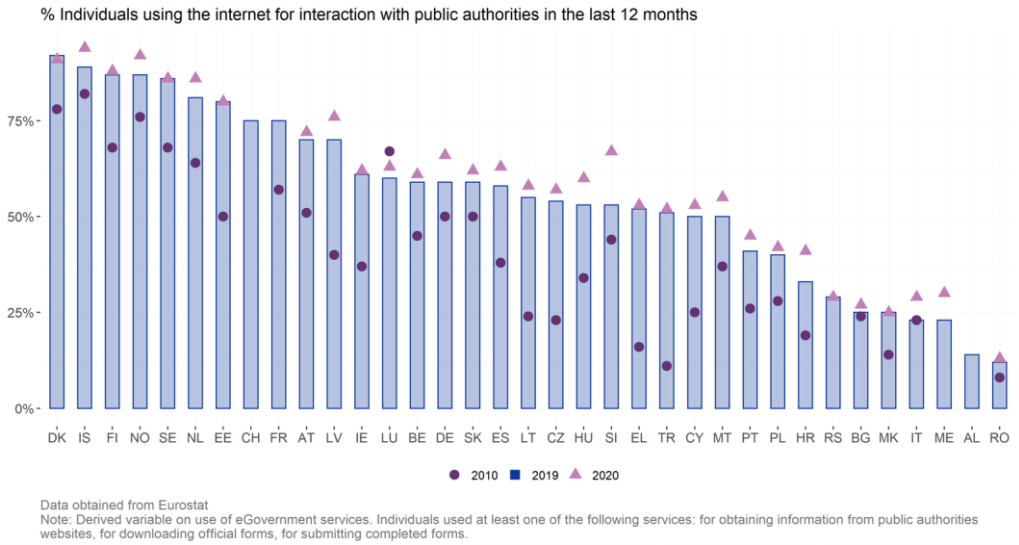
Data obtained from Eurostat
Note: Health-related information: injury, disease, nutrition, improving health, etc.

Graph 28: Individuals using internet in the last 3 months making an appointment with a practitioner via a website



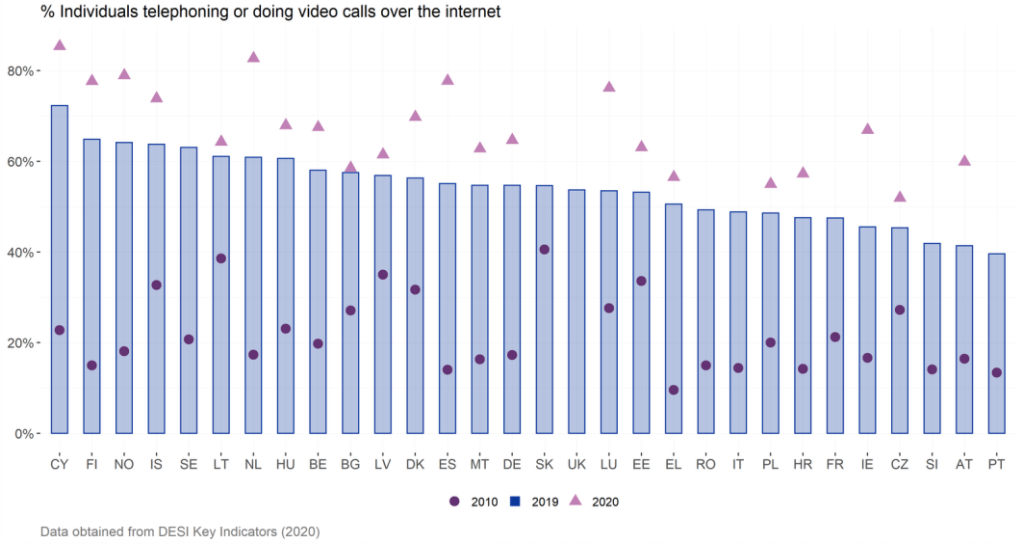
Data obtained from DESI Key Indicators (2020)

Graph 29: Individuals using the internet for interaction with public authorities in the last 12 months



Data obtained from Eurostat
Note: Derived variable on use of eGovernment services. Individuals used at least one of the following services: for obtaining information from public authorities websites, for downloading official forms, for submitting completed forms.

Graph 30: Individuals telephoning or doing video calls over the internet



Data obtained from DESI Key Indicators (2020)

Graph 31: Individuals that have used internet, in the last 3 months, for participating in social networks

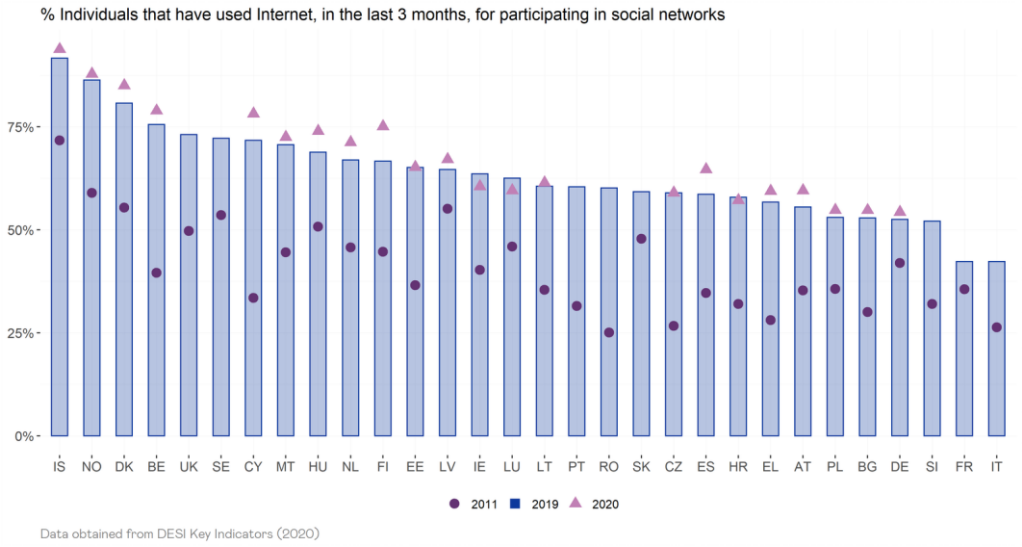


Table 31: Basket prices as a percentage of GNI per capita, 2018-2020

Country	Fixed broadband 5GB			Mobile broadband data only 1.5 GB			Mobile Cellular Low Usage			Mobile Data and Voice Low Usage			Mobile Data and Voice High Usage		
	2018	2019	2020	2018	2019	2020	2018	2019	2020	2018	2019	2020	2018	2019	2020
Albania	1,6	1,6	1,44	1,71	1,14	1,03	1,83	1,83	1,65	2,74	2,06	2,47	2,74	2,74	2,47
Austria	0,83	0,8	0,8	0,34	0,29	0,27	0,1	0,1	0,09	0,86	0,26	0,23	0,86	0,41	0,23
Belgium	0,86	0,86	0,8	0,47	0,47	0,44	0,31	0,31	0,29	0,5	0,5	0,46	0,69	0,69	0,64
Bulgaria	1,62	1,62	1,73	0,9	0,9	1,23	1,88	2,04	1,65	1,96	1,96	1,67	3,19	2,65	2,19
Croatia	2,15	0,67	0,6	1,37	1,37	1,6	0,33	2,06	1,6	0,73	2,06	1,6	0,75	2,06	1,6
Cyprus	0,86	0,86	0,9	0,97	0,97	0,9	0,33	0,59	0,55	0,92	0,92	0,85	2,05	1,64	1,4
Czech Republic	1,36	1,36	0,95	0,54	0,54	0,3	0,85	1,44	0,59	1,44	1,44	0,89	2,18	2,18	1,01
Denmark	0,88	0,88	0,82	0,38	0,38	0,35	0,47	0,53	0,5	0,47	0,53	0,5	0,47	0,53	0,5
Estonia	1,08	1,08	0,93	0,68	0,81	0,38	0,34	0,34	0,29	0,68	0,34	0,58	1,15	0,81	0,67
Finland	0,97	0,97	0,91	0,88	0,88	0,77	0,42	0,42	0,39	0,57	0,42	0,53	0,74	0,66	0,74
France	1,28	0,79	1,2	0,34	0,34	0,49	0,28	0,28	0,26	0,59	0,59	0,55	0,93	0,93	0,88
Germany	1,04	1,04	0,99	0,45	0,37	0,42	1,05	1,05	0,85	0,56	0,56	0,85	0,87	0,87	0,85
Greece	1,35	1,35	1,45	1,1	0,92	0,47	0,62	0,62	0,58	0,91	0,73	0,82	1,82	1,53	1,06
Hungary	1,7	1,7	1,48	1,03	1,21	0,34	1,05	1,03	1,01	1,05	1,05	1,01	3,31	3,31	1,01
Iceland	0,84	1,64	1,22	0,55	0,55	0,37	0,36	0,36	0,26	0,36	0,36	0,37	0,55	0,55	0,37
Ireland	1,27	1,27	1,46	0,53	0,84	0,78	0,72	0,84	0,78	0,72	0,84	0,78	0,72	0,84	0,78
Italy	1,05	1,48	1,4	0,25	0,25	0,4	0,58	0,84	0,8	0,63	0,76	0,8	0,63	0,76	0,8
Latvia	1,47	1,64	1,49	0,5	0,5	0,84	0,71	0,71	0,5	0,71	0,71	0,65	1,01	1,01	0,84
Liechtenstein	.	.	0,34	.	.	0,16	.	.	0,13	.	.	0,13	.	.	0,13

Country	Fixed broadband 5GB			Mobile broadband data only 1.5 GB			Mobile Cellular Low Usage			Mobile Data and Voice Low Usage			Mobile Data and Voice High Usage		
	2018	2019	2020	2018	2019	2020	2018	2019	2020	2018	2019	2020	2018	2019	2020
Lithuania	0,94	0,94	0,92	0,65	0,81	0,71	0,32	0,64	0,71	0,49	0,89	0,71	0,56	0,89	0,99
Luxembourg	0,75	0,75	0,75	0,18	0,18	0,18	0,09	0,09	0,09	0,18	0,09	0,09	0,33	0,33	0,18
Malta	1,08	1,08	1	0,54	0,81	0,75	0,54	0,54	0,5	1,08	1,08	1	1,62	1,62	1
Montenegro	1,97	1,97	1,77	0,82	0,82	0,89	1,66	1,86	2,41	1,84	1,84	2,41	2,85	2,85	2,41
Netherlands	1,15	1,17	1,35	0,83	0,83	0,64	0,4	0,44	0,41	0,58	0,58	0,54	0,75	0,58	0,51
North Macedonia	3,8	3,8	3,35	1,6	1,9	1,68	1,53	2,4	2,24	2,4	2,4	2,24	2,74	3,38	2,79
Norway	0,66	0,69	0,81	0,36	0,36	0,52	0,15	0,15	0,43	0,45	0,45	0,43	0,55	0,55	0,52
Poland	1,64	1,64	1,26	0,23	0,23	0,21	0,79	0,92	0,73	0,8	0,92	0,82	0,94	1,06	0,94
Portugal	1,44	1,44	1,49	1,08	0,97	0,89	0,59	0,59	0,53	0,59	0,59	0,53	1,05	1,05	0,83
Romania	0,81	0,81	0,67	1,01	1,13	0,86	1,01	1,13	0,86	1,01	0,96	0,97	1,01	1,13	0,97
Serbia	2,9	2,9	2,77	1,31	1,31	1,14	1,31	1,5	1,38	1,77	2,06	1,38	3,09	3,37	1,71
Slovakia	1,16	0,84	0,77	0,77	0,77	0,35	0,74	0,66	0,68	0,96	0,96	0,93	1,86	1,86	1,62
Slovenia	1,9	2,01	1,85	0,75	0,75	0,74	0,92	0,86	0,85	0,92	0,86	0,85	1,44	0,86	0,85
Spain	2,17	1,92	1,72	0,29	0,33	0,31	0,57	0,67	0,54	0,58	0,67	0,54	0,88	0,9	1,03
Sweden	0,98	0,98	1,05	0,37	0,37	0,48	0,58	0,58	0,56	0,5	0,5	0,52	0,5	0,5	0,52
Switzerland	0,95	0,95	0,94	0,72	0,72	0,65	0,56	0,49	0,48	0,43	0,37	0,36	0,43	0,51	0,65
Turkey	2,66	1,63	0,95	1,32	0,93	0,95	0,69	0,69	0,83	1,77	0,93	0,83	1,77	0,93	0,83

Source: ITU ICT Price Baskets, historical data series, March 2021 release.

Table 32: Difference in basket prices as a percentage of GNI per capita, 2019-2020 (percentage points)

Country	Fixed broadband 5GB	Mobile broadband data only 1.5 GB	Mobile Cellular Low Usage	Mobile Data and Voice Low Usage	Mobile Data and Voice High Usage
Albania	-0,16	-0,11	-0,18	0,41	-0,27
Austria	0	-0,02	-0,01	-0,03	-0,18
Belgium	-0,06	-0,03	-0,02	-0,04	-0,05
Bulgaria	0,11	0,33	-0,39	-0,29	-0,46
Croatia	-0,07	0,23	-0,46	-0,46	-0,46
Cyprus	0,04	-0,07	-0,04	-0,07	-0,24
Czech Republic	-0,41	-0,24	-0,85	-0,55	-1,17
Denmark	-0,06	-0,03	-0,03	-0,03	-0,03
Estonia	-0,15	-0,43	-0,05	0,24	-0,14
Finland	-0,06	-0,11	-0,03	0,11	0,08
France	0,41	0,15	-0,02	-0,04	-0,05
Germany	-0,05	0,05	-0,2	0,29	-0,02
Greece	0,1	-0,45	-0,04	0,09	-0,47
Hungary	-0,22	-0,87	-0,02	-0,04	-2,3
Iceland	-0,42	-0,18	-0,1	0,01	-0,18
Ireland	0,19	-0,06	-0,06	-0,06	-0,06
Italy	-0,08	0,15	-0,04	0,04	0,04
Latvia	-0,15	0,34	-0,21	-0,06	-0,17
Lithuania	-0,02	-0,1	0,07	-0,18	0,1
Luxembourg	0	0	0	0	-0,15

Country	Fixed broadband 5GB	Mobile broadband data only 1.5 GB	Mobile Cellular Low Usage	Mobile Data and Voice Low Usage	Mobile Data and Voice High Usage
Malta	-0,08	-0,06	-0,04	-0,08	-0,62
Montenegro	-0,2	0,07	0,55	0,57	-0,44
Netherlands	0,18	-0,19	-0,03	-0,04	-0,07
North Macedonia	-0,45	-0,22	-0,16	-0,16	-0,59
Norway	0,12	0,16	0,28	-0,02	-0,03
Poland	-0,38	-0,02	-0,19	-0,1	-0,12
Portugal	0,05	-0,08	-0,06	-0,06	-0,22
Romania	-0,14	-0,27	-0,27	0,01	-0,16
Serbia	-0,13	-0,17	-0,12	-0,68	-1,66
Slovakia	-0,07	-0,42	0,02	-0,03	-0,24
Slovenia	-0,16	-0,01	-0,01	-0,01	-0,01
Spain	-0,2	-0,02	-0,13	-0,13	0,13
Sweden	0,07	0,11	-0,02	0,02	0,02
Switzerland	-0,01	-0,07	-0,01	-0,01	0,14
Turkey	-0,68	0,02	0,14	-0,1	-0,1

Source: own elaboration with data from ITU ICT Price Baskets, historical data series, March 2021 release.

Table 33: Variation in the digital divide (2019-2020): Individuals who have used internet in the last 3 months.

Country	Age	Sex	Education	Density	Income
Austria	0,14	-1,68	-1,27	2,11	-0,39
Belgium	-2,45	-1,30	-1,22	0,71	-7,79
Bulgaria	-3,63	0,35	-2,34	0,52	-1,43
Cyprus	-12,23	-1,00	-11,89	-3,95	-4,60
Czech Republic	-0,10	-1,93	-3,38	-1,67	0,01
Germany	-3,74	-0,76	-1,83	0,52	-1,76
Denmark	-2,64	0,19	-2,36	-0,49	-1,07
Estonia	2,60	-1,91	2,64	-2,62	3,25
Greece	-4,00	1,88	-4,20	0,11	6,19
Spain	-3,77	0,10	-3,10	-0,72	-4,21
Finland	-4,39	-0,03	-4,07	-3,44	-5,47
Croatia	7,15	0,87	8,92	-0,69	0,15
Hungary	-8,26	-2,29	-7,08	0,25	-20,03
Ireland	-	-0,69	3,38	5,13	-
Iceland	-1,20	-0,89	-1,62	0,48	-
Italy	-2,88	-0,63	-3,53	-0,48	-
Lithuania	-1,73	-0,46	-1,18	-1,81	1,58
Luxembourg	-6,69	-1,79	-3,51	-3,55	-4,28
Latvia	-10,20	-3,81	-4,06	-1,92	-12,36
Montenegro	-4,00	-3,00	8,00	-	-
North Macedonia	-8,00	3,00	-4,00	-1,00	4,00
Malta	-1,40	-0,16	-5,84	-10,49	-
Netherlands	-1,43	-0,75	0,12	-0,88	4,41
Norway	3,23	0,36	1,38	3,18	2,53
Poland	-5,93	-0,67	-5,69	-0,75	-9,89
Portugal	-6,10	0,14	-2,12	-1,39	-0,84
Romania	-6,82	0,08	-2,45	-0,91	-0,22
Serbia	-9,00	-1,00	-2,00	-	-
Sweden	-4,76	0,11	0,11	-0,31	5,82
Slovenia	-7,13	-0,98	-3,46	-2,11	-5,76
Slovakia	-0,60	-20,18	-1,05	-12,52	-
Turkey	-1,00	-4,00	-	-	-

Source: own elaboration with data from Key Indicators - Digital Scoreboard.

Table 34: Variation in the digital divide (2019-2020): Individuals who are frequent internet users (every day or almost every day).

Country	Age	Sex	Education	Density	Income
Austria	-1,25	-3,99	-3,14	1,49	-2,01
Belgium	0,10	-1,25	-0,58	1,05	-0,79
Bulgaria	-2,19	-0,11	-2,59	0,41	0,31
Cyprus	-17,00	-1,42	-10,04	-3,05	-2,88
Czech Republic	-4,65	-1,91	-1,50	-0,89	-3,04
Germany	-7,15	-1,95	-1,27	-0,52	-1,46
Denmark	-2,24	-0,21	-2,92	-1,21	-0,93
Estonia	-0,28	-0,86	1,37	-3,67	-1,02
Greece	-3,37	3,17	-5,31	-2,84	5,79
Spain	-4,31	-0,15	-2,65	-1,33	-1,50
Finland	-2,55	-0,58	-2,75	-2,76	-5,38
Croatia	2,37	1,10	9,08	3,61	-1,91
Hungary	-7,57	-2,36	-4,93	1,26	-16,46
Ireland	-	-5,94	8,63	4,79	-
Iceland	-3,59	-0,89	-1,98	-0,20	-
Italy	-3,09	-0,50	-4,11	-0,45	-
Lithuania	-3,38	-3,06	1,96	-3,06	2,34
Luxembourg	-12,65	-4,46	-10,32	-1,57	-13,19
Latvia	-9,85	-2,71	-8,14	-5,66	-13,50
Montenegro	-2,00	-1,00	16,00	-	-
North Macedonia	-9,00	0,00	-3,00	-3,00	9,00
Malta	-0,69	0,72	-7,33	-1,21	-
Netherlands	-3,29	-0,20	-0,67	-0,22	3,66
Norway	5,18	-0,84	0,69	3,44	0,00
Poland	-3,12	-0,53	-6,86	-1,39	-8,65
Portugal	-5,74	1,01	-2,11	-2,28	2,91
Romania	-6,47	-1,18	0,12	2,14	-0,50
Serbia	-6,00	-2,00	-3,00	-	-
Sweden	-1,99	1,06	-2,28	3,34	4,51
Slovenia	-0,88	-4,43	0,07	-4,79	-7,10
Slovakia	-8,37	-3,31	-14,26	-1,56	-7,23
Turkey	-4,00	-1,00	-4,00	-	-

Source: own elaboration with data from Key Indicators - Digital Scoreboard.

Table 35: Variation in the digital divide (2019-2020): Individuals who have used the internet, in the last 3 months, for internet banking.

Country	Age	Sex	Education	Density	Income
Austria	0,76	-1,34	-3,22	1,79	5,35
Belgium	-2,22	-0,40	1,54	5,24	1,79
Bulgaria	5,33	1,58	8,76	6,55	7,61
Cyprus	4,27	1,15	9,26	-0,25	3,80
Czech Republic	-2,84	-0,03	-3,93	-2,60	-2,93
Germany	1,34	-0,45	-1,91	2,24	2,00
Denmark	-5,97	0,83	-2,10	-0,74	-4,45
Estonia	-2,13	-0,64	4,28	-0,72	5,73
Greece	-4,01	2,18	-1,84	5,13	4,49
Spain	-0,04	1,22	-1,38	-1,32	-3,29
Finland	0,80	1,01	-4,21	-5,01	-1,82
Croatia	12,61	1,27	6,99	6,93	4,35
Hungary	4,94	-2,78	2,28	3,75	3,61
Ireland	-	4,19	-8,15	2,22	-
Iceland	-1,32	2,60	-5,87	3,21	-
Italy	0,68	-0,30	-2,16	-0,70	-
Lithuania	5,12	-1,86	-1,30	-4,74	3,54
Luxembourg	-9,56	-9,38	1,62	-2,02	-7,69
Latvia	-0,53	-0,45	-10,24	3,75	-2,65
Montenegro	6,00	-1,00	10,00	-	-
North Macedonia	-3,00	-4,00	6,00	8,00	2,00
Malta	7,86	0,30	-19,38	15,23	-
Netherlands	-4,10	0,68	-0,57	-2,09	3,52
Norway	-0,67	-1,34	6,77	1,02	0,99
Poland	-2,17	-0,32	-4,69	-5,54	-11,36
Portugal	-3,53	0,12	1,13	-4,06	4,48
Romania	4,05	0,03	11,84	6,73	4,35
Serbia	-2,00	1,00	-13,00	-	-
Sweden	-9,61	2,38	-2,78	4,35	7,39
Slovenia	2,41	6,23	2,41	-6,65	1,04
Slovakia	-10,34	-0,52	-18,08	-4,91	-12,37
Turkey	-1,00	0,00	-2,00	-	-

Source: own elaboration with data from Key Indicators - Digital Scoreboard.

Table 36: Variation in the digital divide (2019-2020): Individuals who have used the internet, in the last 3 months, for doing an online course (of any subject).

