ESPAS European Strategy and Policy Analysis System

ESPAS – at the heart of EU foresight

ESPAS *Ideas* Paper Series

Digital cohesion

ESPAS European Strategy and Policy Analysis System

AN INTER-INSTITUTIONAL EU PROJECT

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Introduction

"Digital divide" is a term that refers to "different levels of access and use of information and communication technologies (ICTs) and, more specifically, to the gaps in access and use of Internet-based digital services" . Variables indicating a digital divide can be linked to geography (such as rural and urban areas), gender, age, skill level, firm size and vulnerability of social groups.

Given the crucial importance of digitalisation for the short, medium- and long-term future of the European Union, these digital divides can jeopardise the achievement of the targets of the EU's Digital Decade, which have been set until 2030. A key question is therefore how to address the digital divides in the context of relevant long-term developments, and with a view to global trends such as demographic change, urbanisation or the changing nature of work, well until 2040 or 2050. Here, foresight is not specifically about predicting the future, but about being prepared for different future scenarios.

Currently, the rapidly worsening geopolitical context following the Russian invasion of Ukraine further strengthens the argument in favour of achieving digital cohesion within the European Union. Only a society without gaps in the access to and use of latest technology can provide its citizens with the latest information as well as key support tools for those in need, such as those provided through digital platforms.

The CoR therefore proposes an open debate on the future role of digitalisation in achieving cohesion in the European Union. Expanding the smart specialisation strategy (from S3 to S4) and developing a sound concept for adding digital cohesion to the existing concept of economic, social and territorial cohesion enshrined in the Treaties might be useful approaches. This ESPAS ideas paper focuses on exploring the possible development of a range of parameters for the coming decades. In this respect, it looks beyond scenarios within the EU, to take into account geostrategic and global trends on several dimensions.

The paper is mainly based on a recent CoR Territorial Foresight study on Digital cohesion (hereinafter referred to as "CoR foresight study"), investigating the potential evolution of digital cohesion in the future with a combination of approaches used in the foresight studies: horizon scanning, megatrends analysis, scenarios building, visioning and backcasting. The methodology used in the study is shortly described in Chapter 5 of this paper.

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Evidence of digital divides in the EU

Most studies agree that "the pandemic has not led to the emergence of new causes for digital divides but has aggravated, in some cases significantly, the existing ones" . These digital divides may not only jeopardise the achievement of the targets of the EU's Digital Decade, which have been set until 2030. They are also likely to have an impact on a range of public services that are provided at local level and may result in negative trends in the socio-economic situation of EU citizens.

In 2022, the CoR has continued to analyse the evidence for digital divides and for an uneven digital transformation across the European Union. This complements data from the previous CoR Barometer reports (2020 and 2021), and follows the four cardinal points of the EU's Digital Compass: (a) secure and sustainable digital infrastructure, b) skills, c) digitalisation of public services and d) digital transformation of businesses. In light of the changing geopolitical context, a component e) on the subject of digital resilience has been added.

Digital divide in skills

The proxy used for measuring digital skills at subnational level is individuals' ability to use the internet daily. Cavallini and Soldi already evidenced the digital divide across regions against this indicator . While this divide continues to exist in 2021, several regions have improved their situation when compared to a pre-COVID-19 level.

It can be seen that in some countries, the pandemic boosted the daily use of the internet with positive changes of over 10pp (e.g., Romania, Slovenia and several regions of Greece, Portugal and Spain). In other countries such as Germany, France and Sweden, the reduction of daily internet use in 2021 compared to 2019 is evident (red colour). In 2019, the highest gap across European regions was of 47 pp; in 2021, it reduced to 36pp .

Figure 6.1 in Annex depicts change of individuals using the internet daily (percentage points) between 2019 and 2021.

When considering the Eurostat indicator 'Frequency of internet access: once a week (including every day)', the digital divide between rural and urban areas, in 2021, is almost closed in Belgium, Ireland, Luxembourg and Denmark. Peaks of the divide, however, are found in Bulgaria, Greece, Portugal, Malta and Croatia, countries where the percentage of individuals accessing internet at least once a week is at the lowest levels across the EU.