Country	Age	Sex	Education	Density	Income
Austria	14,17	-2,77	5,99	5,60	0,99
Belgium	21,60	2,69	3,34	2,28	0,20
Bulgaria	21,58	-0,16	3,09	4,01	5,66
Cyprus	51,96	-5,80	-1,38	-4,80	15,84
Czech Republic	16,59	-0,31	-4,02	1,29	2,58
Germany	5,91	-0,53	2,70	0,55	4,58
Denmark	4,48	0,56	1,09	3,14	-4,00
Estonia	9,33	-8,95	6,16	0,67	6,39
Greece	36,25	-0,25	5,19	3,39	7,81
Spain	28,41	-0,27	10,59	3,12	10,31
Finland	16,43	-2,22	-2,71	6,78	-1,92
Croatia	17,27	2,09	4,76	5,82	6,84
Hungary	9,44	-1,22	8,68	5,39	7,10
Ireland	-	-3,82	8,05	-0,76	-
Iceland	19,31	-5,72	10,36	1,84	-
Italy	15,15	-1,14	10,20	2,15	-
Lithuania	30,75	-4,14	-13,16	-0,69	7,62
Luxembourg	47,74	-4,08	2,19	-0,02	0,16
Latvia	14,68	-0,60	1,09	1,06	0,03
Montenegro	20,00	-4,00	6,00	-	-
North Macedonia	13,00	1,00	-2,00	12,00	8,00
Malta	24,58	-4,10	7,39	10,24	-
Netherlands	8,33	0,73	1,35	0,40	3,25
Norway	11,23	-5,05	-5,46	-5,08	-5,03
Poland	7,41	-0,85	-4,57	-0,17	1,29
Portugal	13,55	-0,22	16,87	3,12	10,45
Romania	8,80	0,67	-5,77	-1,32	0,15
Serbia	-1,00	1,00	-2,00	-	-
Sweden	12,73	2,23	-10,13	1,90	-2,98
Slovenia	9,05	0,14	-0,35	3,08	4,18
Slovakia	9,11	-1,33	-5,25	-1,13	0,91
Turkey	13,00	-1,00	2,00	-	-

Source: own elaboration with data from Key Indicators - Digital Scoreboard.

Table 37: Variation in the digital divide (2019-2020): Individuals ordering goods or services online.

Country	Age	Sex	Education	Density	Income
Austria	2,54	-2,79	-8,00	2,74	2,33
Belgium	-7,87	0,67	-2,35	8,58	-4,16
Bulgaria	7,52	0,48	13,31	7,57	13,05
Cyprus	2,83	-2,39	8,57	-2,37	3,26
Czech Republic	-5,59	-0,54	-4,68	-1,03	-2,86
Germany	-3,31	0,52	0,86	1,02	-0,01
Denmark	0,73	0,63	-2,08	-0,32	-5,23
Estonia	-2,27	-4,10	4,49	-3,30	1,97
Greece	4,90	2,26	1,65	8,30	12,29
Spain	-2,00	0,27	-2,72	0,45	-0,85
Finland	-3,16	2,22	-7,11	-4,82	-9,37
Croatia	1,19	-0,08	11,23	5,49	7,30
Hungary	5,69	-2,22	3,85	8,90	-4,31
Ireland	-	-1,66	-1,07	-2,65	-
Iceland	3,08	1,78	-2,84	1,48	-
Italy	2,45	-1,23	0,30	0,63	-
Lithuania	2,36	-1,93	5,16	-1,82	3,83
Luxembourg	-8,64	-5,78	-4,26	-5,72	-16,29
Latvia	4,51	0,26	-8,04	-5,10	-1,34
Malta	-4,45	-1,29	-12,34	22,38	-
Netherlands	-8,57	1,00	-6,12	-3,24	1,58
Norway	1,37	0,75	1,32	-1,27	-2,32
Poland	-2,85	0,55	-1,92	0,33	-4,52
Portugal	1,40	-0,94	2,30	-2,44	4,66
Romania	12,26	0,84	15,04	5,98	9,39
Sweden	-12,45	-1,21	0,42	4,67	4,76
Slovenia	2,16	0,51	0,51	-4,44	-3,60
Slovakia	-16,54	-1,98	-22,87	-9,65	-16,41

Source: own elaboration with data from Key Indicators - Digital Scoreboard. Albania, Switzerland, France, Liechtenstein, Montenegro, North Macedonia, Serbia and Turkey not included due to data availability.

Table 38: Variation in the digital divide (2019-2020): Individuals using internet in the last 3 months, seeking information about health: injury, disease, nutrition, improving health, etc.

Country	Age	Sex	Education	Density	Income
Austria	1,83	3,74	-1,55	0,95	-4,64
Belgium	-1,18	2,06	4,51	7,37	-3,67
Bulgaria	-6,36	0,55	3,12	4,52	-2,01
Cyprus	-15,86	3,58	2,25	23,78	-7,30
Czech Republic	-0,26	4,28	3,73	1,63	4,11
Germany	-5,25	0,66	3,08	1,51	1,57
Denmark	-0,57	2,00	-6,42	-0,40	1,38
Estonia	-5,87	-0,07	4,47	-2,60	2,20
Greece	5,51	3,30	9,51	7,31	10,04
Spain	-4,13	-1,15	-1,95	-0,79	-5,31
Finland	-0,76	1,45	-1,06	-1,85	-10,33
Croatia	5,68	-0,88	5,40	12,28	5,43
Hungary	-3,42	-2,69	6,88	7,96	-9,93
Ireland	-	3,51	1,71	-5,44	-
Iceland	5,54	-3,04	-7,61	0,22	-
Italy	0,31	0,76	4,21	0,10	-
Lithuania	3,65	-2,61	3,37	-3,35	-0,90
Luxembourg	-7,73	2,02	-3,01	-7,18	-3,10
Latvia	14,65	3,92	-4,37	2,74	-3,05
Montenegro	-4,00	-10,00	1,00	-	-
North Macedonia	-3,00	2,00	-2,00	6,00	3,00
Malta	4,64	3,33	-13,93	-7,14	-
Netherlands	-2,15	-1,30	-0,68	-6,31	1,04
Norway	1,94	6,11	0,04	1,70	3,33
Poland	-9,88	0,46	-3,41	-4,13	-9,73
Portugal	-4,99	1,85	0,69	0,79	1,61
Romania	-5,90	0,13	4,40	-2,76	-3,35
Serbia	-21,00	-5,00	2,00	-	-
Sweden	-10,97	4,92	1,25	-1,19	5,36
Slovenia	11,18	2,13	-0,18	-3,11	-1,89
Slovakia	-22,63	-4,68	-8,69	-7,76	-13,78
Turkey	1,00	1,00	-3,00	-	-

Source: own elaboration with data from Key Indicators - Digital Scoreboard.

Table 39: Variation in the digital divide (2019-2020): Telephoning or video calls (via webcam) over the internet

Country	Age	Sex	Education	Density	Income
Austria	5,91	-5,17	14,96	-2,06	12,27
Belgium	-1,41	-0,99	1,25	1,79	2,36
Bulgaria	-0,27	0,62	-1,88	0,73	-1,18
Cyprus	-12,45	0,37	-11,45	-5,21	-6,63
Czech Republic	-0,23	-2,84	5,42	-6,75	-1,84
Germany	-2,21	-0,90	7,78	3,48	6,99
Denmark	6,17	0,43	0,30	5,20	4,36
Estonia	8,97	-5,21	3,83	-0,37	15,30
Greece	-2,13	3,34	2,43	11,25	5,47
Spain	-9,05	0,08	3,09	0,24	6,55
Finland	-8,41	-1,19	3,87	-4,56	-5,91
Croatia	15,32	-0,18	8,55	-4,01	-11,88
Hungary	-9,13	-5,67	-0,98	0,00	-15,18
Ireland	-	-9,10	-7,70	1,74	-
Iceland	-0,82	-2,78	-3,62	-1,62	-
Italy	-1,40	-1,09	6,92	0,87	-
Lithuania	0,87	-2,81	2,64	-4,86	1,91
Luxembourg	-5,16	-6,58	-4,65	-6,51	-3,18
Latvia	-5,50	-0,21	-3,19	-3,70	-11,65
Montenegro	-8,00	-4,00	15,00	-	-
North Macedonia	3,00	-2,00	3,00	5,00	5,00
Malta	8,77	1,24	-2,03	-11,22	-
Netherlands	-11,45	-2,09	-1,31	-4,25	4,10
Norway	2,39	-1,69	7,68	0,97	-12,43
Poland	0,46	-0,43	-1,85	-0,86	-7,58
Portugal	9,24	-1,77	7,03	3,38	10,02
Romania	-3,52	-0,47	2,99	3,27	2,38
Serbia	-6,00	-4,00	-1,00	-	-
Sweden	3,36	-5,44	-3,70	3,49	4,95
Slovenia	7,90	-5,41	-1,64	-9,84	0,76
Slovakia	-12,04	-4,75	-9,55	1,65	-4,14
Turkey	-6,00	-1,00	-2,00	-	-

Source: own elaboration with data from Key Indicators - Digital Scoreboard.

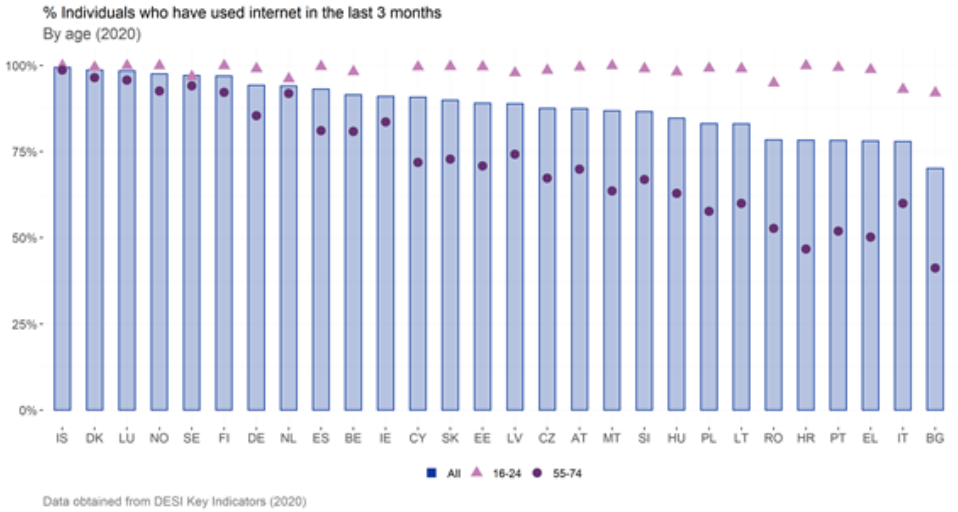
Table 40: Variation in the digital divide (2019-2020): Individuals who have used the internet, in the last 3 months, for participating in social networks (creating user profile, posting messages or other contributions to Facebook, Twitter, etc.).

Country	Age	Sex	Education	Density	Income
Austria	-3,21	-0,49	1,31	5,89	1,34
Belgium	-5,48	-0,20	-1,34	1,94	-8,76
Bulgaria	-4,68	0,92	-6,23	-2,65	-0,72
Cyprus	-13,29	-2,22	4,00	1,87	-1,02
Czech Republic	-1,75	-0,86	-2,44	0,81	-0,28
Germany	-1,50	1,02	-0,02	0,45	6,03
Denmark	-5,74	0,21	-1,84	0,17	-2,91
Estonia	-0,83	-1,98	3,89	-0,27	1,98
Greece	-4,66	-0,04	5,92	3,68	7,56
Spain	-4,20	1,07	0,28	1,48	5,79
Finland	-4,15	1,01	-4,91	-4,98	-5,97
Croatia	3,84	-3,42	9,11	5,09	1,98
Hungary	-4,76	-4,66	-5,22	0,33	-17,58
Ireland	-	-1,72	1,24	1,30	-
Iceland	-2,38	2,01	-8,23	0,73	-
Italy	-1,16	0,54	4,74	3,47	-
Lithuania	-9,77	-2,89	4,15	-5,20	1,52
Luxembourg	-12,20	6,13	2,28	1,69	-9,25
Latvia	-11,16	-2,82	-3,21	-1,09	-10,78
Montenegro	-9,00	-3,00	8,00	-	-
North Macedonia	-4,00	3,00	2,00	3,00	13,00
Malta	-1,94	2,02	-4,45	-16,79	-
Netherlands	-5,78	0,57	2,52	-2,30	5,79
Norway	-0,06	3,32	3,19	2,26	0,85
Poland	-1,73	-0,05	-4,60	-5,28	-2,11
Portugal	-3,40	0,16	-2,73	-0,08	-0,01
Romania	-3,88	-1,25	1,97	1,71	-1,38
Serbia	-19,00	1,00	17,00	-	-
Sweden	-16,63	-0,70	-2,64	0,01	1,54
Slovenia	-10,13	-1,70	11,13	5,60	2,03
Slovakia	-9,19	-1,71	-19,00	-4,58	-6,65
Turkey	-5,00	-2,00	-2,00	-	-

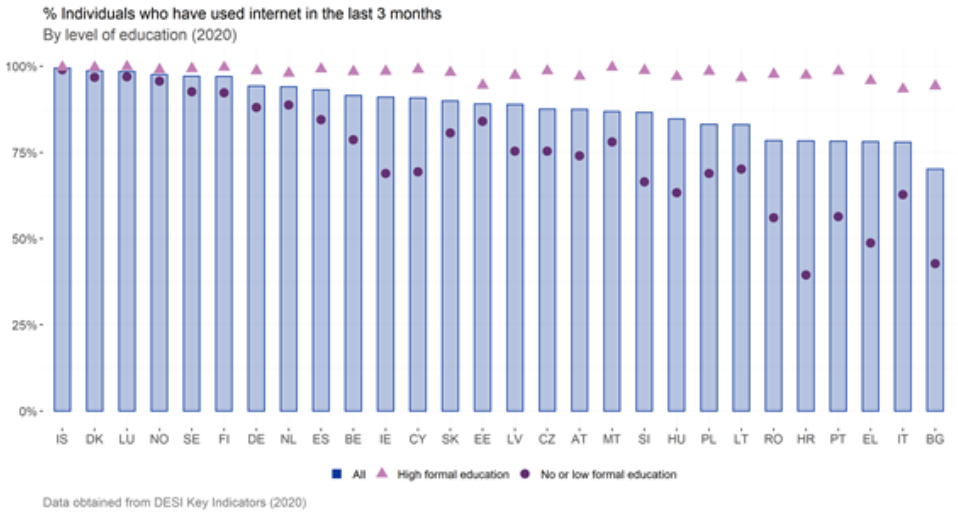
Source: own elaboration with data from Key Indicators - Digital Scoreboard.

Annex 3: Additional graphic analysis of the digital divide

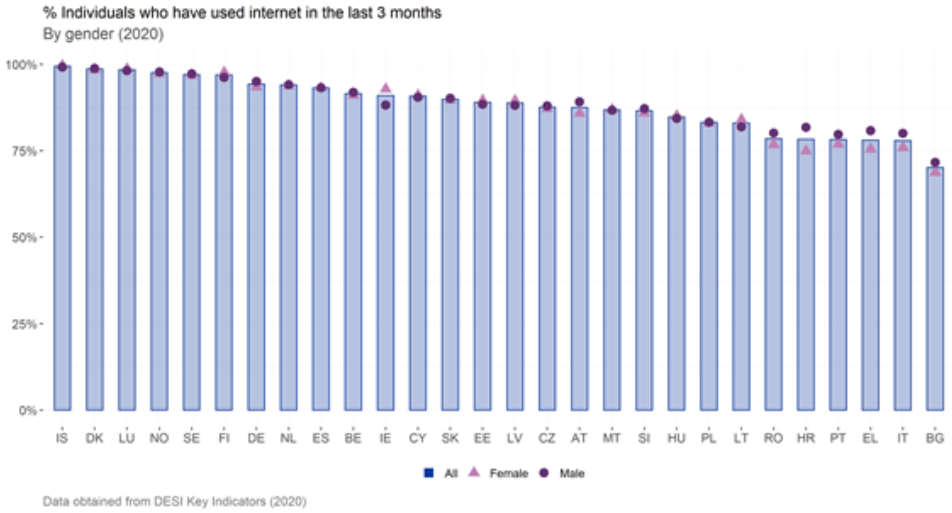
Graph 1. Individuals who have used internet in the last 3 months by age (2020)



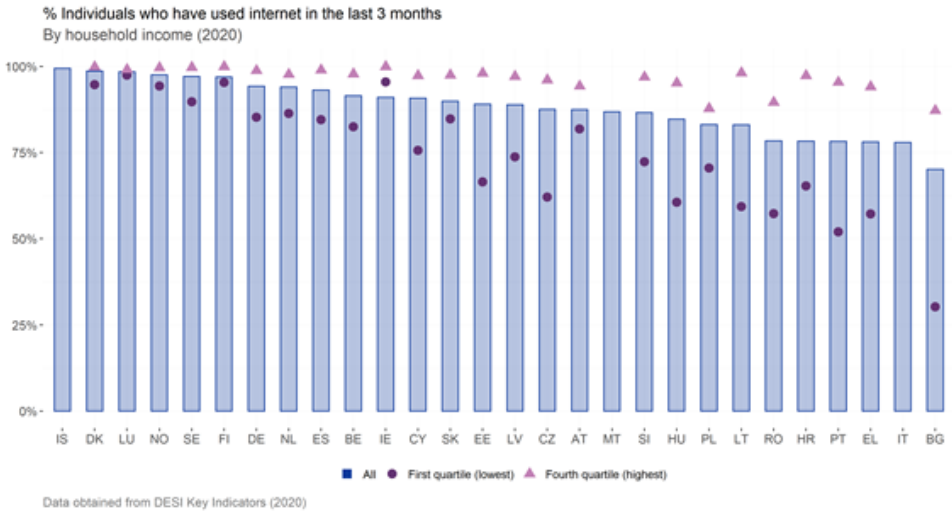
Graph 2. Individuals who have used internet in the last 3 months by level of education (2020)



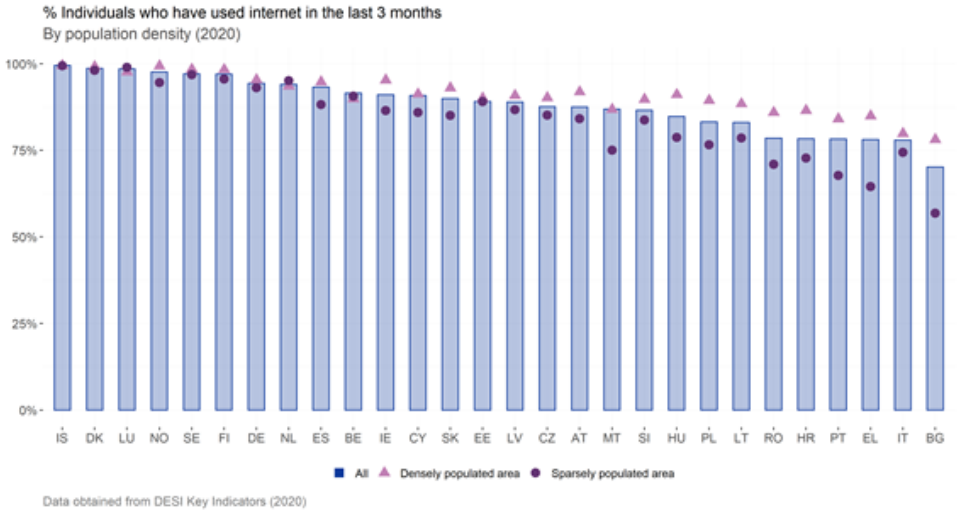
Graph 3. Individuals who have used internet in the last 3 months by gender (2020)



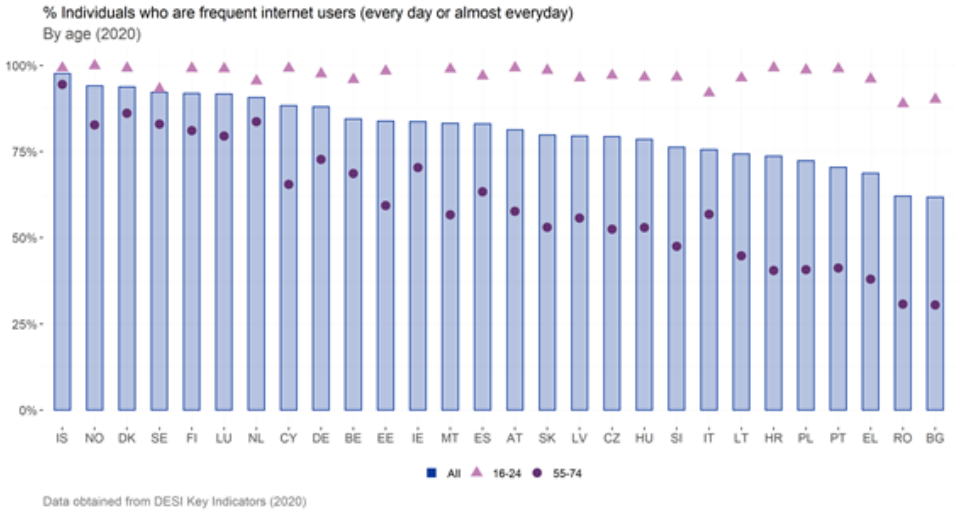
Graph 4. Individuals who have used internet in the last 3 months by household income (2020)



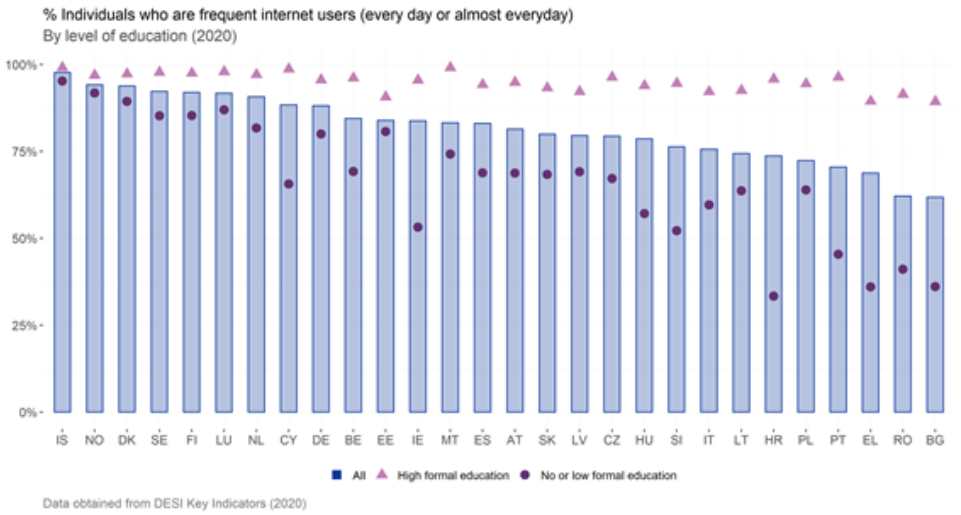
Graph 5. Individuals who have used internet in the last 3 months by population density (2020)