Annexed Figure 6.2 depicts the percentage of individuals accessing internet at least once a week.

In terms of progress, since 2019, data show that in the post-COVID-19 era the situation slightly worsened in Germany, the Netherlands and Sweden while it improved substantially in several other countries.

Notably, improvement is observed in many rural areas and in some of these areas the increase reached 10pp, or more (e.g., Ireland, Romania, Bulgaria and Slovenia).

The majority of EU countries also demonstrate an important rural-urban divide for the share of individuals who never use the internet (Figure 6.2). As broadband connectivity is guaranteed across the EU, there is thus a high amount of the population that could be addressed by tailored digital inclusion policies. The highest divide is found in Bulgaria, Greece and Portugal. Denmark, Ireland and

Luxembourg show no rural-urban divide and also a negligible share of individuals never using the internet.

Figure 6.3 in Annex shows data on individuals who never use the internet while Figure 4 shows data on percentage of individuals accessing internet at least once a week (including daily access) in 2019 and 2021.

The European Parliamentary Research Service (EPRS) Demography Outlook 2022 has also summarised evidence on a clear divide in the digital skills between southern or eastern and northern or western regions of the EU and between urban and rural areas: the three regions with the largest share of adults using the internet on a daily basis are capital regions from Scandinavia, with other largely urban regions in many Member States witnessing particularly high levels of daily internet use among adults. One could try to seek reasons for such divides, looking at the relative prosperity of the given Member State, as well as political, cultural and territorial elements (for example, for countries with sparsely populated areas, access to the internet could be one of the less expensive ways to communicate, hence considering it as a basic right).

Additionally, the relatively low rates of daily internet use across many regions of France, with many of the regions in question predominantly rural areas, are specifically explained by the urban/rural digital divide in the Eurostat yearbook.

The indicator 'employment in the information and communication sector' can be used as a proxy of the gender convergence in the digital skills domain, and shows the divide in ratio of female employment versus male employment. The indicator has very diverse values across regions and lacks a clear country-based pattern.

According to latest data (2021), the only region where the number of employed females aged 15-64 years is higher than the number of males is Észak-Alföld, in Hungary. Észak-Magyarország (HU) has also a high ratio (78%). Other regions where the ratio of employed females versus males is over 70% are Comunidad Foral de Navarra (86%), Spain, Alsace (77%), France, and Friuli-Venezia Giulia (72%), Italy. In Italy, the divide is almost closed in Umbria (94%). These data are shown in Figure 6.5 of the Annex.

Evidence on digital skills thus shows that there are digital divides across regions according to different variables, such as geographical and by gender. It further demonstrates that the COVID-19 pandemic has had a different impact across Europe, accelerating processes in some cases and stopping or reversing trends in other cases.

Digital divide in infrastructures

For a long time, the key focus on digital divides has been on connectivity. Here, it is interesting to discover that the rural-urban digital gap is almost closed for 4G mobile, but the deployment of all the other digital infrastructures lags behind in rural areas. Since 2018, in rural areas, the growth rate of Next Generation Access (NGA) coverage increased more than in urban areas. In terms of Very High Connection Network (VHCN) coverage, the opposite occurred.

5G connectivity, however, is of concern. According to data from the 5G Observatory Quarterly Report 141, although commercial 5G is available in all 27 EU Member States, all current deployments in the

1 European Commission, *Quarterly Report of the European 5G Observatory*, 2022.

Member States cover mainly major cities and urban areas, so rural areas are at risk from a digital divide2. In addition, only 17 of 27 Member States are involved in the existing 12 5G cross-border corridors3. Figures 6.6 – 6.9 showcase how the digital divide in infrastructures develops over time and across EU Member States.