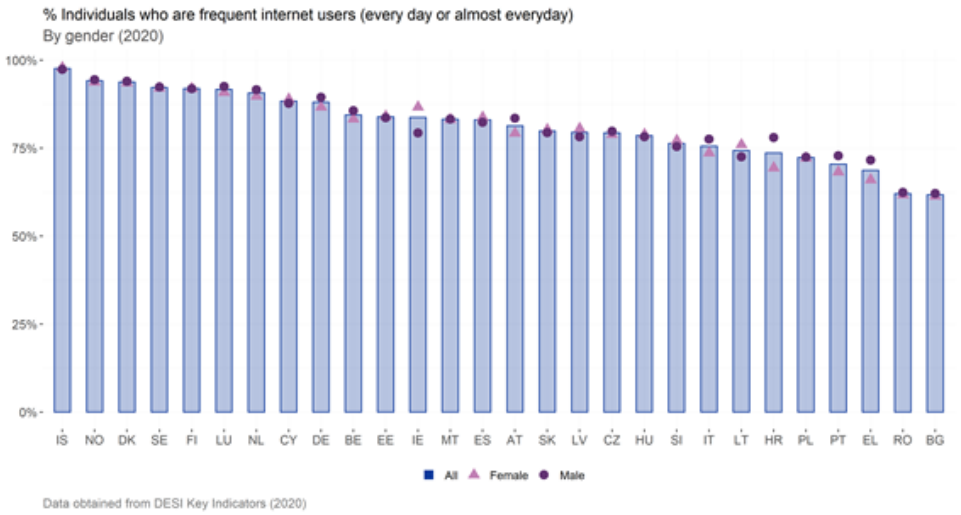
Graph 6. Individuals who are frequent internet users by age (2020)



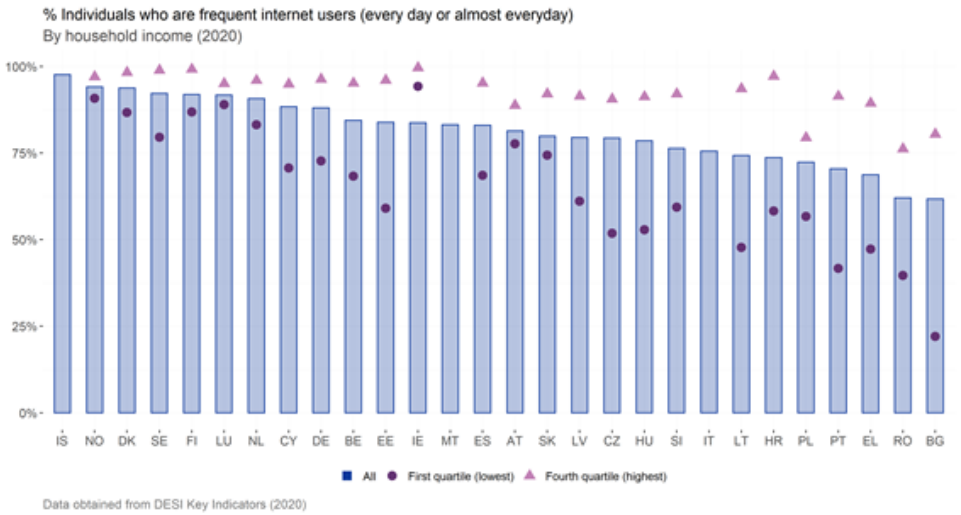
Graph 7. Individuals who are frequent internet users by level of education (2020)



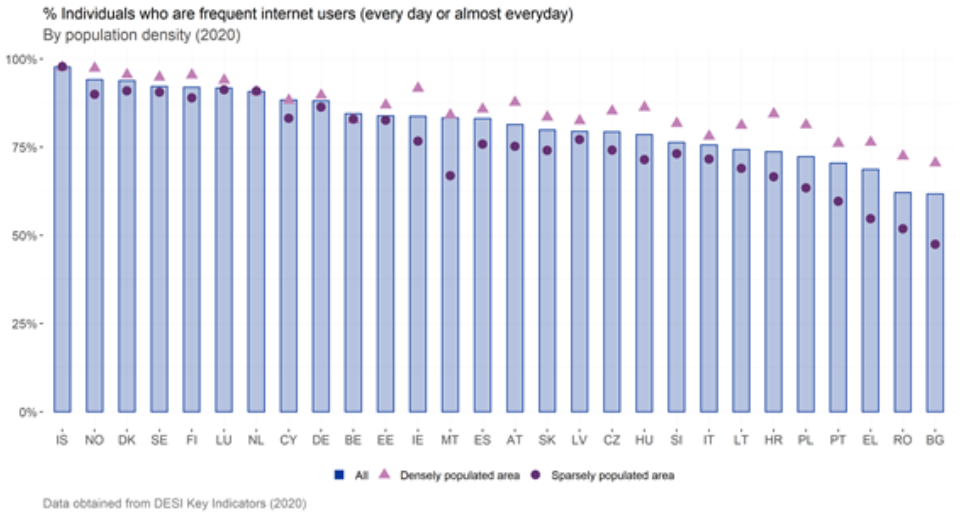
Graph 8. Individuals who are frequent internet users by gender (2020)



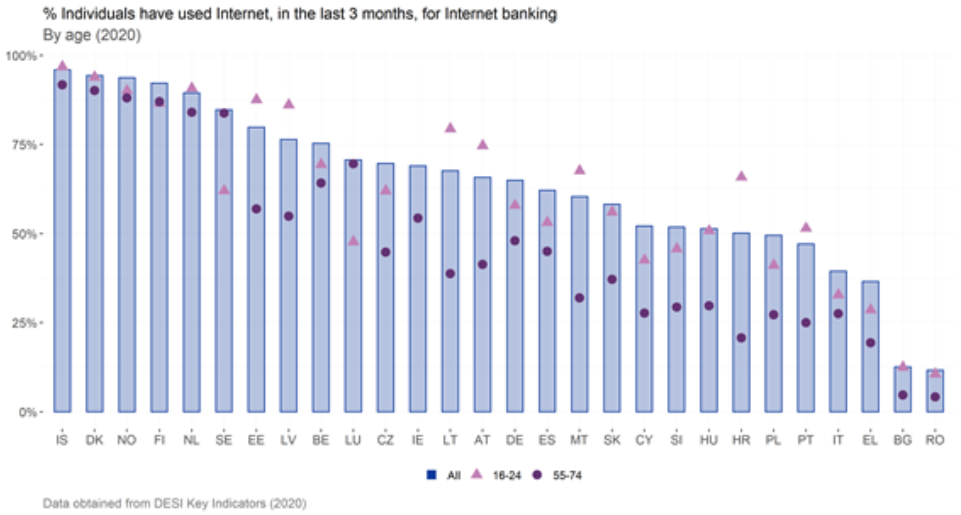
Graph 9. Individuals who are frequent internet users by household income (2020)



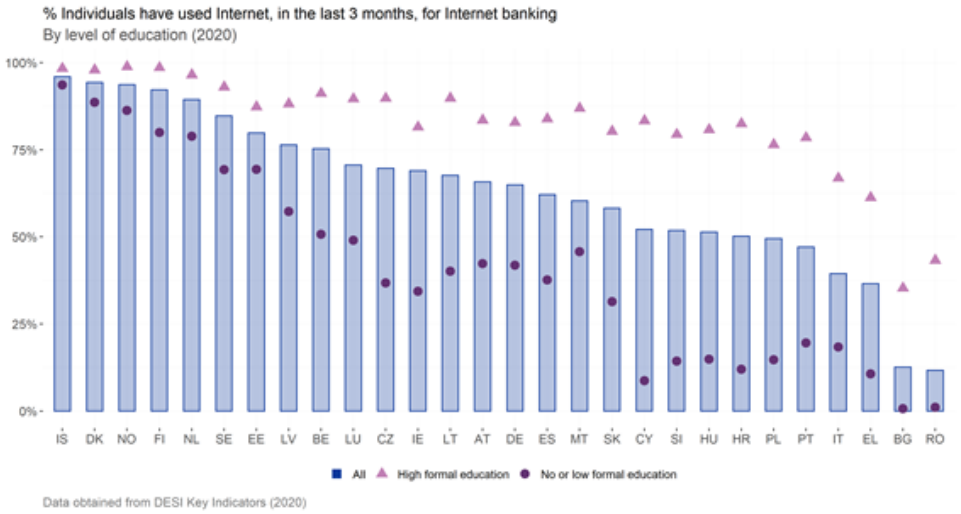
Graph 10. Individuals who are frequent internet users by population density (2020)



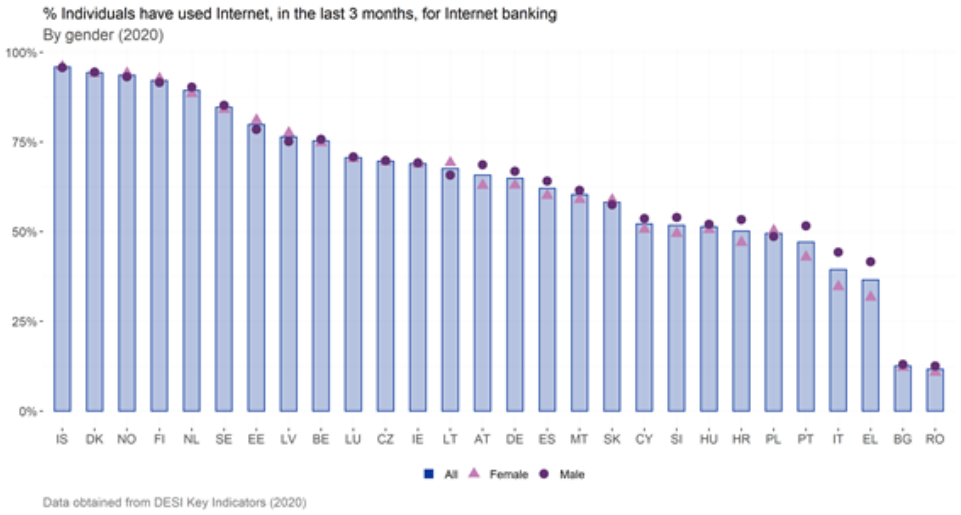
Graph 11. Individuals who have used internet banking by age (2020)



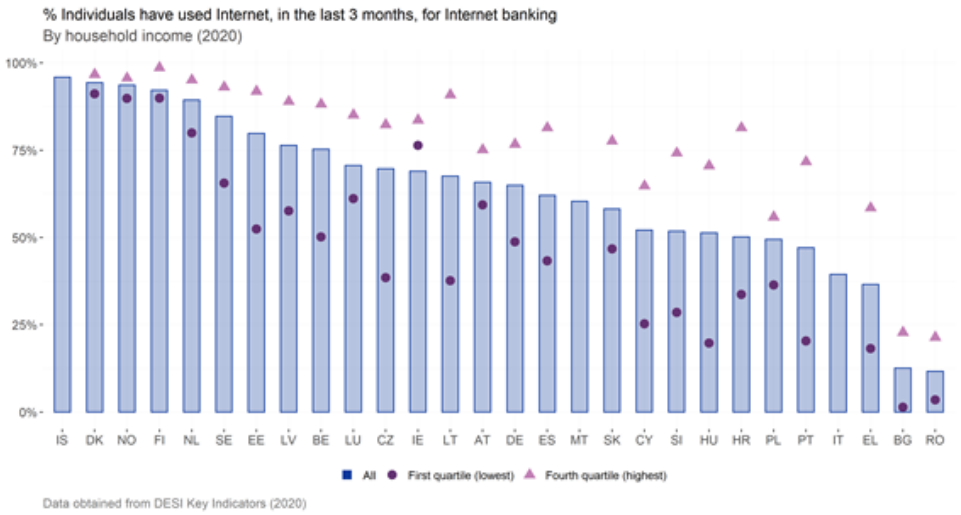
Graph 12. Individuals who have used internet banking by level of education (2020)



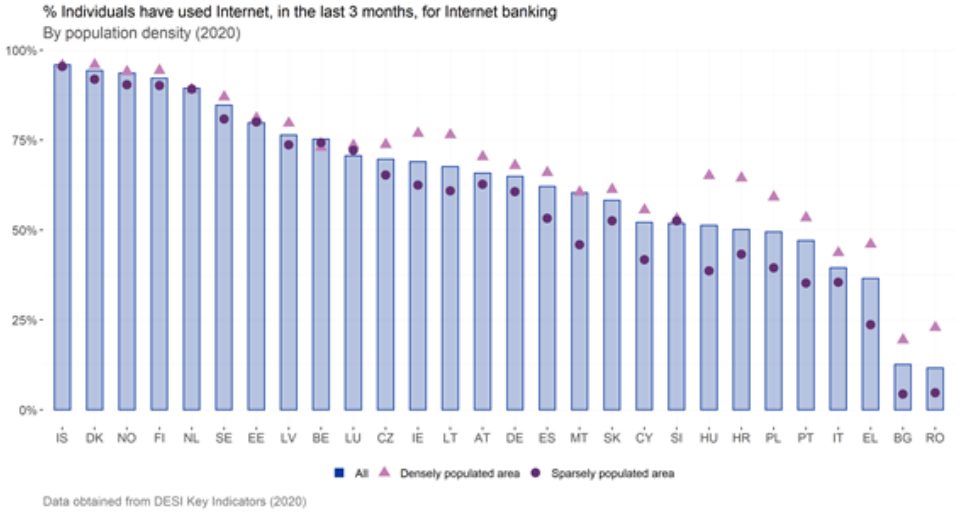
Graph 13. Individuals who have used internet banking by gender (2020)



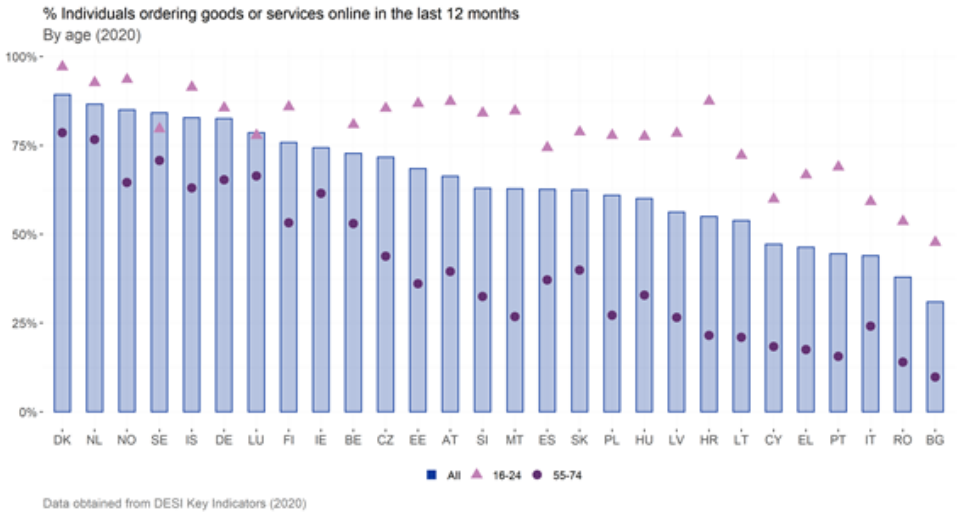
Graph 14. Individuals who have used internet banking by household income (2020)



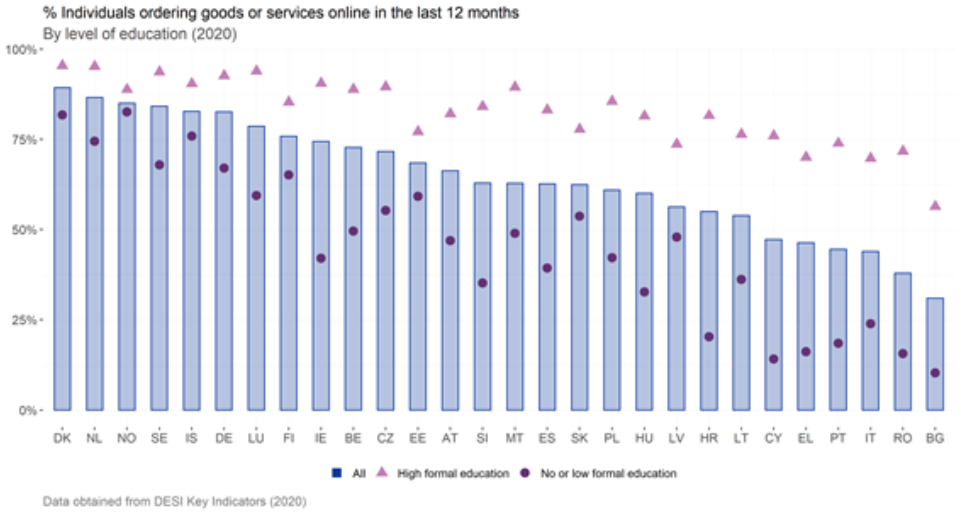
Graph 15. Individuals who have used internet banking by population density (2020)



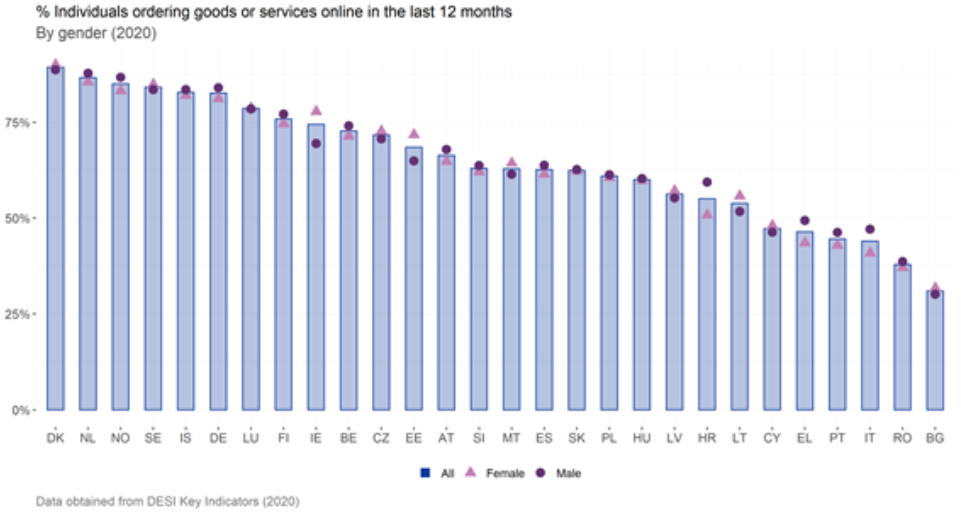
Graph 16. Individuals ordering goods and services online by age (2020)



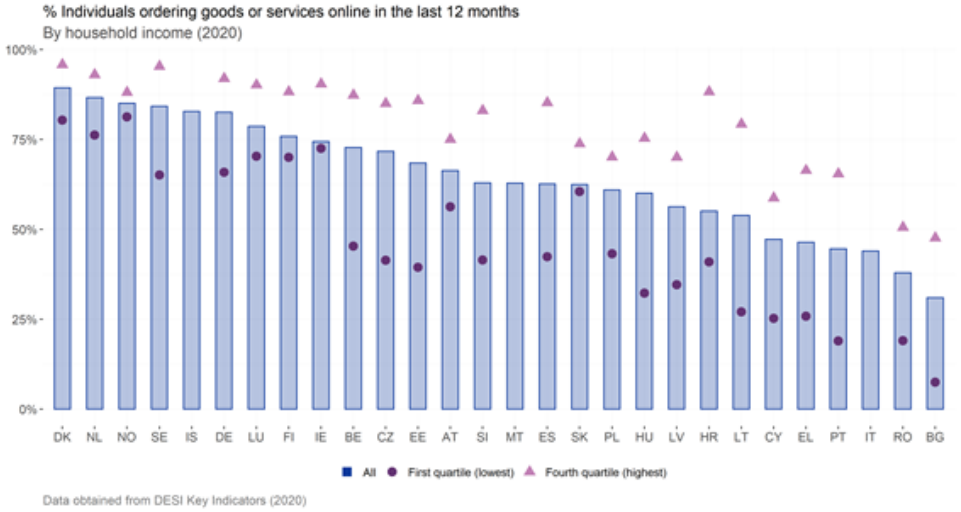
Graph 17. Individuals ordering goods and services online by level of education (2020)



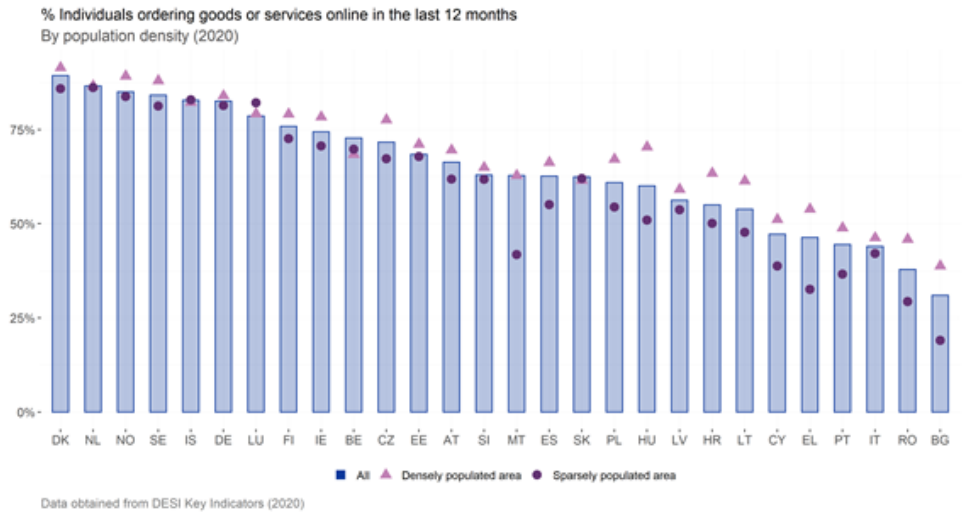
Graph 18. Individuals ordering goods and services online by gender (2020)



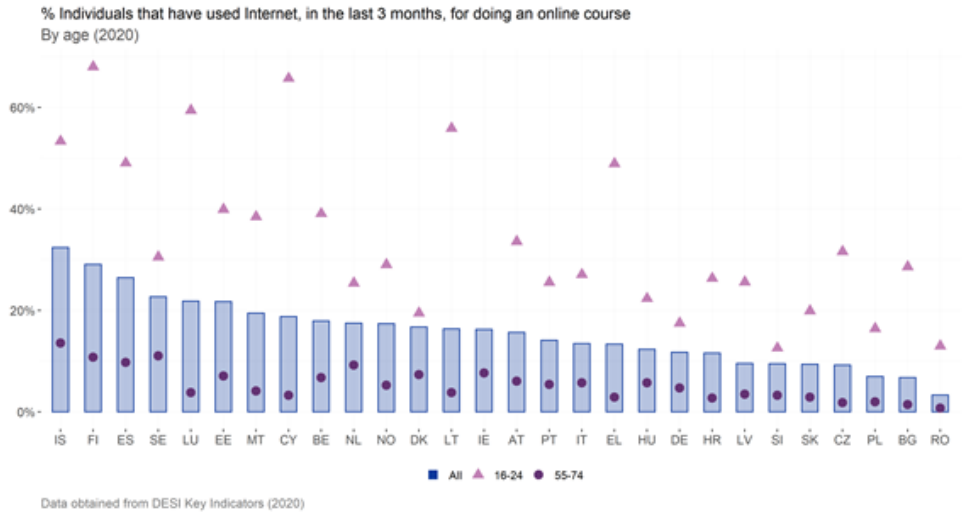
Graph 19. Individuals ordering goods and services online by household income (2020)



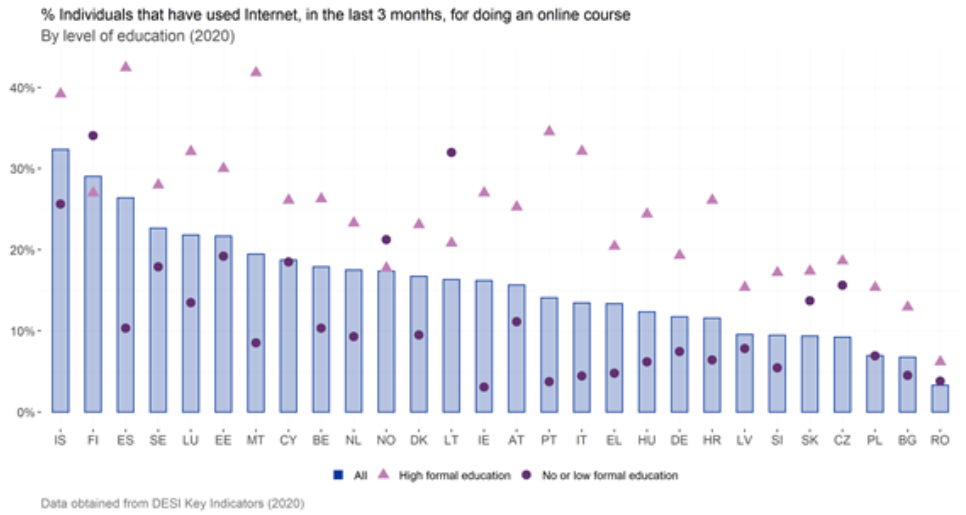
Graph 20. Individuals ordering goods and services online by population density (2020)



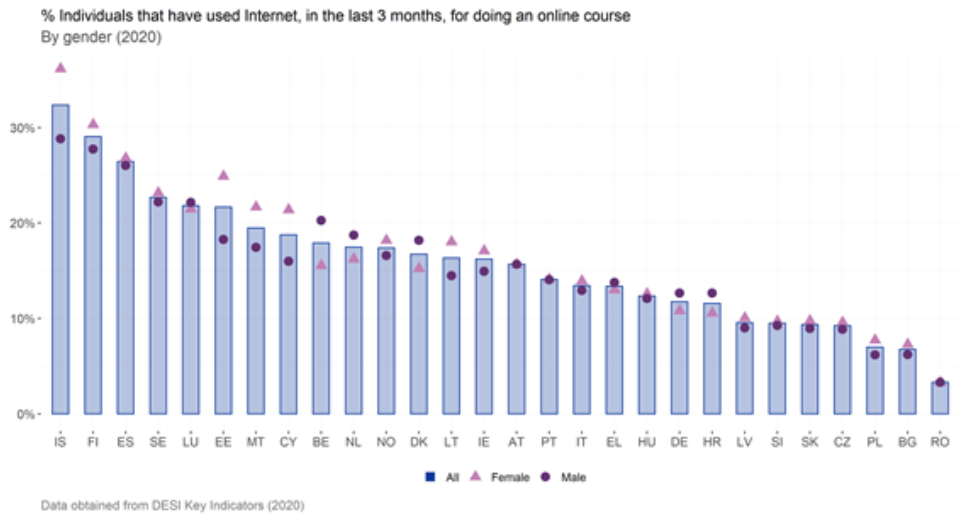
Graph 21. Individuals doing an online course by age (2020)



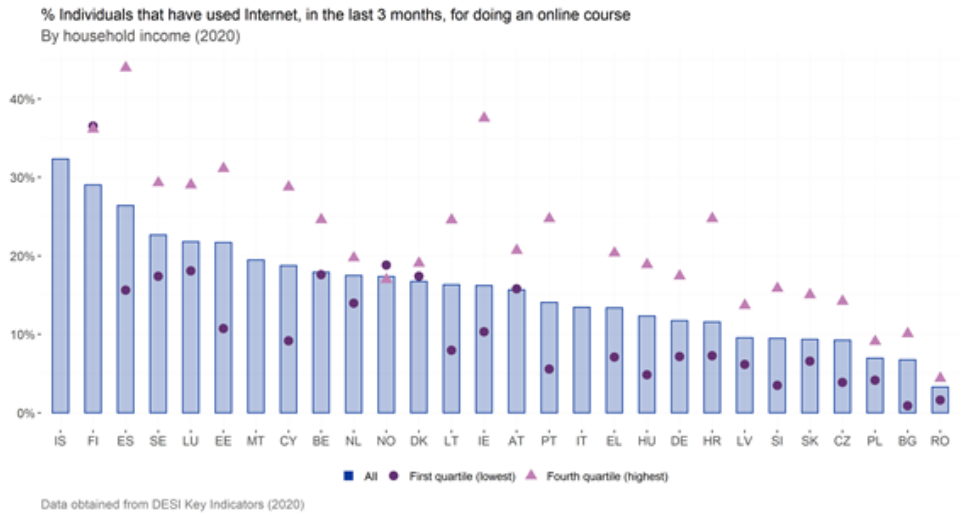
Graph 22. Individuals doing an online course by level of education (2020)



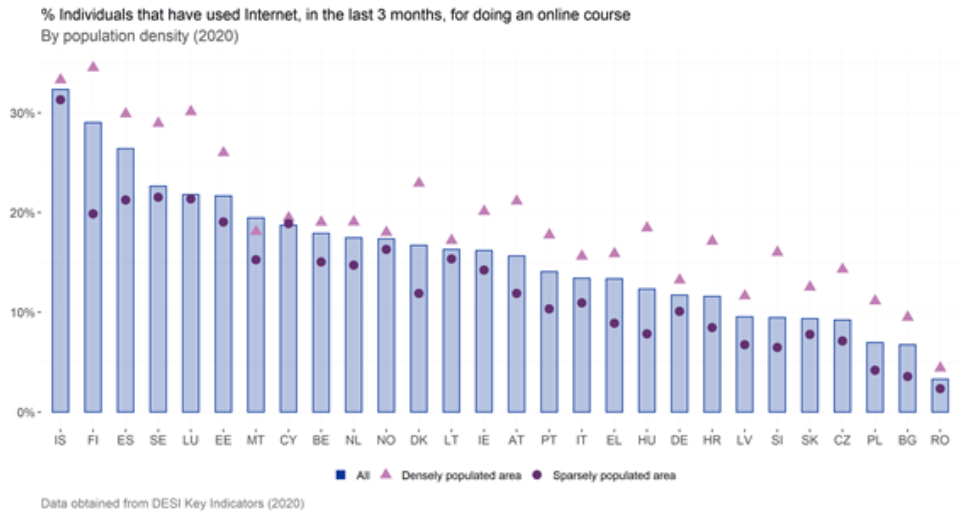
Graph 23. Individuals doing an online course by gender (2020)



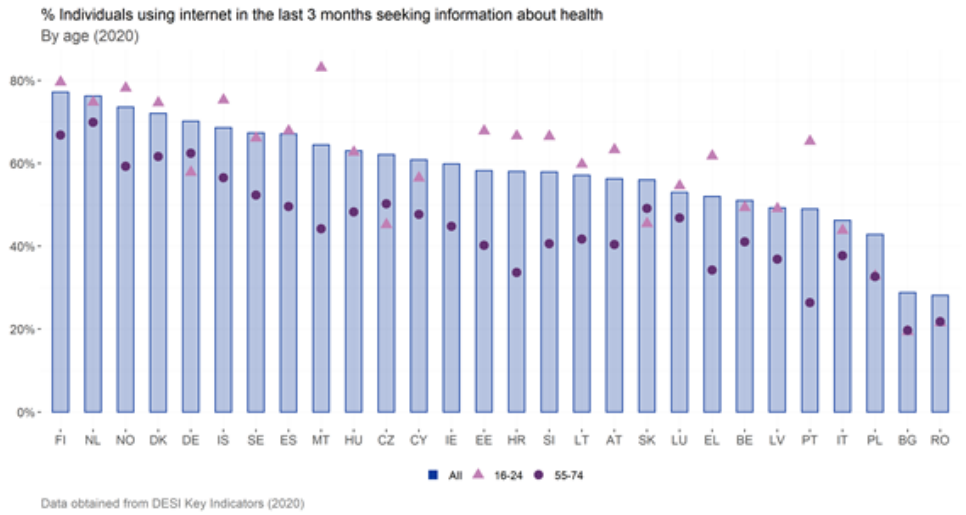
Graph 24. Individuals doing an online course by household income (2020)



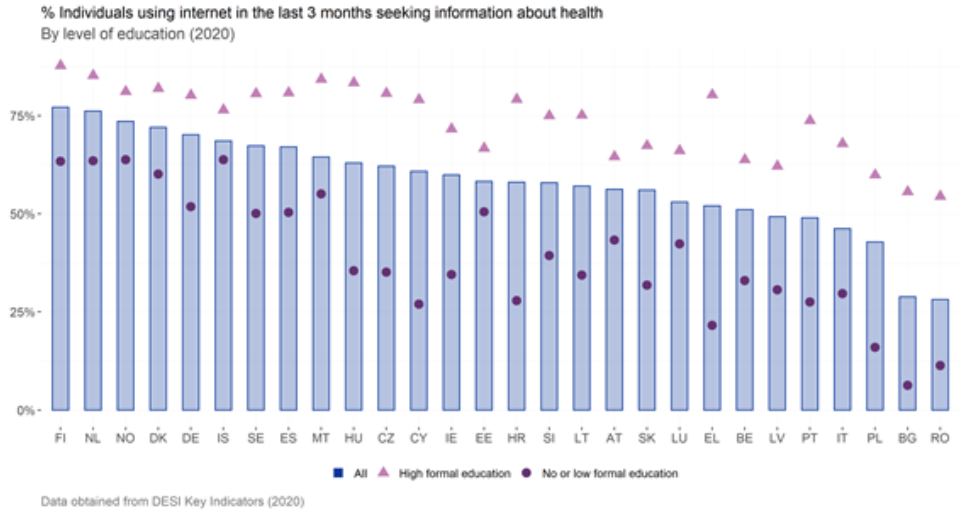
Graph 25. Individuals doing an online course by population density (2020)



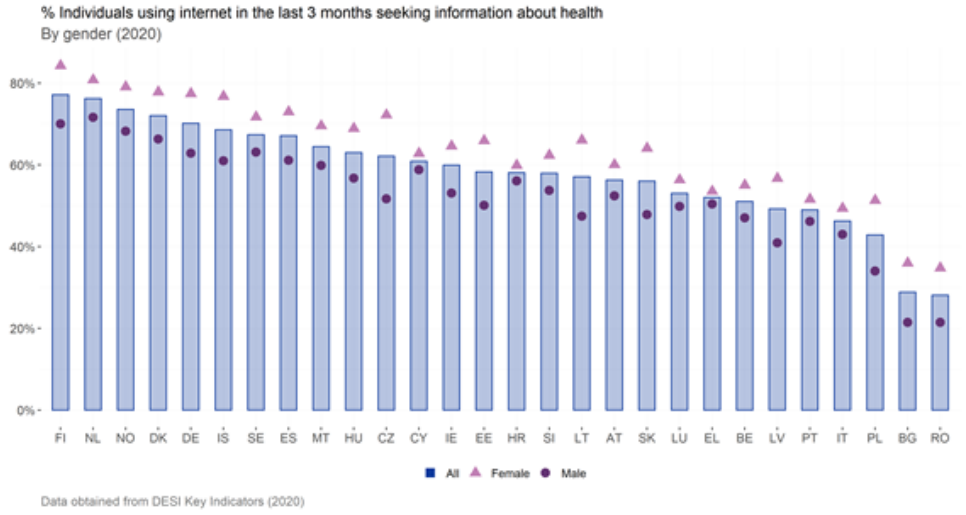
Graph 26. Individuals seeking information about health on the internet by age (2020)



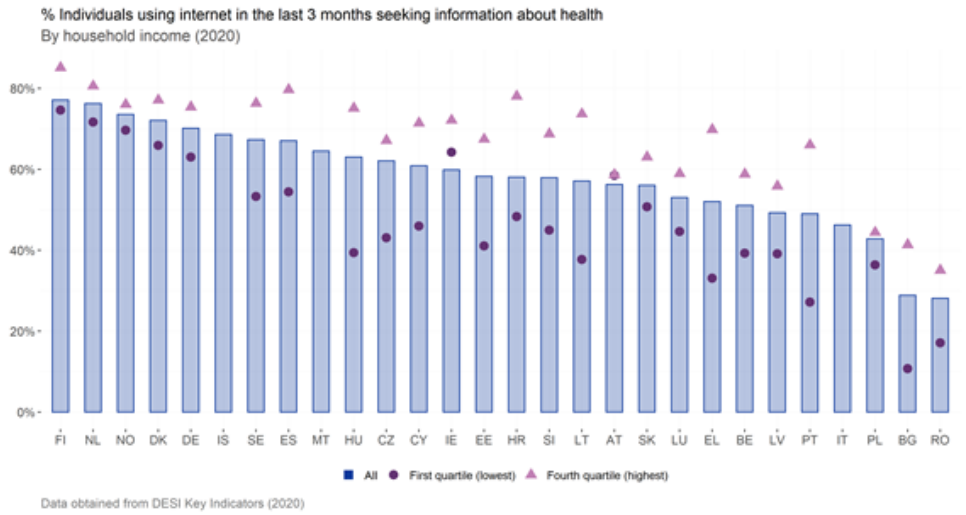
Graph 27. Individuals seeking information about health on the internet by level of education (2020)



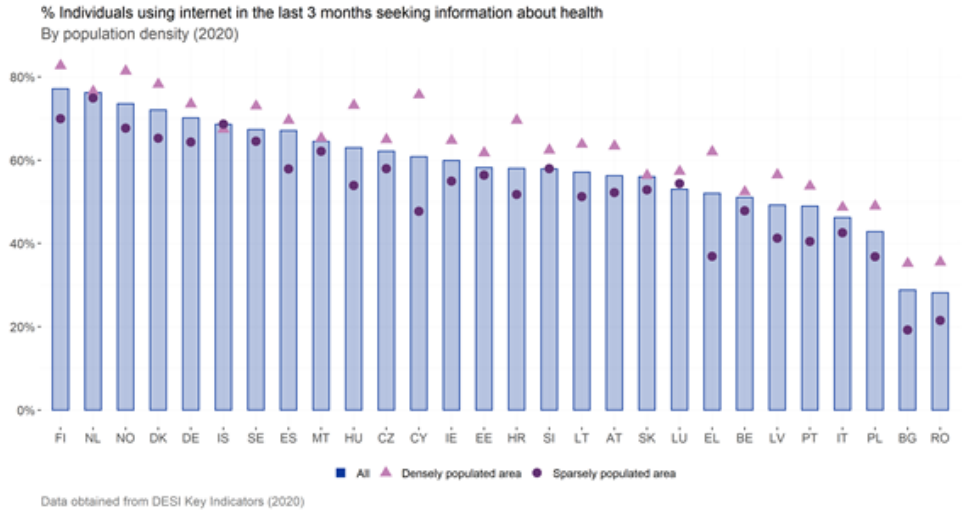
Graph 28. Individuals seeking information about health on the internet by gender (2020)



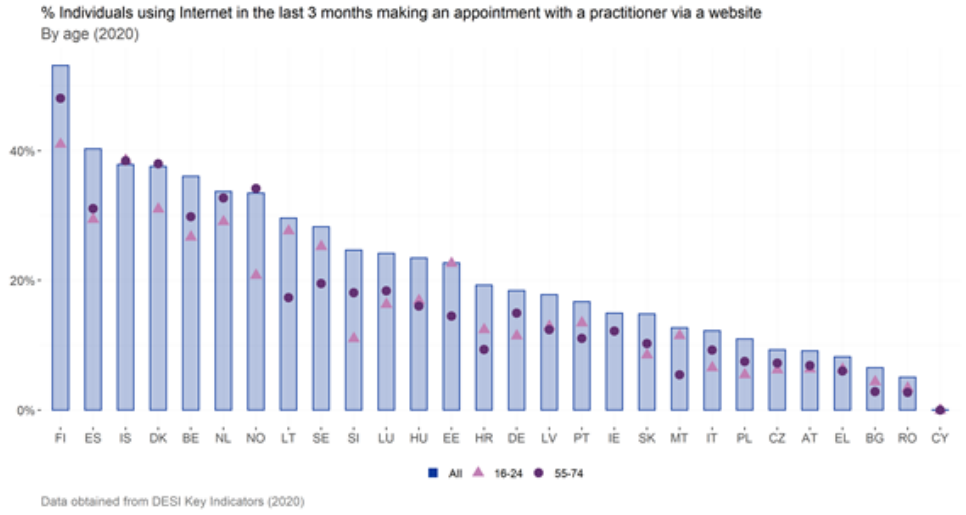
Graph 29. Individuals seeking information about health on the internet by household income (2020)



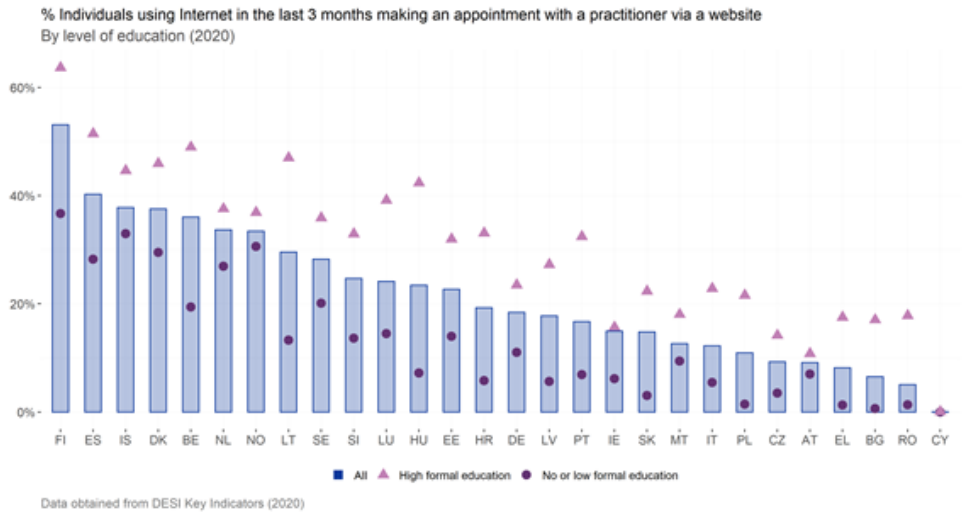
Graph 30. Individuals seeking information about health on the internet by population density (2020)



Graph 31. Individuals making an appointment with a practitioner via a website by age (2020)

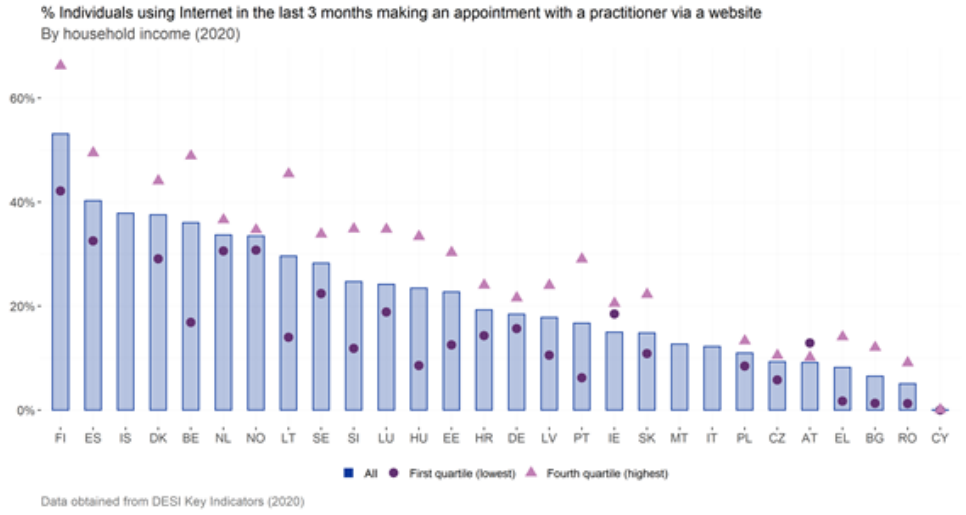


Graph 32. Individuals making an appointment with a practitioner via a website by level of education (2020)

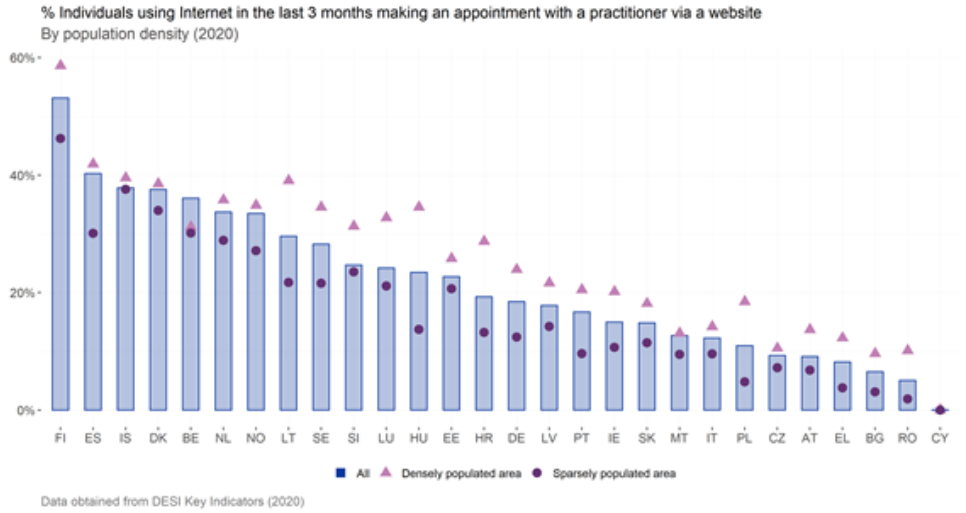


Graph 33. Individuals making an appointment with a practitioner via a website by gender (2020)

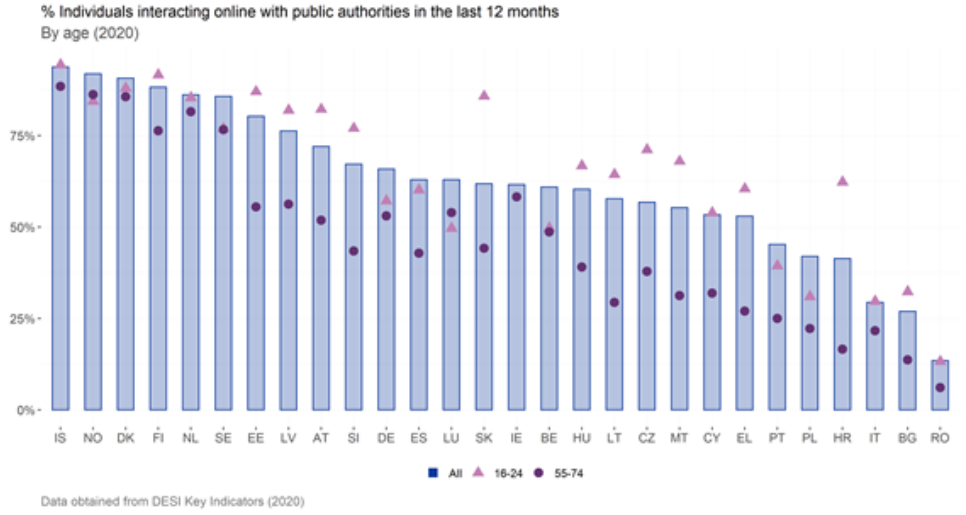
Graph 34. Individuals making an appointment with a practitioner via a website by household income (2020)