Digital divide in digital transformation of businesses

When trying to find information on the take-up of digital tools and services by businesses, we find that there is no equivalent of the digital intensity index at the regional level. The proxy proposed is thus related to start ups and concerns the share of high growth enterprises by urbanisation level (Figure 6.10) . This proxy provides an indication of the geographical distribution within a country of high growth enterprises where the growth is measured in employment terms .

It serves to identify a comparable number of high-growth businesses across rural, intermediate and urban areas of Romania, Croatia, Austria, Finland, Denmark, France, Portugal and Slovakia. A marked rural-urban divide in terms of distribution of high-growth enterprises can be detected in Bulgaria, Italy, Sweden, Lithuania, Czech Republic and Hungary. In Spain, the Netherlands, Latvia and Estonia high-growth businesses are concentrated in urban areas. Estonia has a third of its high-growth enterprises located in rural areas.

The digital divide in the digital transformation of business is exacerbated by the lack of ICT specialists in the EU: in 2020, 55% of enterprises reported difficulties in recruiting ICT specialists .

Digital divide in digitalisation of public services

For the indicator 'the share of individuals who use the internet for interaction with public authorities', the maps on Figures 6.11 and 6.12 show the state of play of the indicator in 2021, and compare the pre-COVID-19 situation (2019) with the post-COVID-19 one (2021).

Figure 6.11 not only highlights how the divide is evident across countries, but also shows the divide across regions of the same country, such as in Italy, Germany or Poland. Figure 6.12 confirms the information reported in Figure 6.2 on the daily use of the internet by individuals, showing that in some EU countries the share of people interacting with public authorities through the internet has decreased in 2021 compared to pre-COVID-19 levels. Examples include almost all German regions, Slovakian regions and several regions of Bulgaria.

The gathered evidence has provided information on the existing and developing digital divides across Europe and has clarified that achievements in one part of the Digital Compass must take into account its other parts. As an example, providing the best possible connectivity for a region may not help if the take-up side is not accounted for and businesses or individuals are not able to use relevant technologies. These intervention interlinkages expand across policy fields – the impact of the digital divide on different sectors of public service provision has been shown above.

As digitalisation progresses further, there is a need to mainstream digital cohesion concerns across various policy fields and to employ digital readiness as a key baseline for the majority of policy areas. Further investigation is needed to analyse if and how progress in the achievement of

2 European Parliamentary Research Service, *Demographic Outlook for the European Union*, 2022, p. 19.

3 *Ibid*.

territorial, social and economic cohesion have had positive side effects on cohesion in the digital domain and vice versa.

Whereas the Covid19 pandemic has accelerated the digital transformation in Europe, the war in Ukraine and changes in the geopolitical environment have put a focus on digital resilience. At the business level, digital resilience 'positions an enterprise to pivot fast, adapt to fluid conditions, maintain seamless business continuity and capitalise on opportunities' . Only a society without gaps in the access to and use of latest technology (for example empowered by tech tools such as Artificial Intelligence (AI), machine learning and the Internet of Things (IoT)) can provide its citizens with the latest information as well as key support tools for those in need, such as those provided through social media and digital platforms. Solid digital infrastructures serve to reinforce cybersecurity and make digital societies resilient against outside attacks. The role of foresight is to identify these interdependencies as a result of the changed geopolitical context and renewed focus on security and defense in Europe. 'Now is the time to get in on the ground floor and align the skills, strategies and solutions needed to build transition frameworks across society. Public and private sector leaders can collaborate to build practical roadmaps for collective resilience that would contribute to economic growth and global innovation.'

Scenarios for digital cohesion in Europe[4]

In the context of this paper and the CoR foresight study, the scenarios building serves the purpose of exploring how digital cohesion can be achieved and learn possible implications for the present. The approach takes into account the experts' consultation results to build four (4) possible scenarios based on weak signals and the occurrence of wild cards.