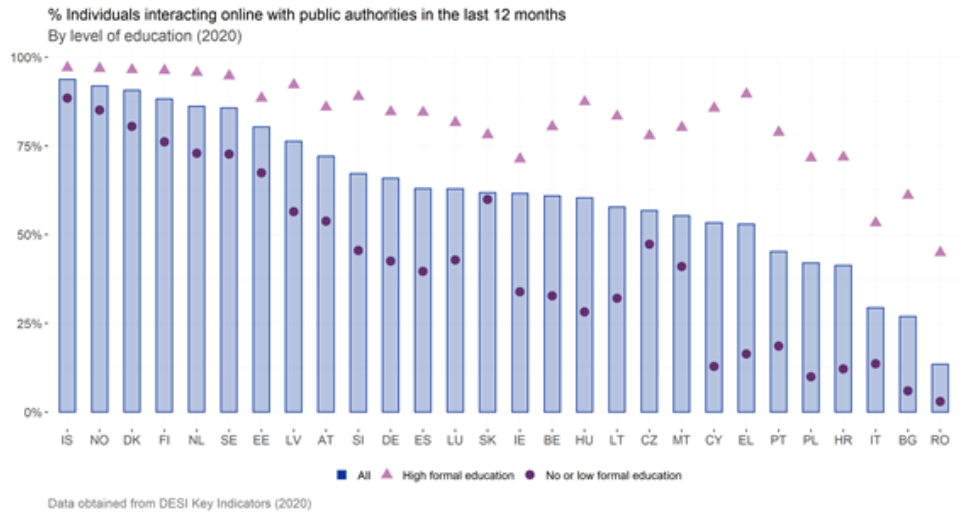
Graph 35. Individuals making an appointment with a practitioner via a website by population density (2020)



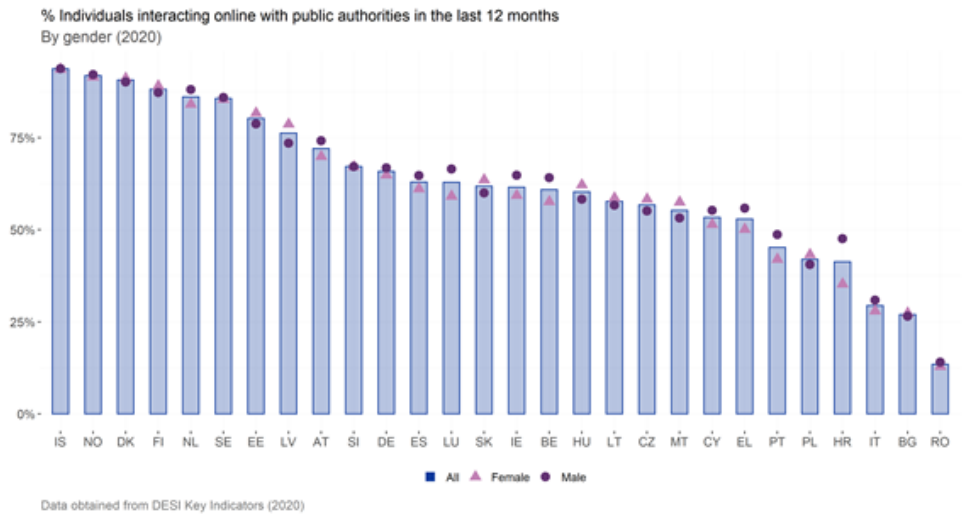
Graph 36. Individuals interacting online with public authorities by age (2020)



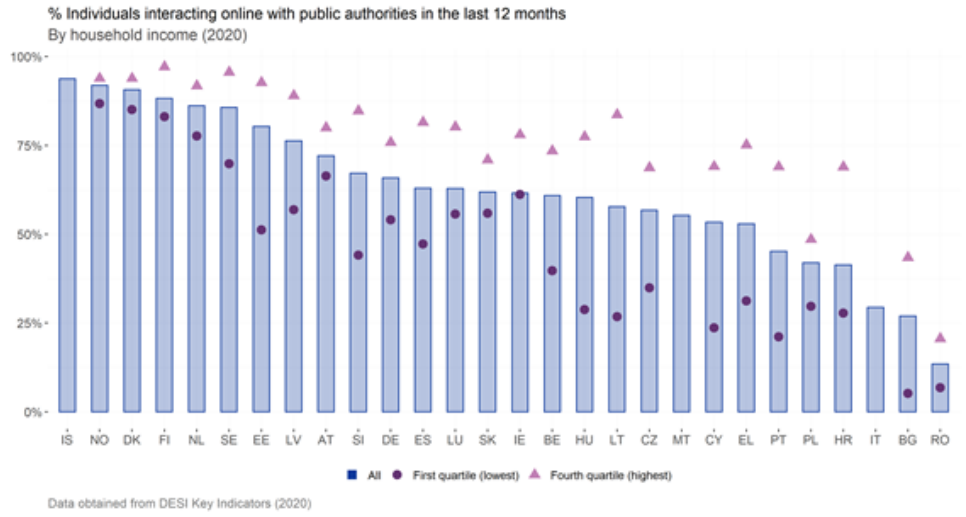
Graph 37. Individuals interacting online with public authorities by level of education (2020)



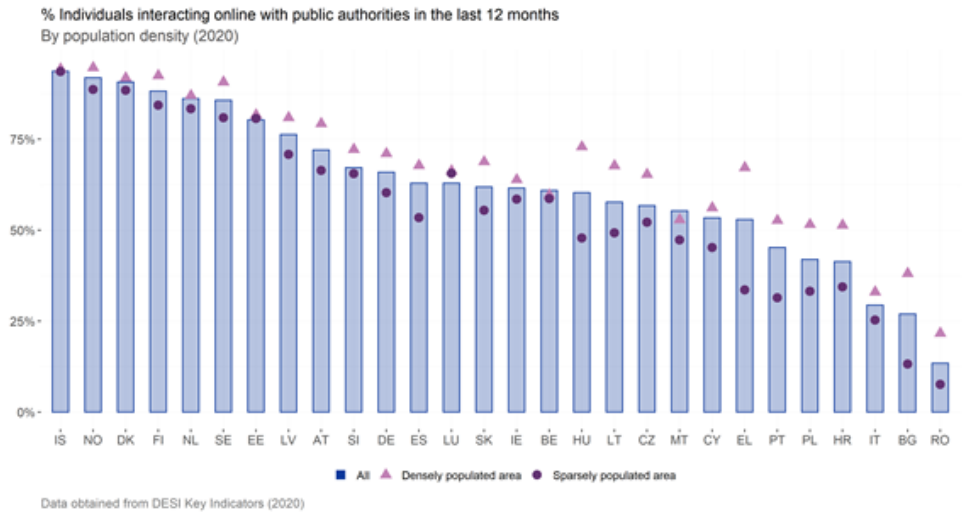
Graph 38. Individuals interacting online with public authorities by gender (2020)



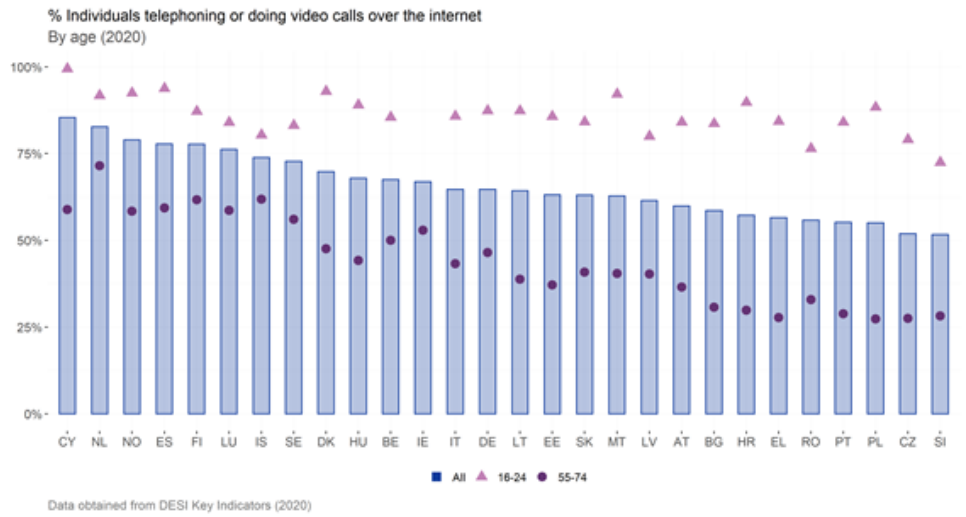
Graph 39. Individuals interacting online with public authorities by household income (2020)



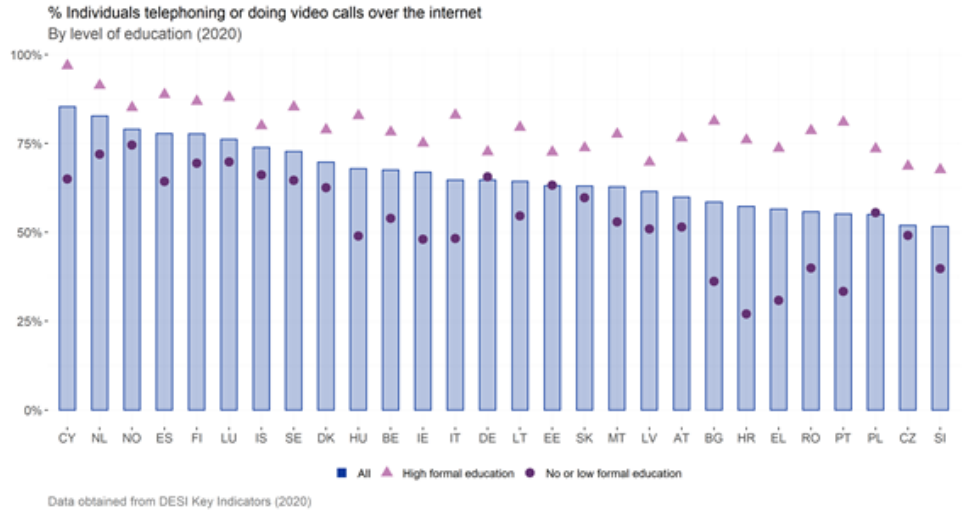
Graph 40. Individuals interacting online with public authorities by population density (2020)



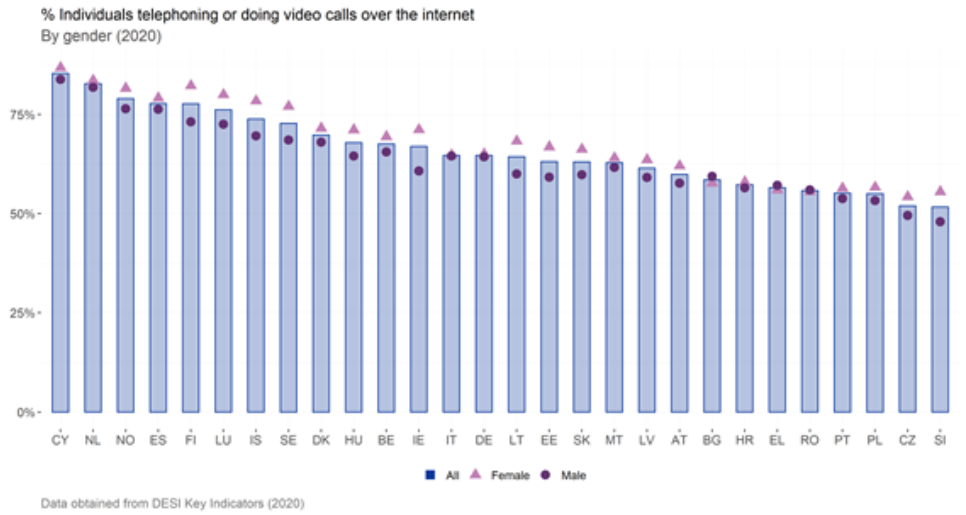
Graph 41. Individuals doing video calls over the internet by age (2020)



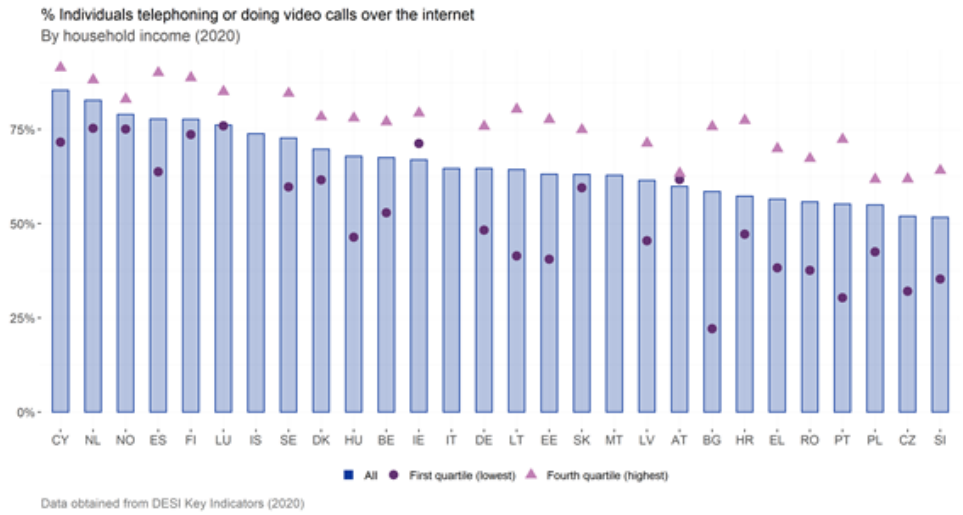
Graph 42. Individuals doing video calls over the internet by level of education (2020)



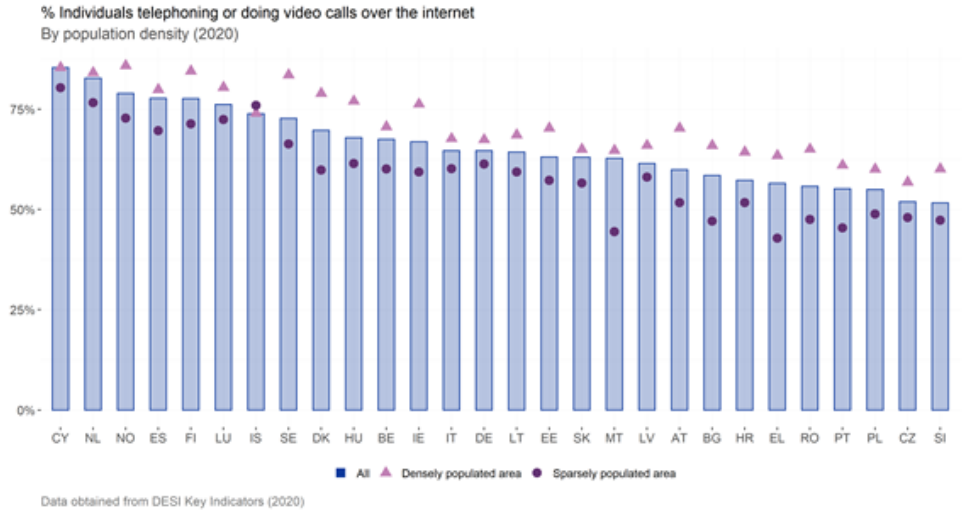
Graph 43. Individuals doing video calls over the internet by gender (2020)



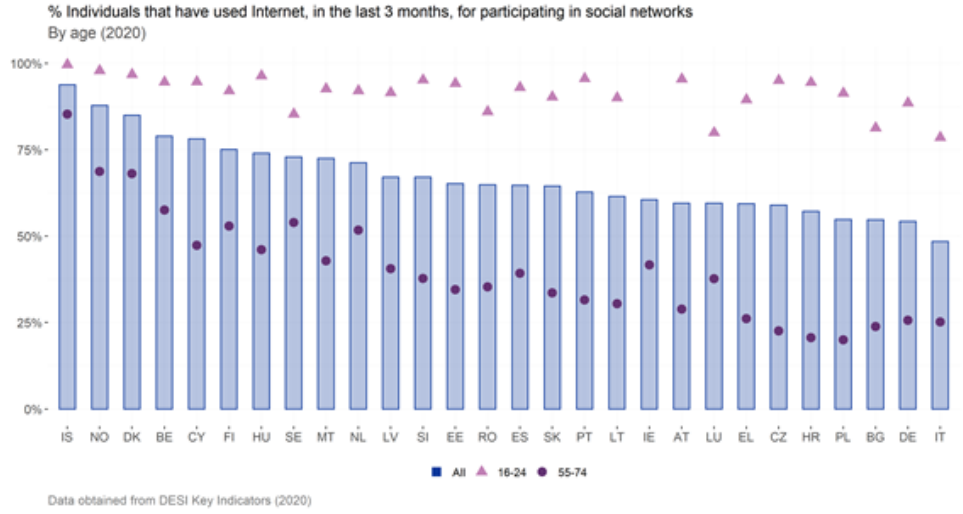
Graph 44. Individuals doing video calls over the internet by household income (2020)



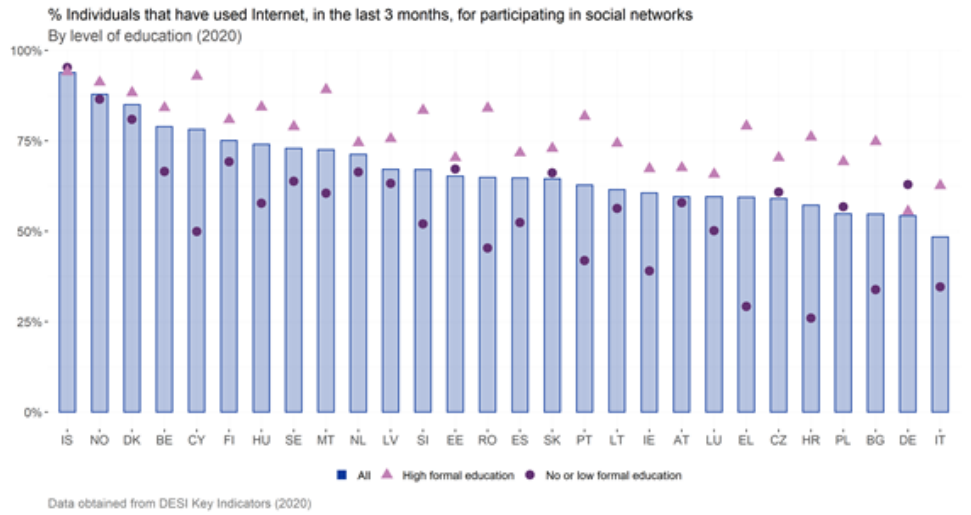
Graph 45. Individuals doing video calls over the internet by population density (2020)



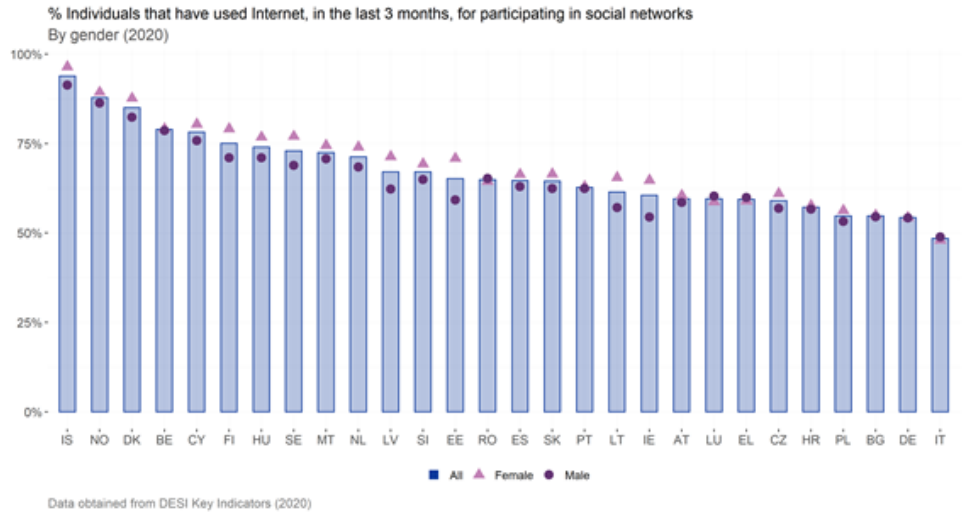
Graph 46. Individuals participating in social networks by age (2020)



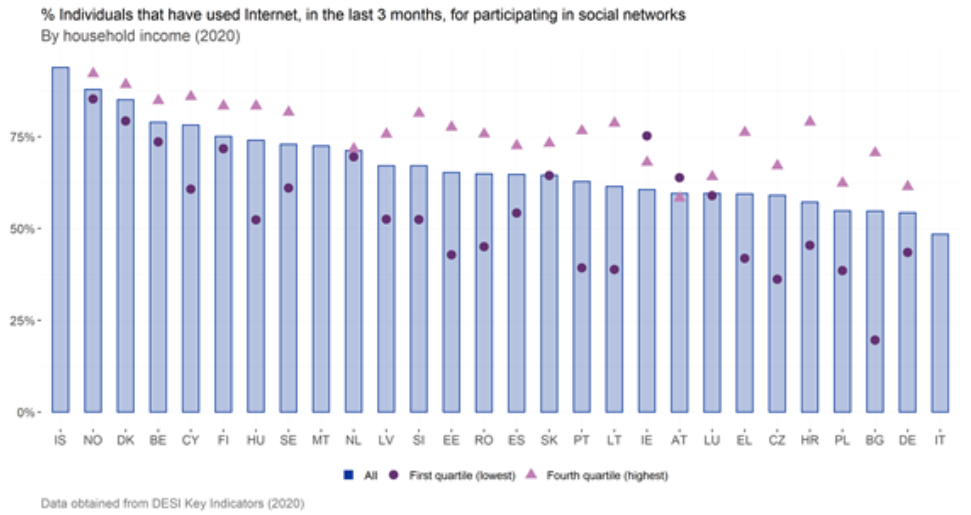
Graph 47. Individuals participating in social networks by level of education (2020)



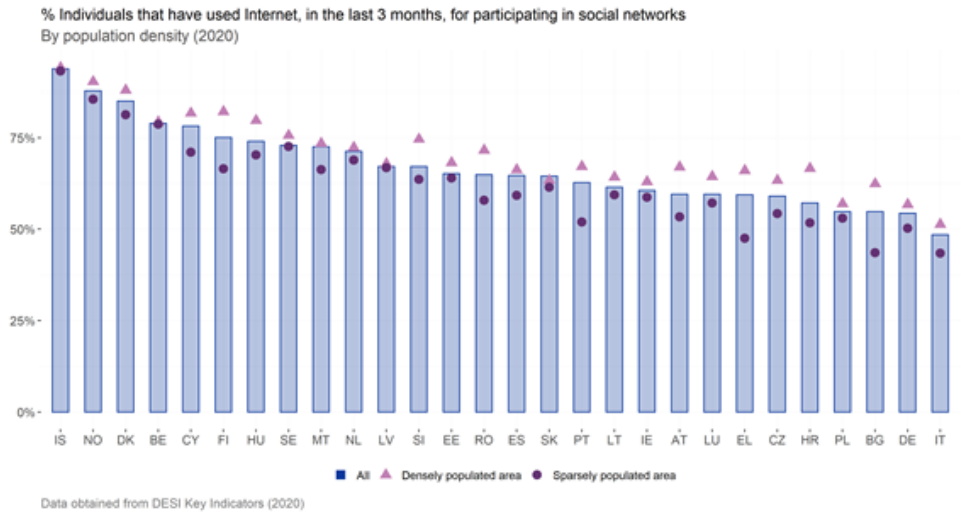
Graph 48. Individuals participating in social networks by gender (2020)



Graph 49. Individuals participating in social networks by household income (2020)



Graph 50. Individuals participating in social networks by population density (2020)



Annex 4: Questionnaires for interviews

Questionnaire for telecommunications operators and other digital companies

Section 1. Evolution of the digital divide during the pandemic.

Question 1. In general, the academy, NGOs and civil society organisations affirm that the Covid-19 pandemic has worsened digital divides. Do you agree with this idea?

Question 2. What are the groups most affected by digital divides? Has the pandemic caused a setback or progress in bridging the digital divides for these specific groups?

Section 2. Causes of the digital divides.

Question 3. What are the main causes of digital divides?

Question 4. How has pandemic contributed to mitigate or worsen them?

Section 3. Impact of the digital divides.

Question 5. What are the most affected daily activities by digital divides?

Question 6. What are the implications of the digital divides for affected persons or groups?

Section 4. Telecommunication networks performance and digital divides.

Question 7. Data traffic substantially increased during Covid-19 pandemic, particularly during confinement periods. How would you consider telecommunication networks performance in terms of service availability and capacity?

Question 8. Do you know any measure developed during pandemic to ensure a good telecommunication networks performance? Have these measures had any impact on the digital divides?

Question 9. Have these measures implied additional investments?

Section 5. Challenges posed by Covid-19 pandemic for digital divides.

Question 10. What are the main challenges that Covid-19 pandemic has posed for bridging digital divides (insufficient bandwidth in internet connections, inadequate equipment, lack of digital skills, economic problems that prevent people from subscribing to better telecommunication services, etc.)?

Question 11. How have these challenges affected specific sectors and activities?

- **a.** Education
- **b.** Health
- **c.** Other public services
- **d.** Commerce
- **e.** Work
- **f.** Leisure

Section 6. Measures adopted to bridge digital divides during the pandemic.

Question 12. Would you highlight any specific measures developed during pandemic to bridge digital divides?

Question 13. Have these measures been effective? Have they solved the specific problems related to the digital divides for which they were defined?

Question 14. What other measures could have been implemented to bridge the digital divides? Who should have led their implementation?

Section 7. Expected evolution of the digital divides.

Question 15. How do you expect the digital divides to evolve in the short and medium term? Will measures adopted during Covid-19 pandemic affect the evolution of digital divides?

Question 16. Should exceptional measures implemented during pandemic to bridge digital divides be maintained over time? Is there a risk of widening the digital divide if these measures are removed?

Section 9. Affordability of telecom services.

Question 17. Has pandemic affected affordability of telecom services?

Question 18. What measures have been taken to ensure connectivity of people in economic difficulties due to the pandemic?

Section 10. IT infrastructure.

Question 19. Households have had to deploy additional IT infrastructure (equipment, wi-fi networks, etc.) to allow members accessing the internet for teleworking, online education, etc. What role have played telecommunication operators in this process?

Section 11. Lessons learnt from the pandemic related to the digital divides.

Question 20. In your opinion, what are the main lessons that can be drawn from the impact of the pandemic on the digital divides?

Question 21. Are we now better prepared to fight against digital divides?

Question 22. Is there now more awareness about the issue of digital divides in the society (governments, public and private institutions, the population, etc.)?

Section 12. Recommendations.

Question 23. What recommendations would you propose to bridge the digital divides after Covid-19 pandemic?

Questionnaire for National Regulatory Authorities

Section 1. Evolution of the digital divide during the pandemic.

Question 1. In general, the academy, NGOs and civil society organisations affirm that the Covid-19 pandemic has worsened digital divides. Do you agree with this idea?

Question 2. What are the groups most affected by digital divides? Has the pandemic caused a setback or progress in bridging the digital divides for these specific groups?

Section 2. Causes of the digital divides.

Question 3. What are the main causes of digital divides?

Question 4. How has pandemic contributed to mitigate or worsen them?

Section 3. Impact of the digital divides.

Question 5. What are the most affected daily activities by digital divides?

Question 6. What are the implications of the digital divides for affected persons or groups?

Section 4. Telecommunication networks performance and digital divides.

Question 7. Data traffic substantially increased during Covid-19 pandemic, particularly during confinement periods. How would you consider telecommunication networks performance in terms of service availability and capacity?

Question 8. Do you know any measure developed during pandemic to ensure a good telecommunication networks performance? Have these measures had any impact on the digital divides?

Section 5. Challenges posed by Covid-19 pandemic for digital divides.

Question 9. What are the main challenges that Covid-19 pandemic has posed for bridging digital divides (insufficient bandwidth in internet connections, inadequate equipment, lack of digital skills, economic problems that prevent people from subscribing to better telecommunication services, etc.)?

Question 10. How have these challenges affected specific sectors and activities?

- **a.** Education
- **b.** Health
- **c.** Other public services
- **d.** Commerce
- **e.** Work
- **f.** Leisure

Section 6. Measures adopted to bridge digital divides during the pandemic.

Question 11. Would you highlight any specific measures developed during pandemic to bridge digital divides?

Question 12. Have these measures been effective? Have they solved the specific problems related to the digital divides for which they were defined?

Question 13. Has any collaboration been established with public institutions or private entities for the implementation of measures to bridge the digital divides? Which ones? Have been effective?

Question 14. What other measures could have been implemented to bridge the digital divides? Who should have led their implementation?

Section 7. Expected evolution of the digital divides.

Question 15. How do you expect the digital divides to evolve in the short and medium term? Will measures adopted during Covid-19 pandemic affect the evolution of digital divides?

Question 16. Should exceptional measures implemented during pandemic to bridge digital divides be maintained over time? Is there a risk of widening the digital divide if these measures are removed?

Section 8. Regulation adopted during the pandemic.

Question 17. Has any specific regulation been enacted during pandemic to ease the deployment of telecom services?

Question 18. Has any previously enacted regulation been of particular help in facilitating the adaptation of telecom operators to the exceptional circumstances due to the pandemic?

Section 9. Competition and prices.

Question 19. Has the pandemic triggered any competition issue in the telecom sector that could contribute to widening digital divides?

Question 20. Have prices of telecommunication services experienced any substantial modification during pandemic that could contribute to widening digital divides?

Section 11. Lessons learnt from the pandemic related to the digital divides.

Question 21. In your opinion, what are the main lessons that can be drawn from the impact of the pandemic on the digital divides?

Question 22. Are we now better prepared to fight against digital divides?

Question 23. Is there now more awareness about the issue of digital divides in society (governments, public and private institutions, the population, etc.)?

Section 12. Recommendations.

Question 24. What recommendations would you propose to bridge the digital divides after Covid-19 pandemic?

Questionnaire for civil society organisations working to close digital divides

Section 1. Evolution of the digital divide during the pandemic.

Question 1. In general, the academy, NGOs and civil society organisations affirm that the Covid-19 pandemic has worsened digital divides. Do you agree with this idea?

Question 2. What are the groups most affected by digital divides? Has the pandemic caused a setback or progress in bridging the digital divides for these specific groups?

Section 2. Causes of the digital divides.

Question 3. What are the main causes of digital divides?

Question 4. How has pandemic contributed to mitigate or worsen them?

Section 3. Impact of the digital divides.

Question 5. What are the most affected daily activities by digital divides?

Question 6. What are the implications of the digital divides for affected persons or groups?

Section 4. Telecommunication networks performance and digital divides.

Question 7. Data traffic substantially increased during Covid-19 pandemic, particularly during confinement periods. How would you consider telecommunication networks performance in terms of service availability and capacity?

Question 8. Do you know any measure developed during pandemic to ensure a good telecommunication networks performance? Have these measures had any impact on the digital divides?

Section 5. Challenges posed by Covid-19 pandemic for digital divides.

Question 9. What are the main challenges that Covid-19 pandemic has posed for bridging digital divides (insufficient bandwidth in internet connections, inadequate equipment, lack of digital skills, economic problems that prevent people from subscribing to better telecommunication services, etc.)?

Question 10. How have these challenges affected specific sectors and activities?

- **a.** Education
- **b.** Health
- **c.** Other public services
- **d.** Commerce
- **e.** Work
- **f.** Leisure

Section 6. Measures adopted to bridge digital divides during the pandemic.

Question 11. Would you highlight any specific measures developed during pandemic to bridge digital divides?

Question 12. Have these measures been effective? Have they solved the specific problems related to the digital divides for which they were defined?

Question 13. What other measures could have been implemented to bridge the digital divides? Who should have led their implementation?

Section 7. Expected evolution of the digital divides.

Question 14. How do you expect the digital divides to evolve in the short and medium term? Will measures adopted during Covid-19 pandemic affect the evolution of digital divides?

Question 15. Should exceptional measures implemented during pandemic to bridge digital divides be maintained over time? Is there a risk of widening the digital divide if these measures are removed?

Section 8. Impact of the pandemic on the digital divides for vulnerable groups.

Question 16. How has the digital divides evolved during the pandemic for vulnerable groups (elderly, persons with disabilities, illiterate people)?

Question 17. Digital skills are the cornerstone to close the digital divides. How has the pandemic favoured (or hindered) the acquisition of digital skills?

Question 18. What obstacles for digital inclusion of vulnerable groups have worsened (or improved) during the pandemic?

Question 19. What successful initiatives have been developed in Europe to improve digital inclusion of vulnerable groups during the pandemic?

Question 20. How has the pandemic affected the work of civil society organisations in bridging the digital divides?

Section 9. Lessons learnt from the pandemic related to the digital divides.

Question 21. In your opinion, what are the main lessons that can be drawn from the impact of the pandemic on the digital divides?

Question 22. Are we now better prepared to fight against digital divides?

Question 23. Is there now more awareness about the issue of digital divides in the society (governments, public and private institutions, the population, etc.)?

Section 10. Recommendations.

Question 25. What recommendations would you propose to bridge the digital divides after Covid-19 pandemic?

Questionnaire for academic experts

Section 1. Evolution of the digital divide during the pandemic.

Question 1. In general, the academy, NGOs and civil society organisations affirm that the Covid-19 pandemic has worsened digital divides. Do you agree with this idea?

Question 2. What are the groups most affected by digital divides? Has the pandemic caused a setback or progress in bridging the digital divides for these specific groups?

Section 2. Causes of the digital divides.

Question 3. What are the main causes of digital divides?

Question 4. How has pandemic contributed to mitigate or worsen them?

Section 3. Impact of the digital divides.

Question 5. What are the most affected daily activities by digital divides?

Question 6. What are the implications of the digital divides for affected persons or groups?

Section 4. Telecommunication networks performance and digital divides.

Question 7. Data traffic substantially increased during Covid-19 pandemic, particularly during confinement periods. How would you consider telecommunication networks performance in terms of service availability and capacity?

Question 8. Do you know any measure developed during pandemic to ensure a good telecommunication networks performance? Have these measures had any impact on the digital divides?

Section 5. Challenges posed by Covid-19 pandemic for digital divides.

Question 9. What are the main challenges that Covid-19 pandemic has posed for bridging digital divides (insufficient bandwidth in internet connections, inadequate equipment, lack of digital skills, economic problems that prevent people from subscribing to better telecommunication services, etc.)?

Question 10. How have these challenges affected specific sectors and activities?

- **a.** Education
- **b.** Health
- **c.** Other public services
- **d.** Commerce
- **e.** Work
- **f.** Leisure

Section 6. Measures adopted to bridge digital divides during the pandemic.

Question 11. Would you highlight any specific measures developed during pandemic to bridge digital divides?

Question 12. Have these measures been effective? Have they solved the specific problems related to the digital divides for which they were defined?

Question 13. What other measures could have been implemented to bridge the digital divides? Who should have led their implementation?

Section 7. Expected evolution of the digital divides.

Question 14. How do you expect the digital divides to evolve in the short and medium term? Will measures adopted during Covid-19 pandemic affect the evolution of digital divides?

Question 15. Should exceptional measures implemented during pandemic to bridge digital divides be maintained over time? Is there a risk of widening the digital divide if these measures are removed?

Section 8. Evidence about the digital divides.

Question 16. Is there any empirical evidence of the effects of the Covid-19 pandemic on the digital divides?

Question 17. According to academic research, what measures are most effective to bridge digital divides? Has the Covid-19 pandemic hindered the development of any of these measures?

Question 18. What countries have implemented the best strategies in bridging the digital divide? What are the main factors for their success?

Section 9. Lessons learnt from the pandemic related to the digital divides.

Question 19. In your opinion, what are the main lessons that can be drawn from the impact of the pandemic on the digital divides?

Question 20. Are we now better prepared to fight against digital divides?

Question 21. Is there now more awareness about the issue of digital divides in society (governments, public and private institutions, the population, etc.)?

Section 10. Recommendations.

Question 23. What recommendations would you propose to bridge the digital divides after Covid-19 pandemic?

Questionnaire for public agencies promoting digital inclusion

Section 1. Evolution of the digital divide during the pandemic.

Question 1. In general, the academy, NGOs and civil society organisations affirm that the Covid-19 pandemic has worsened digital divides. Do you agree with this idea?

Question 2. What are the groups most affected by digital divides? Has the pandemic caused a setback or progress in bridging the digital divides for these specific groups?

Section 2. Causes of the digital divides.

Question 3. What are the main causes of digital divides?

Question 4. How has pandemic contributed to mitigate or worsen them?

Section 3. Impact of the digital divides.

Question 5. What are the most affected daily activities by digital divides?

Question 6. What are the implications of the digital divides for affected persons or groups?

Section 4. Telecommunication networks performance and digital divides.

Question 7. Data traffic substantially increased during Covid-19 pandemic, particularly during confinement periods. How would you consider telecommunication networks performance in terms of service availability and capacity?

Question 8. Do you know any measure developed during pandemic to ensure a good telecommunication networks performance? Have these measures had any impact on the digital divides?

Section 5. Challenges posed by Covid-19 pandemic for digital divides.

Question 9. What are the main challenges that Covid-19 pandemic has posed for bridging digital divides (insufficient bandwidth in internet connections, inadequate equipment, lack of digital skills, economic problems that prevent people from subscribing to better telecommunication services, etc.)?

Question 10. How have these challenges affected specific sectors and activities?

- **a.** Education
- **b.** Health
- **c.** Other public services
- **d.** Commerce
- **e.** Work
- **f.** Leisure

Section 6. Measures adopted to bridge digital divides during the pandemic.

Question 11. Would you highlight any specific measures developed during pandemic to bridge digital divides?

Question 12. Have these measures been effective? Have they solved the specific problems related to the digital divides for which they were defined?

Question 13. What other measures could have been implemented to bridge the digital divides? Who should have led their implementation?

Section 7. Expected evolution of the digital divides.

Question 14. How do you expect the digital divides to evolve in the short and medium term? Will measures adopted during Covid-19 pandemic affect the evolution of digital divides?

Question 15. Should exceptional measures implemented during pandemic to bridge digital divides be maintained over time? Is there a risk of widening the digital divide if these measures are removed?

Section 8. Case studies across Europe.

Question 16. Could you identify successful projects aimed at improving digital inclusion promoted by any public administration in the EU? What are the main factors for their success?

Question 17. What instruments (financial aid, public-private cooperation, etc.) will be more suitable to keep promoting digital inclusion after Covid-19 pandemic?

Section 9. Lessons learnt from the pandemic related to the digital divides.

Question 18. In your opinion, what are the main lessons that can be drawn from the impact of the pandemic on the digital divides?

Question 19. Are we now better prepared to fight against digital divides?

Question 20. Is there now more awareness about the issue of digital divides in society (governments, public and private institutions, the population, etc.)?

Section 10. Recommendations.

Question 21. What recommendations would you propose to bridge the digital divides after Covid-19 pandemic?

Annex 5: Benchmarking of initiatives implemented across Europe to bridge digital divides and map of actors involved

Initiatives implemented at European, international and national level

European Level:

- **Connecting Europe Broadband Fund**[263]: pooled fund designed to finance broadband network infrastructure across underserved areas in Europe. It was launched in 2018 and intended to unlock €1bn over 5 years. It was the first investment platform to support broadband infrastructure under the European Fund for Strategic Investments (EFSI)[264].

[263] https://www.eib.org/en/press/all/2018-168-investment-plan-first-eu-fund-fully-dedicated-to-broadband-infrastructure-to-unlock-at-least-eur1-billion-over-5-years
[264] https://ec.europa.eu/eip/ageing/funding/EFSI_en.html

Main actors: EIB[265], European Commission, KfW, Cassa depositi e prestiti, Caisse des Dépôts, Cube Infrastructure Managers.

- **Path to the Digital Decade** [266] : (concrete plan to achieve the digital transformation of our society and economy by 2030). Collaboration of BEREC and NRAs with the European Commission to meet the objectives of connectivity.

  Main actors: European Commission (DG CONNECT), national bodies responsible of incentivising deployments, associations of telecom providers (ETNO, GSMA, etc.), consumers' associations (BEUC).

- **Digital Education Action Plan 2021-2027**[267]: cooperation to develop a high-performing digital education system by providing enhanced connectivity to schools and students. It is mainly referred to the action 4 (connectivity and digital equipment for education) of the priority 1 (fostering the development of a high-performing digital education ecosystem) of the plan.

  Main actors: European Commission (DG Education, Youth, Sport and Culture), Ministries of Education, associations from the education sector (European Students Union, European Association for the Education of Adults, etc.).

- **Digital Skills and Jobs Coalition**[268]: an EU initiative bringing together Member States, companies, social partners, non-profit organisations and education providers, who work to address the lack of digital skills in Europe.

  Main actors: European Commission (DG Employment, Social Affairs and Inclusion), Ministries of Employment, workers' associations (European Trade Union Confederation, etc.), business associations (BusinessEurope, etc.).

- **Digital Skills and Jobs Platform**[269]: this initiative aims to boost the digital competencies of European society and workforce to make Europe more competitive in the global digital economy through digital capacity-building. It has been launched under the Connecting Europe Facility Programme. The platform provides information about EU and national initiatives in digital skills and jobs, training opportunities, good practices and advice, as well as funding opportunities and financial instruments**.**

  Main actors: European Commission, European Schoolnet, DigitalEurope, LIKTA[270], European Digital SME Alliance, Public Libraries 2030.

- **Strategy for the Rights of Persons with Disabilities 2021-2030** [271] : collaboration to create the European resource centre AccesibleEU. Participation in the Disability Platform, which brings together responsible bodies at national and EU level to implement the Strategy (from 2022 onwards).

  Main actors: European Commission (DG Employment, Social Affairs and Inclusion), associations representing persons with disabilities (European

[265] European Investment Bank
[266] https://ec.europa.eu/commission/presscorner/detail/en/ip_21_4630
[267] https://ec.europa.eu/education/education-in-the-eu/digital-education-action-plan_en
[268] https://digital-skills-jobs.europa.eu/en
[269] https://digital-skills-jobs.europa.eu/en
[270] Latvian Information and Communications Technology Association
[271] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021DC0101&from=EN

Disability Forum, European Platform of Deafness, Hard of Hearing, and Deafblindness, European Council of Autistic People, Inclusion Europe, European Network on Independent Living, etc.)

International level:

- **Alliance for Affordable Internet**[272]: A global coalition working to make broadband affordable for all.

  Main actors: Institutional partners (ITU, Caribbean Telecommunications Union, Smart Africa, etc.), Global sponsors (Google and Sweden Sverige), private sector (Cisco, Ericsson, Facebook, Huawei, Intel, Microsoft, etc.), public sector (COMTELCA[273], CRASA[274], CTO[275], Department of State of USA, national ministries of communications), civil society organisations (Digital Society Foundation, Internet Society, World Wide Web Foundation, etc.)

- **EDISON Alliance**[276]: the World Economic Forum has launched the EDISON alliance, an open ecosystem to prioritise digital inclusion as foundational to the achievement of the SDGs. So far telecom NRAs are not participating in this initiative, which brings together digital companies, the Academia, national governments and civil society organisations.

  Main actors: World Economic Forum, private companies (Verizon, Mastercard, Vista Equity Partners, Google, Barclays, Dell, etc.), Ministries of communications, international organisations (UNICEF, UN, etc.)

- **Global Education Coalition**[277]: The initiative, launched by UNESCO, is a platform of collaboration and exchange to protect the right to education. Connectivity is one of its flagship areas in which NRAs can participate.

  Main actors: International organisations (WHO[278], UNHCR[279], ITU, OECD), private companies (Ericsson, Vodafone, IBM, Microsoft, Huawei, Telefónica, Qualcomm, etc.), non-profit organisations (Scholas Ocurrentes Pontifical Foundation, Sesame Workshop, Global Business Coalition for Education, etc.).

- **Connect 2030 Agenda for Global Telecommunications/ICT Development**[280]: 'Connect 2030' is the strategy implemented by ITU to improve connectivity across the World. It is intended to accelerate the achievement of the United Nations Sustainable Development Goals by 2030.

  Main actors: ITU, public bodies representing Member States.

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[272] https://a4ai.org/
[273] Regional Telecommunications Commission of Central America
[274] Communications Regulators' Association of Southern Africa
[275] Commonwealth Telecommunications Organisation
[276] https://www.weforum.org/the-edison-alliance
[277] https://en.unesco.org/covid19/educationresponse/globalcoalition
[278] World Health Organisation
[279] United National Refugee Agency
[280] https://www.itu.int/en/mediacentre/backgrounders/Pages/connect-2030-agenda.aspx#%3a~%3atext=The%20%27Connect%202030%20Agenda%20for%2cGoals%20%28SDGs%29%20by%202030.&text=ITU%27s%20Connect%202030%20Agenda%20%28PP-18%20Resolution%20200%2c%20Rev.

- **#eSkills4Girls platform** [281] : initiative launched to collect and disseminate information and knowledge as well as policy recommendations, good practices and flagship project on gender digital equality.

  Main actors: the initiative has been launched by G20 members together with UNESCO, UN Women, ITU and OECD.