Identification of the early signals of changes that can affect future dynamics and effectiveness of policies is a key part of foresight exercises. Signals of changes are grouped into weak signals and wild cards. Weak signals are *unclear observables warning us about the possibility of future 'game changing' events' and 'their 'weakness' is directly proportional to levels of uncertainty about their interpretations, importance and implications in the short-medium to long-term.* (iKnow project). *A wild card is a future development or event with a relatively low probability of occurrence but a likely high impact on the conduct of business* (Steinmüller, 2003). For ease of reference between the CoR foresight study and the ESPAS common terminology, "weak signals" and "wild cards" correspond to "uncertainties" and "disruptions" respectively.

Weak signals

Approach

The building process of scenarios is composed of both top-down and bottom-up elements. The weak signals selected and rated during the experts' consultation within the CoR foresight study have been analysed with quantitative method and represent the bottom-up approach, on the other hand the creation of the scenarios narratives has been undertaken with a qualitative method representing the top-down approach. Scenarios building can bundle, connect and present weak signals in a meaningful way in order to decrease the complexity in an unpredictable future environment and support stakeholders to prepare for potential changes. Weak signals, for the purpose of the scenarios building process, have been considered as factors occurring simultaneously and contributing to the achievement of digital cohesion. For each weak signal, the

[4] based on the CoR foresight study

temporal horizon as indicated by the consultation's results, has been considered transversally to each scenario, by selecting the resulting median values. According to the results, weak signals were considered to have an impact either in the short term (up to 5 years) or in the medium term (from 6 to 15 years). No weak signal has been deemed to have an impact in the long-term (from 16 to 30 years). Therefore, all scenarios have a temporal horizon ranging from 1 to 15 years.

Results

The results have been consolidated into **four scenarios**:

- **Scenario 1 - Change takes time, digital cohesion is in progress**
- **Scenario 2 - Halfway there, digital cohesion is improving**
- **Scenario 3 - Connected but unsafe, digital cohesion is still far**
- **Scenario 4 - So far so good, digital cohesion is achieved**

The overall result shows how the analysis of the data can present different scenarios.

An assumption in the analysis and in the creation of each scenario's narrative is that weak signals that were found less relevant for the digital cohesion can be interpreted as less pervasive due to different possible barriers (e.g., affordability, lack of the necessary infrastructure, but also relevance for the general public).

For each scenario, digital cohesion has been evaluated according to the four cardinal points described in the Digital Compass: Digital infrastructures, Digital skills, Digital public administration and Digital business.

As mentioned before, weak signals deemed relevant for the short term (up to 5 years) have been graphically marked, all the others refer to the medium span-time (from 6 to 15 years). In the following Figure 1, all the four scenarios stemming from the rating of the weak signals have been represented graphically. The coloured boxes represent the relevance scale from 1 to 5, while 0 representing zero relevance has been omitted, e.g, large scale group decision making is not shown in scenario 3 because it has been rated as not relevant. A separate figure in annexed to represent each of the four scenario respectively.