- **Close the Digital Divides: Global Declaration on the Digital Response to COVID-19**[282]: The aim of this Ministerial Conference launched by Croatia was to provide an opportunity to discuss how countries can emerge stronger and better equipped from the COVID-19 crisis by using innovative and flexible digital solutions and working together as a global family.

  Main actors: 69 countries worldwide have signed the declaration.

National level:

All EU countries are currently implementing their Connectivity Toolboxes[283], with detailed plans and specific measures for the deployment of VHCN, notably fibre and 5G. Most NRAs have participated actively in the phases 1 (identification of and sharing best practices) and 2 (development and agreement of the Connectivity Toolbox). Member States are now developing the phase 3 (implementation of the Toolbox and reporting) and NRAs could still be involved, supervising the implementation, and contributing to the final reporting.

Albania

- **National Plan for Sustainable Development of Digital Infrastructure, Broadband 2020-2025** [284] : It is the national plan to improve the country's broadband infrastructure. The objectives of the plan are the sustainable development of broadband infrastructure, bridging the digital divide and providing broadband services, and increasing demand for the development of the digital economy and the gigabit society.

  Main actors: Ministry of Infrastructure and Energy, Ministry of Finance and Economy.

- **iSIGURT.al**[285]: It is The National Platform for Safe Internet for Children. The mission of the platform is to empower children, parents, teachers, and all citizens to use the Internet and other ways of technological communication positively, safely, and effectively. The objective of the platform is to promote the reporting of illegal sites and unwanted content.

[281] https://www.eskills4girls.org/
[282] https://vm.ee/en/close-digital-divides-digital-response-covid-19
[283] https://digital-strategy.ec.europa.eu/en/library/connectivity-toolbox-member-states-develop-and-share-roadmaps-toolbox-implementation
[284] https://www.infrastruktura.gov.al/wp-content/uploads/2020/07/National-Plan-BBand-EN.pdf
[285] https://www.isigurt.al/

Main actors: Center for the Protection of the Rights of the Child in Albania[286], several ministries of the Government of Albania, UNICEF, and other civil society organisations and private partners.

Austria

- **Digital Austria**[287]: The Austrian Federal Government's initiative for successful digitalisation in Austria. The plan aims to increase competitiveness, position Austria as a digital innovation region, leverage the use of information for innovations, shape education as a digital competitive advantage, specifically support cutting-edge digital research and facilitate communication between the state and citizens.

  Main actors: Federal Ministry for Digitization, Business associations.

- **fit4internet**[288]: Independent, non-partisan association whose aim is to qualify and quantify the digital literacy of the Austrian population. As a platform, it offers digital skills courses for young people, employees, those re-entering the workforce and seniors. Fit4internet also develops the Austrian digital skills certification system according to the EU DigComp. In addition, the Federal Ministry for Digital and Economic Affairs entrusted fit4internet with the establishment and chairmanship of the Task Force Digital Competences.

  Main actors: Federal Ministry for Digital and Economic Affairs, fit4internet.

- **Let's go digital**[289]: the project funded by the Austrian Federal Ministry for Digitalisation and Economic Affairs aims to connect and equip non-profit organisations who support migrants, refugees, low-qualified or people with learning disabilities to develop and offer training which will strengthen the digital literacy of these target groups and hence overcome the digital skills gap.

  Main actors: Federal Ministry for Digital and Economic Affairs, TechSoup[290], Fundraising Association Austria[291], Future Learning Lab Wien[292].

Belgium

- **'Digital for Development' policy** [293] : strategic policy from the Belgian development cooperation to increase the impact of the Sustainable Development Goals (SDGs) through three main priorities: better use of (big) data; digital for inclusive societies; digital for inclusive and sustainable economic growth.

[286] https://www.crca.al/sq
[287] https://www.digitalaustria.gv.at/
[288] https://www.fit4internet.at/page/home
[289] https://www.techsoupeurope.org/austria-training-to-overcome-digital-skills-gap/
[290] https://www.techsoupeurope.org/
[291] https://www.fundraising.at/
[292] https://www.fll.wien/angebot/lets-go-digital/
[293] https://diplomatie.belgium.be/sites/default/files/downloads/strategic_note_d4d.pdf

Main actors: Belgian Government, BTC[294], BIO[295], World Bank.

- **Digital Wallonia 2019-2024**[296]: the digital strategy of the Government of Wallonia region, which sets the framework for the actions of the Government in terms of digital transformation.

  Main actors: the Government of Wallonia[297], Digital Council[298].

- **Flemish Reform Programme 2020**[299]: Regional reform programme that includes measures to address specific national recommendations of the Council of the European Union[300]. In line with the third recommendation, the Government of Flanders includes in the programme the state of the art in digitisation as well as related upcoming initiatives.

  Main actors: Government of Flanders, Flanders Information Agency[301].

- **The Digital Public Space**[302]: a non-profit public place that offers a public program of access, initiation and support to information and communication technologies. The service consists of equipping public spaces in municipalities of Brussels-Capital Region with computer equipment facilitating the access to free computer training.

  Main actors: Computer Centre for the Brussels Region[303], and the municipalities of the Brussels-Capital Region.

- **1819 Women in Tech Brussels**[304]: is a female ecosystem to empower women in technology and innovation. A public-private collaboration.

  Main actors: Brussels-Capital Region[305], 1819 Women in Business Brussels[306], 1819 Hub Brussels[307].

Bosnia and Herzegovina

- **Digital Transformation Programme 2020-2024**[308]: in September 2020, the British Embassy in Sarajevo and the United Nations Development Programme in Bosnia and Herzegovina signed a Memorandum of Understanding to launch a

294 Belgian Development Agency
295 Belgian Investment Company
296 https://www.digitalwallonia.be/en/digital-strategy
297 https://www.wallonie.be/en
298 https://www.digitalwallonia.be/en/digital-council
299 https://www.flandersineu.be/sites/default/files/atoms/files/Flemish%20Reform%20Programme%202020_0.pdf
300 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0501&from=EN
301 https://overheid.vlaanderen.be/informatie-vlaanderen
302 https://cirb.brussels/fr/nos-solutions/learning-solutions/epn
303 https://cirb.brussels/fr
304 https://www.womenintech.brussels/
305 https://be.brussels/brussels
306 https://www.womeninbusiness.brussels/
307 https://1819.brussels/en
308 https://www.ba.undp.org/content/bosnia_and_herzegovina/en/home/presscenter/articles/2020/undp-and-british-embassy-launch-programme-to-boost-digital-trans.html

USD 5 million four-year digital transformation programme to support improvement and modernisation of public services in Bosnia and Herzegovina.

Main actors: British Embassy in Sarajevo, UNDP in Bosnia and Herzegovina.

- **Economic Reform Programme 2021-2023** [309] : A national plan for the comprehensive reform of the Bosnian economy. The reform addresses digital transformation in business, public administration and services, and education.

  Main actors: several ministries of the Government of the Federation of Bosnia and Herzegovina.

Bulgaria

- **Digital Bulgaria 2025** [310]: it is the continuation of the Digital Bulgaria 2015 programme. Bearing in mind the achievements of the previous programme and the new European strategic and programming guidelines, the programme focuses on establishing appropriate conditions for the development and accessibility of digital networks and services, developing the digital economy, improving digital skills, ensuring quality public services, promoting a secure digital ecosystem and the e-governance.

  Main actors: Ministry of Transport, Information Technology and Communication.

- **Digital transformation of Bulgaria 2020-2030**[311]: is the national strategy for the digital transformation of the country towards 2030. The objectives of the strategy are the deployment of secure digital infrastructures, access to appropriate technological knowledge and digital skills, strengthening research and innovation capacity, unlocking the potential of data, digitisation for a circular and low-carbon economy, and improving the efficiency of public administration and the quality of public services.

  Main actors: Ministry of Transport, Information technology and Communications.

- **Connected Bulgaria; Updated National Broadband Infrastructure Plan for Next Generation Access** [312] : is the continuation of the previous national broadband plan (2014) updated with the requirements of the EU Commission and related new strategic documents. Its priorities include building broadband infrastructure, bridging the digital divide and network security, among others.

  Main actors: Ministry of Transport, Information technology and Communications.

[309] http://www.dep.gov.ba/naslovna/Archive.aspx?pageIndex=1&langTag=en-US
[310] https://www.mtitc.government.bg/en/category/85/national-program-digital-bulgaria-2025-and-road-map-its-implementation-are-adopted-cm-decision-no73005-12-2019
[311] https://www.mtitc.government.bg/sites/default/files/digital_transformation_of_bulgaria_for_the_period_2020-2030_f.pdf
[312] https://www.mtitc.government.bg/sites/default/files/updatedngaplanconnectedbulgaria.pdf

Croatia

- **National Development Strategy 2030**[313]: is the national strategic action plan for the period with horizon 2030. It consists of four development areas. One of them is the green and digital transition. Among its strategic goals is the digital transition of society and the economy, which encompasses the digitisation of the economy, public administration and justice and the development of broadband and digital skills and jobs.

  Main actors: Government of the Republic of Croatia, Steering Committee for the Elaboration of the National Development Strategy of the Republic of Croatia.

- **National Plan for the Development of Broadband Access in the Republic of Croatia in the Period from 2021 to 2027**[314]: the Plan is a continuation of previous broadband strategies (last 2016-2020). Its main objective is to further develop broadband access, intensifying activities to remove the obstacles and shortcomings observed so far.

  Main actors: Ministry of the Sea, Transport and Infrastructure, Broadband Competence Office.

Cyprus

- **e-Government Projects 2020-2025**[315]: Cyprus has an extensive list of projects (24) for the digitisation of the administration for the period 2020-2025. Seventeen projects have a direct impact on the services provided to citizens and businesses.

  Main actors: Deputy Ministry of Research, Innovation and Digital Policy.

- **'Cyprus – Tomorrow' Plan**[316]: Within the framework of the EU-backed recovery and resilience strategy, called 'Cyprus – Tomorrow', the government intends to invest €283 million to digitalise its economy. €53 million will be devoted to improving connectivity and broadband infrastructure and €20 million for projects to upgrade digital skills.

  Main actors: Ministry of Innovation

Czech Republic

- **Innovation Strategy of the Czech Republic 2019-2030**[317]: this national strategy on innovation includes issues such as improving education by addressing digital competences and skills development for the labour force and information and

[313] https://hrvatska2030.hr/

[314] https://mmpi.gov.hr/promet/elektronicke-komunikacije-126/dokumenti-8279/8279

[315] https://www.dmrid.gov.cy/dmrid/research.nsf/all/5A9F4413066E4589C22586140032A64F?opendocument

[316] http://www.cyprus-tomorrow.gov.cy/cypresidency/kyprostoavrio.nsf/all/B37B4D3AC1DB73B6C22586DA00421E05/$file/Cyprus%20RRP%20For%20Upload%2020052021.pdf?openelement

[317] https://www.mzv.cz/file/3569261/Innovation_Strategy_of_the_CR_2019_2030._The_Country_for_the_Future.pdf

communication technology (ICT) experts. It also envisages digital transformation in a broad sense by setting goals such as online public services, preparing society for new technological trends (IoT, AI, etc.) or the digitisation of SMEs.

Main actors: prepared by the Council for Research, Development and Innovation [318] . Institutions involved: Government Council for Information Society[319], Ministry of Industry and Trade, Ministry of the Interior, Office of the Government of the Czech Republic, Ministry of Education, Youth and Sports, Ministry of Agriculture.

- **Digital Czech Republic**[320]: is a cross-sectional strategic document divided in three pillars. Ensuring a unified and innovative approach of the Czech Republic to the digital agenda at EU level, digitization in the area of the exercise of official authority at national level, and digital economy and society as a key and cross-cutting strategy for the digitization of the whole society.

  Main actors: Government Council for the Information Society, headed by the Government Commissioner for Information Technology.

- **Implementation and Development of 5G Networks in the Czech Republic**[321]: the aim of this plan is to define the strategic approach of the Czech Republic to the deployment and use of 5G networks.

  Main actors: Government of the Czech Republic, Ministry of Industry and Trade.

- **National Plan for the Development of Very High Capacity Networks**[322]: This national plan contains, on the one hand, indications on the preconditions necessary to facilitate investment in very high capacity networks and, on the other hand, defines the strategic procedure of the Czech Republic in the construction of these networks and, at the same time, direct support from public sources while minimising interference with competition.

  Main actors: Government of Czech Republic, Ministry of Industry and Trade, Ministry of Transport.

Denmark

- **Strategy for Denmark's Digital Growth**[323]: this national strategy, with horizon 2025, is structured around six strategic initiatives. Digital hub for a stronger growth environment, digital enhancement of SMEs, digital skills for all, data as a driver of growth in trade and industry, agile regulation of trade and industry, and strengthened cyber security in companies.

[318] https://www.vyzkum.cz/
[319] https://www.mvcr.cz/clanek/rada-vlady-pro-informacni-spolecnost.aspx
[320] https://www.mpo.cz/en/business/digital-society/digital-czech-republic--243601/
[321] https://www.mpo.cz/assets/cz/e-komunikace-a-posta/elektronicke-komunikace/koncepce-a-strategie/narodni-plan-rozvoje-siti-nga/2020/1/Implementace-a-rozvoj-siti-5G-v-CR-EN.pdf
[322] https://www.mpo.cz/assets/cz/e-komunikace-a-posta/elektronicke-komunikace/koncepce-a-strategie/narodni-plan-rozvoje-siti-nga/2021/3/149908-21_III_mat_VHCN_EN.pdf
[323] https://eng.em.dk/media/10566/digital-growth-strategy-report_uk_web-2.pdf

Main actors: Danish Government and a ministerial group composed by the Ministry for Industry, Business, and Financial Affairs, the Ministry for Higher Education and Science, the Ministry Education and the Ministry for Employment.

- **Technological Pact**[324]: launched by the Danish Government in 2018, the initiative involves the government, businesses, educational and research institutions, business organisations, non-profit organisations and private foundations joining forces to implement projects and activities to strengthen the technical and digital skills of the workforce and to attract more young people to STEM education.

  Main actors: Ministry of Business Affairs, Ministry of Education and Research, Ministry of Children and Education, Ministry of Employment.

Estonia

- **Estonia 2035**[325]: is the long-term development strategy of Estonia. Digitisation is omnipresent in the document, calling for an improvement and deepening of the digitisation process in areas such as education, business, healthcare, e-governance, etc.

  Main actors: Riigikogu (Estonian Parliament) and the Government of the Republic.

Finland

- **Programme for the Promotion of Digitisation (2020-2023)**[326]: this Government Programme has set the objective for Finland to become pioneer in developing and introducing opportunities for digitalisation and technological development across administrative and industry boundaries.

  Main actors: Government of Finland, Ministry of Finance, Digital and Population Data Services Agency[327], municipalities.

France

- **National Strategy for inclusive digital technology**[328]: the main goal of the strategy is to guarantee the access to the digital society (specifically to digital public services) to all citizens, in particular to those with difficulties using digital services. The strategy follows 5 steps: (1) detect the groups; (2) accompanying them in the process of using digital technology; (3) guide them to make them autonomous in the use of digital technologies; (4) consolidate the actors who provide digital training; (5) equip and support digital inclusion programs. It offers

[324] https://www.teknologipagten.dk/
[325] https://www.valitsus.ee/en/node/31
[326] https://vm.fi/en/programme-for-the-promotion-of-digitalisation
[327] https://dvv.fi/en/individuals
[328] https://societenumerique.gouv.fr/plannational/

diverse services such as the Caregiver Kit[329], aimed to help caregivers to support individuals in difficulties with digital tools, and Carto[330], a mapping of digital training and mediation places.

Main actors: Secretary of State of Digitalisation, Banque des Territoires, Orange, BNP Paribas, Veolia Eau, Crédit Agricole, regional governments.

- **Digital Society Mission**[331]: this governmental initiative works to accelerate the digital skills development of the French population and to support the digital transition of territories, guaranteeing the equally access of citizens to public services and digital opportunities.

  Main actors: Ministry of Economy and Finance, regional governments, MedNum[332].

- **Cooperative of digital mediation players** [333] : The cooperative, called 'MedNum', brings together the network of actors who have been working for those excluded from digital technologies. The cooperative has implemented several projects[334] to foster digital inclusion in France.

  Main actors: Simplon.co, French government, Association 'Adrets', #APTIC, associations working on digital inclusion, digital companies, individual experts.

Germany

- **Digital Strategy 2025 Germany**[335]: Launched in 2016, the Digital Strategy 2025 includes the rollout of gigabit fibre networks and the introduction of digital education to all phases of life as main measures to address digital divides in the country.

  Main actors: Federal Ministry for Economic Affairs and Energy, digital companies, education institutions, and telecom operators.

- **MINT Networking Center Germany**[336]: This is the service and contact point for the community of STEM (MINT in German) actors in Germany. It is the successor of the National Pact for Women in MINT (STEM) Professions, which was funded until August 2021 by the Federal Ministry of Education and Research. The goal of this initiative is to boost the potential of women for STEM careers in view of the shortage of skilled workers.

  Main actors: Federal Ministry of Education and Research, Körber Foundation, National MINT Forum, University of Regensburg, matrix gGmbH.

[329] https://kit-inclusion.societenumerique.gouv.fr/
[330] https://carto.societenumerique.gouv.fr/
[331] https://societenumerique.gouv.fr/la-mission/
[332] https://lamednum.coop/
[333] https://lamednum.coop/
[334] https://lamednum.coop/nos-actions/
[335] https://www.de.digital/DIGITAL/Redaktion/EN/Publikation/digital-strategy-2025.pdf?__blob=publicationFile&v=9
[336] https://mint-vernetzt.net/#ziele

- **Digital Strategy of the Federal Ministry for Education and Research**[337]: with this strategy, the German government seeks to foster digital change in five key areas: strengthen digital education and training, generate knowledge and innovations from data, ensure technological sovereignty and scientific leadership, create security and trust, as well as live and work better and more sustainably.

  Main actors: Federal Ministry for Education and Research, education institutions, research organisations, and digital companies.

Greece

- **Digital Transformation Strategy for 2020-2025**[338]: The strategy sets the objectives and priorities for the digital transformation of the country. Among the priorities, some of them directly address the main causes of the digital divides. The first priority is to provide safe, fast and reliable access to the internet for all. Diverse initiatives are being developed to foster VHCN rollouts. Another priority is the development of digital skills for all citizens, including several programs targeting specific groups. NRA can collaborate in these actions.

  Main actors: Ministry of Digital Governance.

- **Greek National Coalition for Digital Skills and Jobs**[339]: the National Coalition is a cooperation platform which seek to improve digital skills in every sector of the Greek economy and society.

  Main actors: Ministry of Digital Governance, Federation of Hellenic Information Technology and Communications Enterprises, Onassis Foundation, National Documentation Centre, Cisco, Microsoft, Region of Crete, City of Athens, and Oracle Academy.

Hungary

- **Digital Success Program 2030**[340]: The program continues the work already done by its predecessors DSP1.0 and DSP2.0. The program includes several initiatives to bridge digital divides such as the Digital Education Strategy, the Elderly Affairs Program, or the Digital Success Package for affordable access, among others. The programme centralises all activities at national level to fight the digital divide. During the pandemic several initiatives, described in the Hungarian case study, were launched

  Main actors: Ministry of Innovation and Technology, Association of Information Technology, Telecommunications and Electronics Enterprises, Scientific Association for Infocommunications, Association for Informatics for Society, Communications Interest Reconciliation Council.

[337] https://www.bmbf.de/upload_filestore/pub/BMBF_Digitalstrategie.pdf
[338] https://digitalstrategy.gov.gr/
[339] https://www.nationalcoalition.gov.gr/en/national-coalition_en/
[340] https://digitalisjoletprogram.hu/en/about

- **Digital Collaboration initiative**[341]: The initiative matches offerings from actors in the digital sector with the needs for services and equipment of teachers, students, schools, school districts, parents, workers, employers, and the elderly.

  Main actors: Ministry of Innovation and Technology, the Hungarian 5G Coalition (5GK), the Artificial Intelligence Coalition (MI Coalition), the Communications Conciliation Council (HÉT), the IVSZ-Association for the Digital Economy, the Association for Informatics for Society (Infotér), János Neumann Computer Science Society (NJSZT).

- **National Digitisation Strategy 2021-2030**[342]: the strategy is focused in four main pillars, of which two are directly related to bridging the digital divide: digital infrastructure; digital skills; digital economy; and digital state.

  Main actors: Ministry of Innovation and Technology, Ministry of the Interior.

Ireland

- **Technology Skills 2022**[343]: this action plan is a collaboration between the Irish Government, the education and training system and industry to meet Ireland's high-level ICT skills needs. The aim is to increase the number of qualified graduates in computer science and electronic and electrical engineering to support and boost the country's economic performance in the coming years.

  Main actors: Mainly High-Level Steering Group, Department of Education and Skills, Department of Business, Enterprise and Innovation.

- **STEM Education Policy 2017-2026**[344]: is a reform of the education system of Ireland. The reform is structured around four pillars: encouraging student engagement and participation in STEM, enhance teacher and early years practitioner capacity in the delivering of STEM education, supporting STEM education practice, and using evidence to support STEM education.

  Main actors: Department of Education, Curriculum and Assessment Policy Unit in the Department, STEM Education Implementation Group.

- **National Disability Inclusion Strategy 2017-2021**[345]: is a coordinated and planned approach, across Government Departments, to promote greater inclusion by people with disabilities in Irish society.

  Main actors: Department of Children, Equality, Disability, Integration and Youth, and the National Disability Strategy Implementation Group.

[341] https://felajanlas.digitalisjoletprogram.hu/
[342] https://2015-2019.kormany.hu/download/f/58/d1000/NDS.pdf
[343] https://assets.gov.ie/24702/90df5645cbac4ed3bf6fa6f832507933.pdf
[344] https://www.gov.ie/en/policy-information/4d40d5-stem-education-policy/#stem-education-policy-statement-2017-2026
[345] https://www.gov.ie/en/publication/8072c0-national-disability-inclusion-strategy-2017-2021/

Italy

- **Digital Republic**[346]: National strategy promoted by the Department for digital transformation of the Presidency of the Council of Ministers within the framework of the "Italy 2025" strategy. The strategy is aimed at addressing the digital divide in the country. The National Coalition for digital skills has been created under this strategy. Several projects[347] have been launched to address the lack of digital skills among Italian population.

  Main actors: Ministries of Cultural Heritage and Tourism, Education, Labor and Welfare, Agricultural and Forestry Policies, Youth and Sport Policies, Public Administration, Economic Development, University and Research. Conference of Regions, UPI[348], ANCI[349], AgID[350], business chambers, universities (CRUI[351]), RAI[352], citizens associations.

- **National Strategy for Digital Skills**[353]: the strategy and its "Operational Plan" are aimed at providing a comprehensive response on the issue of digital skills. The initiative is part of the "Digital Republic" strategy.

  Main actors: Ministry for Technological Innovation and Digitisation, regional and local governments, universities, research institutes, RAI.

- **Strategy for technological innovation and digitisation of the country 2025**[354]: the strategy pursues three main goals: (1) the digitisation of the society; (2) the innovation of the country; (3) the sustainable and ethical development of society as a whole. The action plan includes 20 actions to transform de country. Actions A16 (Shared, safe, reliable and green digital infrastructures) and A19 (an elderly person, a tablet and a smile for digital inclusion) are directly aimed at tackling the first level of the digital divide.

  Main actors: Ministry for Technological Innovation and Digitisation.

Kosovo

- **Women in ICT**[355]: launched by the Ministry of Economic Development, the initiative aims to open doors to women's formal employment in the ICT sector, as Kosovo stands committed to pursuing digital economy as one of its greatest priorities.

  Main actors: Ministry of Economic Development, World Bank.

[346] https://repubblicadigitale.innovazione.gov.it/it/
[347] https://repubblicadigitale.innovazione.gov.it/it/i-progetti/#
[348] Unione delle Province d'Italia
[349] Associazione Nazionale Comuni Italiani
[350] Agenzia per l'Italia digitale
[351] Conferenza dei Rettori delle Università italiane
[352] Radiotelevisione Italiana
[353] https://repubblicadigitale.innovazione.gov.it/it/le-azioni/#documenti
[354] https://docs.italia.it/italia/mid/piano-nazionale-innovazione-2025-docs/it/stabile/index.html
[355] https://www.worldbank.org/en/news/press-release/2015/10/28/kosovo-world-bank-ict-perspective-for-young-women-in-rural-areas

- **EU Support for the Competitiveness of Kosovo's ICT Sector**[356]: This initiative's overall objective is to enhance the competitiveness of Kosovo's digital and traditional businesses by supporting the growth of Kosovo's Information and Communication Technology (ICT) sector, paving the way for growth and new job creation. The project is focused on providing trainings and courses on ICT, Digital Skills and Business management.

  Main actors: EuropeAid, Ministry of Economic Development, Employment Agency of the Republic of Kosovo, STIKK, Innovation Centre Kosovo[357].

Latvia

- **Digital Skills Development Programme 2021-2022**[358]: the idea of the project is based on the Baltic Digital Skills Development Initiative, providing more than 9.800 people from all three Baltic countries with Business and Data Analysis courses, as well as Codeless and small code programming courses, testing the skills acquired at the end of the course in practice in real companies.

  Main actors: Innovation Center of the University of Latvia, Latvian Information and Communication Technology Association[359].

- **Latvia Cybersecurity Strategy 2019-2022**[360]: is a cybersecurity policy at national level which aims to strengthen and improve the cybersecurity capabilities of the public and private sector by boosting resilience against cyber-attacks and enhancing public awareness of existing online threats.

  Main actors: cooperation and engagement between public and private sector actors.

Liechtenstein

- **Digital-liechtenstein.li**[361]: is the central platform for digital innovation and networking for Liechtenstein. The initiative is sponsored by the Prince's House and the Government and is supported by more than 50 recognized companies and organizations who want to jointly develop Liechtenstein into a leading digital business location. The initiative began in autumn 2017 with the five themes and fields of action: Network & Politics, Communication, Talents, Events, and Startups & Innovations.

  Main actors: House of Liechtenstein, Government of Liechtenstein.

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356 https://ictkosovo.eu/about-us/
357 https://ickosovo.com/
358 https://www.lumic.lu.lv/en/baltic-digital-skills-development-programme/digital-skills-development-programme-2021-2022/
359 https://likta.lv/en/home-en/
360 https://www.mod.gov.lv/sites/mod/files/document/Cybersecurity%20Strategy%20of%20Latvia%202019_2022.pdf
361 https://www.digital-liechtenstein.li/

Lithuania

- **National Digital Coalition**[362]: in 2017 the Ministry of Transportation and Communication relaunched the National Digital Coalition, whose main goal is to reduce the shortage of IT professionals, to attract more young people to choose STEM studies and to raise awareness of the importance of digital skills and competences.

  Main actors: Ministry of Transportation and Communication, Ministry of Social Security and Labour, Ministry of Education and Science, Association 'Langas į ateitį', Association 'Infobalt', Vilnius University, Kaunas University of Technology, National Association of Distance Education, Lithuanian Computer Society, Lithuanian Municipal Public Library Association, Lithuanian Computer Science Teachers Association.

- **Connected Lithuania**[363]: the program intends to promote digital skills among specific groups of the Lithuanian population (mainly elderly persons) who have not yet used the internet. The program brings together a community of digital leaders, including librarians, internet access points and e-scouts who help people with low digital skills to discover the benefits of the internet.

  Main actors: Association 'Langas į ateitį', public libraries, municipalities.

- **GovTech Lab**[364]: the main goal of GovTech Lab is to connect public sector institutions that have challenges and teams with innovative ideas and capabilities in entrepreneur community, academia, or NGO. It helps public sector identifying challenges and finding ideas or solutions to solve them. To achieve this, GovTech Challenge Series have been developed, a structured programme to build GovTech solutions solving the most pressing challeges.

  Main actors: Agency for Science, Innovation and Technology, of Lithuania, European Regional Development Found.

- **Sunrise Valley Digital Innovation Hub**[365]: aims to become a leading industry digitalisation service centre in the Baltics. With a mission to bridge ICT sector related R&D, big industries and SMEs in traditional sectors. SV DIH seeks to reinforce the biggest integrated science, studies and business campus in Lithuania, Sunrise Valley.

  Main actors: Sunrise Valley Science and Technology Park, Vilnius University, Vilnius Gediminas Technical University, Vilnius city municipality, Lithuanian Confederation of Industrialists.

Luxembourg

- **Digital Luxembourg**[366]: is an ongoing public initiative aimed to strengthen Luxembourg's digitalisation via three key missions: enabling new projects,

[362] http://www.skaitmeninekoalicija.lt/en/about/
[363] https://digital-skills-jobs.europa.eu/en/inspiration/good-practices/connected-lithuania
[364] https://govtechlab.lt/
[365] https://ssmtp.lt/en/sunrise-valley-digital-innovation-hub/
[366] https://digital-luxembourg.public.lu/

supporting existing initiatives and disseminating information on developments within the national tech sphere.

Main actors: 60 public and private sector stakeholders, including Ministries and governmental organizations, NGO sector and international businesses.

- **Fit4Digital**[367]: the initiative helps SMEs wishing to take advantage of information and communication technologies in order to gain competitiveness.

  Main actors: Government of Luxembourg.

- **Digital Volunteers Programme**[368]: aims to support European SMEs in their digital transformation journey by growing their employees' digital competences, with dedicated and skilled mentors from larger businesses. The digital mentors will apply their digital skills, knowledge and experience to solve a specific challenge related to digitalisation identified by jointly by the mentee company and its mentor.

  Main actors: POST Luxembourg Group.

- **Digital inclusion Luxembourg** [369] : non-profit organisation which develops several projects to help people improve their digital skills and access to digital equipment.

  Main actors: Ministry of Labour, US Embassy, European Union Social Fund.

- **WIDE** [370] : Women in Digital Initiatives Luxembourg Asbl is a non-profit organisation initiated in Luxembourg in 2013 and officially founded in 2014, currently acting as WIDE (Women in Digital Empowerment) in order to empower women with and thanks to digital as well as to increase the number of women seizing their opportunities in the digital economy and society.

  Main actors: Ministry of Gender Equality, Digital Luxembourg, Erasmus+, Fin Corp, Banque Internatioanle à Luxembourg, Technoport (business incubator).

Malta

- **National eSkills Strategy 2019-2021**[371]: the strategy addresses existing skills gaps in the country. It is aimed at complementing initiatives at both local and EU level. The strategy encompasses 12 main areas to improve digital skills.

  Main actors: Secretariat for Financial Services, Digital Economy and Innovation within the Office of the Prime Minister, eSkills Malta Foundation.

[367] https://www.luxinnovation.lu/innovate-in-luxembourg/performance-programmes/fit-4-digital/
[368] https://pledgeviewer.eu/pledge/initiative/696
[369] https://digital-inclusion.lu/
[370] https://wide.lu/
[371] https://eskills.org.mt/en/nationaleskillsstrategy/Documents/National_eSkills_strategy.pdf

Montenegro

- **Smart Specialization Strategy (2019-2024)**[372]: Smart Specialisation Strategy – S3 is a tool providing instructions on how to stimulate most effectively economic and social development, relying on research and innovation as the dominant development drivers in the global economy.

  Main actors: Joint Research Centre, Instrument of Pre-Accession Assistance[373].

- **Program for Encouraging Innovative Start-ups in Montenegro (2019-2021)**[374]: The aim is to enhance the business performance of micro, small and medium-sized enterprises through co-financing the use of consulting services in the implementation of innovative activities.

  Main actors: Ministry of Science, Ministry of the Economy, Instrument of Pre-Accession Assistance.

- **2021-2025 Digital Transformation Strategy of Montenegro**: The strategy which is going to drive digital transformation of the country is currently being drafted.

The Netherlands

- **Dutch Digitalisation Strategy**[375]: to foster digital inclusion for all citizens. The Dutch Digitalisation Strategy is broad in scope: from digitisation in domains ranging from agriculture and care to government, from digital skills to cyber security, and from ground-breaking research to ethical issues.

  Main actors: State Secretary for Economic Affairs and Climate Policy, Ministry of Justice and Security, Ministry of the Interior and Kingdom Relations

- **Digital Government Agenda**[376]: to incentivise investments in digitalisation and improve digital access. The Agenda focuses on public-private partnership to boost digital participation, use technology to make things better and stimulate innovations

  Main actors: Ministry of the Interior and Kingdom Relations.

- **Tel mee met Taal**[377]: (Count with Language) is a program relating to Digital Skills.[378] Tel mee met Taal ensures that as many people as possible have sufficient basic skills to be able to participate fully in our society. It does this by

[372] Smart Specialisation Strategy of Montenegro 2019-2024 • (senat.me)
[373] https://ec.europa.eu/regional_policy/en/funding/ipa/
[374] https://www.itu.int/en/myitu/News/2020/07/14/09/46/How-Montenegro-is-boosting-digital-innovation
[375] https://www.nederlanddigitaal.nl/documenten/publicaties/2019/11/13/english-version-of-the-dutch-digitalisation-strategy-2.0
[376] https://www.digitaleoverheid.nl/overzicht-van-alle-onderwerpen/nldigibeter/
[377] https://www.telmeemettaal.nl/

encouraging adults to work on their basic skills, and by encouraging children to develop sufficient basic skills.

Main actors: Ministries of Education, Culture and Science, Ministry of Interior and Kingdom Relations, Ministry of Social Affairs and Employment, Ministry of Health, Welfare and Sport.

North Macedonia

- **MladiHUB – Digital Youth**[379]: the project seeks to provide digital skills for young people to help them incorporate the digital society and economy. It includes the creation of a platform to allow young people discovering job opportunities in the digital sector.

  Main actors: National Youth Council of Macedonia, MASIT[380], the President of Republic of North Macedonia.

- **National Operational Broadband Plan**[381]: launched in 2019, the plan intends to harmonise the country's national policies on electronic communications with EU policies. The plan sets the broadband objectives and defines the measures required to achieve those objectives.

  Main actors: Ministry of Information Society and Administration.

Norway

- **Restructuring Motor – Digital competence enhancement**[382]: national digital competence programme for SMEs. The programme offers a two-day training/workshop for SMEs tailored to the specific needs of each participant. The programme focuses on 1) increase the general knowledge of what it takes to succeed through digitization; 2) increase the contextual understanding of how digitization affects the company's business model; 3) increase the SMEs ability to utilise innovative methods for product and service design/development; 4) implement changes in the business. In the end, the program also collaborates to improve digital skills of SME's workers.

  Main actors: Digital Norway, Interreg Europe Skills (European Regional Development Fund), Innovation Norge, DigitalNorway and other innovation companies such as Proneo AS.

- **Development of digital networks in non-commercial areas**[383]: the projects are an example of good cooperation between municipality, County Council, SMEs

[379] https://masit.org.mk/wp-content/uploads/2019/11/one-pager-mladihab-project-nmsm-eng.pdf
[380] Information and Communication Technologies Chamber of Commerce
[381] https://mioa.gov.mk/sites/default/files/pbl_files/documents/reports/north_macedonia_national_operational_broadband_plan_final_en.pdf
[382] https://www.interregeurope.eu/policylearning/good-practices/item/3837/restructuring-motor-digital-competence-enhancement/
[383] https://www.interregeurope.eu/policylearning/good-practices/item/3836/development-of-digital-networks-fixed-and-mobile-in-non-commercially-viable-areas/

and Telecom. Areas that still lack coverage, either fixed or mobile, must be expanded with public subsidies. From 2020, the county council has assumed responsibility in relation to be a driver, coordinator and facilitator in collaboration with the municipalities. This will ensure that businesses, households and other areas where people travel should have access to a timely and stable network.

Main actors: Trøndelag County Council, municipalities, Interreg Europe.

Poland

- **The Digital Competence Development Programme 2020-2030** [384] : The programme focuses on digital skills development for citizens, information and communication technology (ICT) sector specialists, employees of small and medium-sized enterprises (SMEs), as well as public administration and national bodies.

  Main actors: Digital Affairs – Chancellery of the Prime Minister, local municipalities, entrepreneurs, employer organisations and representatives from the education sector and science and research.

- **Future Industry Platform**[385]: It is a State Treasury Foundation established by the Polish Ministry of Entrepreneurship and Technology as the answer to the low level of knowledge and awareness of the SMEs regarding the potential of digital transformation, especially in production processes and business models based on them.

  Main actors: Platform State Treasury Foundation, European Union (Interreg).

Portugal

- **Portugal INCoDe.2030** [386] : an integrated public policy initiative aimed at enhancing digital competences. The INCoDe.2030 initiative has a broad scope in its drive towards digital development, starting with the promotion of digital inclusion and literacy, educating the young generations from an early age, qualifying the active population and specialising its graduates for advanced digital jobs, and to turn the country into a net contributor for the new digital developments.

  Main actors: Directorate-General for Statistics in Education and Science (DGEEC), Ministry of Education. National Institute for Statistics (INE).

- **Portugal Digital**[387]: is the Portugal's Action Plan for Digital Transition. The three pillars of the Plan are: capacity building and digital inclusion, digital transformation of businesses, and digitisation of public services.

[384] https://www.gov.pl/web/cyfryzacja/kompetencje-cyfrowe
[385] https://www.interregeurope.eu/policylearning/good-practices/item/4780/future-industry-platform/
[386] https://www.incode2030.gov.pt/en/incode2030
[387] https://portugaldigital.gov.pt/

Main actors: Ministry of State, Economy and Digital Transition, Portugal Digital Mission Structure.

Romania

- **SME Digitisation Programme**[388]: the Programme provides funding to SMEs in non-ICT sectors to make investments in the digitisation of their activity and improving digital skills of workers.

  Main actors: Ministry of Economy and Infrastructure.

Serbia

- Establishment of The **Office for Information Technology and e-Government**[389]: its task is to consolidate state IT resources, to ensure the connection of various information systems, and to provide strong support and foundation for the development of Serbia's e-government services.

  Main actors: Serbian government, ICT companies.

- **Bridging Digital Divide in Serbia for the Most Vulnerable Children**[390]: the project provides open source educational resources and technical equipment, as well as school activities aimed at improving children's digital literacy learning outcomes.

  Main actors: Ministry of Education, Science and Technological Development, UNICEF.

Slovak Republic

- **2030 Digital Transformation Strategy for Slovakia**[391]: The Transformation Strategy is a framework that defines the policy of Slovakia in the context of the on-going digital transformation of economy and society.

  Main actors: Ministry of Economy, Ministry of Education, Science, Research and Sport.

Slovenia

- **Digital Innovation Hub Slovenia**[392]: it enables digital transformation and provides services for the growth of digital competences, exchange of digital experiences and examples of good practice at local, regional and international level.

[388] POC 2.2.2 – SME Digitalisation - TPA Romania (tpa-group.ro)
[389] https://www.ite.gov.rs/
[390] https://www.euzatebe.rs/en/projects/bridging-digital-divide-in-serbia-for-the-most-vulnerable-children-1/1
[391] https://www.mirri.gov.sk/wp-content/uploads/2019/10/SDT-English-Version-FINAL.pdf
[392] Home page - Dih en (dihslovenia.si)

Main actors: Ministry of Economic Development and Technology, European Regional Development Fund.

- **Smart Specialization Strategy**[393]: is an operational plan facilitating the shift to high-productivity economy: through boosting innovation potential, by fostering structural transformation and industrial diversification.

  Main actors: Ministry of Economic Development and Technology, Ministry of Education, Science and Sport.

Spain

- **Spain Digital Plan 2025**[394]: the plan is intended to promote the country's digital transformation process, in line with the digital strategy of the European Union. Including in the plan, are several measures like “Educa en Digital”[395] and National Plan of Digital Competences, or “UNI-Digital”[396], which aims to improve digital skills[397].

  Main actors: National Observatory of Telecommunications and the Information Society, Ministry of Economic Affairs and Digital Transformation.

- **UNICO program**[398]: this program seeks to extend VHCN coverage to 100% of the national territory in 2025. The associated investments are included in component 15 of the Recovery, Transformation and Resilience Plan ("Digital Connectivity, boosting cybersecurity and 5G deployment"), which also foresees the development of special projects to provide connectivity with speeds above 100 Mbps in remote rural areas.

  Main actors: Ministry of Economic Affairs and Digital Transformation

Sweden

- **The Agency for Digital Government** [399] : was created to improve digital accessibility, as well as coordination and support for digitalisation within public administration.

  Main actors: Ministry of Infrastructure.

393 https://www.ice.it/it/sites/default/files/inline-files/S4-Slovenia%27s%20Smart%20Specialization%20Strategy-2015_2023_0.pdf
394 https://www.lamoncloa.gob.es/presidente/actividades/Documents/2020/230720-Espa%C3%B1aDigital_2025.pdf
395 https://www.educacionyfp.gob.es/en/prensa/actualidad/2020/06/20200616-educaendigital.html
396 https://unidigital.com/es/
397 https://portal.mineco.gob.es/RecursosArticulo/mineco/ministerio/ficheros/210127_plan_nacional_de_competencias_digitales.pdf
398 https://portal.mineco.gob.es/es-es/comunicacion/Paginas/210614_np_unico.aspx
399 https://www.digg.se/en

- **Digidel**[400]: through collaboration and shared knowledge, the Digidel network works to increase digital participation and accessibility to digital services in Sweden.

  Main actors: Diverse counties (Dalarna, Örebro, Skåne, Södermanland) have produced material to teach people how to use digital services[401]

- **Till Dig (For You)**[402]: aimed at increasing digital inclusion among the elderly. The project is based on a multi-generational approach, where adolescents support seniors in the use of digital tools.

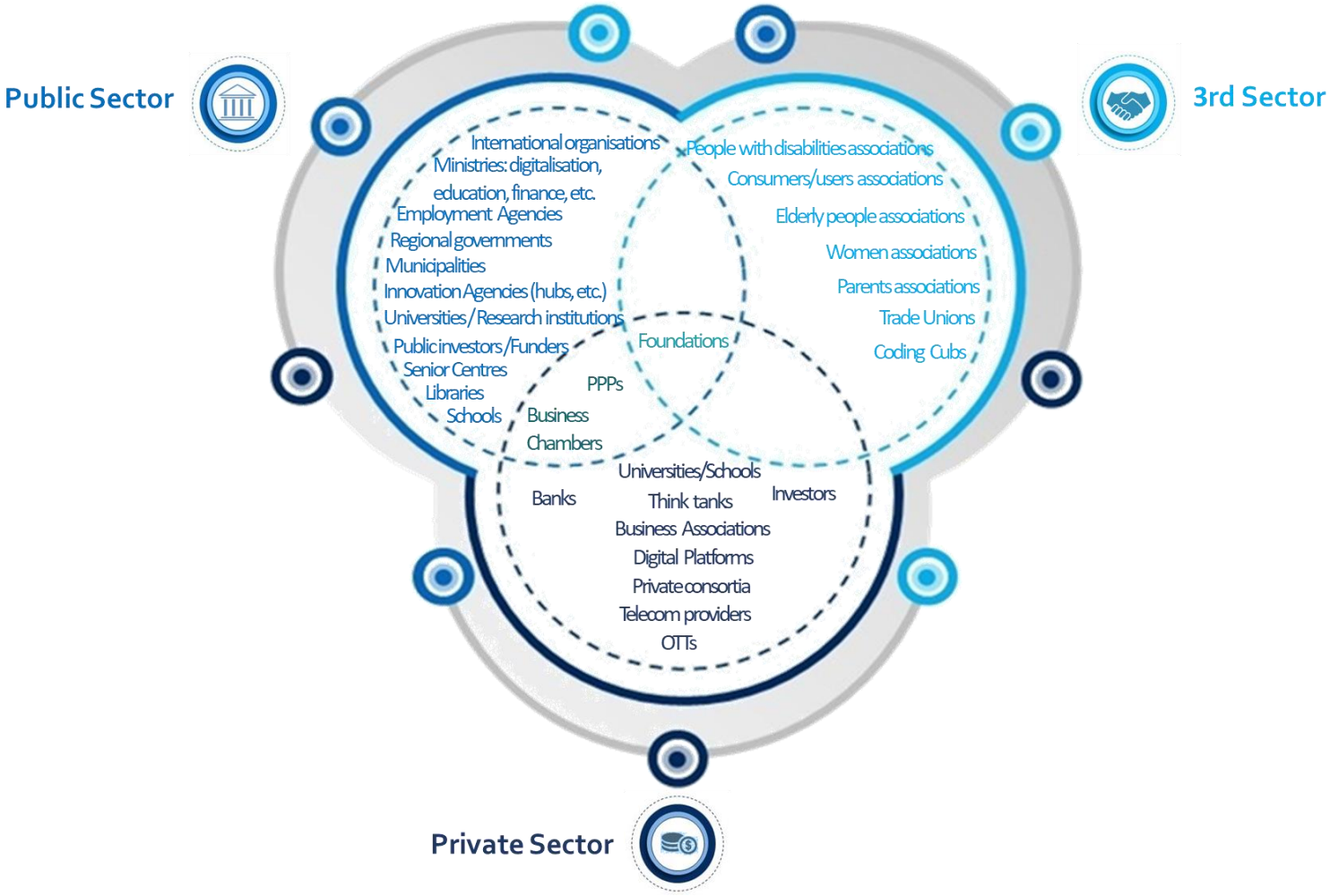
  Main actors: Telia Company, Värmland County Administrative Board and Region Värmland, Connecting Remote Areas (CORA)[403].

Summary of actors with whom NRAs can cooperate to bridge the digital divide

The following picture summarises the actors with whom NRAs can cooperate to address the issue of the digital divide.

400 https://digidel.se/
401 https://digidel.se/nyheter/stod-for-att-anvanda-digitala-betaltjanster/
402 https://www.lansstyrelsen.se/download/18.6c5a54c6179f5bfadf411094/1625149273733/Summary%20report%20CORA%20pilot%20Sweden_Norway.pdf#page=13&zoom=100,90,140
403 https://coraproject.eu/

Figure 13: Map of actors to bridge digital divides



Source: own elaboration