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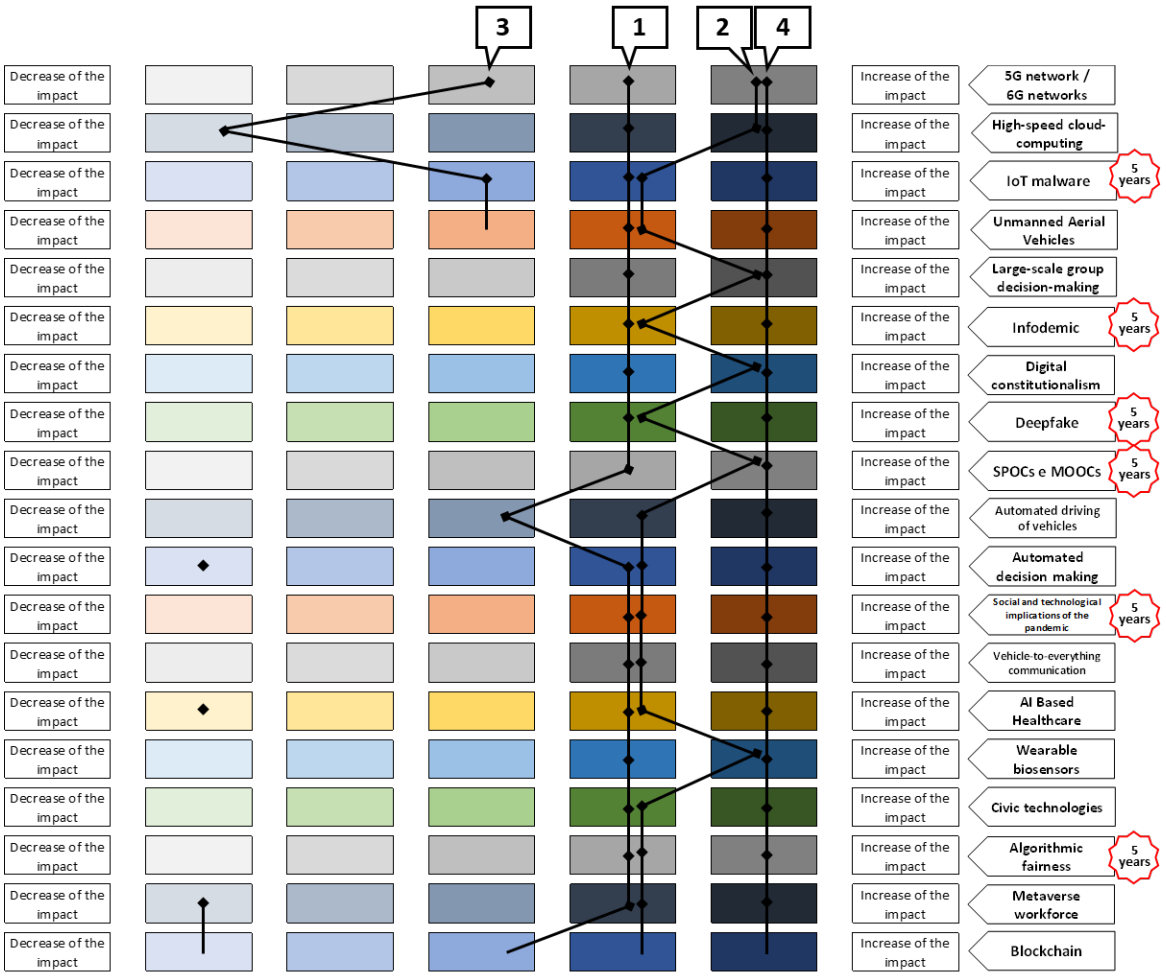
Figure 1. Representation of the scenarios built on the weak signal



Each scenario is now presented focusing on the role of weak signals. In section 3.2 the analysis is enriched with the potential contribution of the relevant wild cards to each scenario.

Scenario 1 - Change takes time, digital cohesion is in progress

Built on the **median** of the experts' consultation results, Scenario 1 depicted in Figure 6.13 is named **Change takes time, digital cohesion is in progress**. The approach employed to analyse the current weak signals of change outlines a future scenario where they are unevenly impacting the society: only part of it is benefiting from technologies such as 5G/6G networks, high speed cloud computing, unmanned aerial vehicles, large scale group decision making, Small private online courses (SPOCs) and Massive open online courses (MOOCs), vehicle to everything communication, AI based healthcare and wearable biosensors.

The popularity of 5G/6G networks basically enables all the other technologies except for the SPOCs and MOOCs which, besides being on the market for at least 10 years, had clearly received a boost by the social distancing imposed by the pandemic.

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All these technologies are expected to be spread and used by the public administration, private sector and citizens, thus, also the infrastructure has been receiving attention (and incentives) for some time (European Commission, 2022[5]).

Interestingly, other technologies such as automated driving and blockchain, are impacting digital cohesion less, a possible sign that they are not being adopted on the market as much as expected but remain spread in selected sectors.

A possible explanation for the scarcer relevance found for these two signals is that they present significative and not yet completely explored barriers. In spite of the huge media hype, automated driving requires specific (and flawless) infrastructures, sensors must be so accurate to detect the differences of the possible (non-autonomous) objects on the road (Nitsche *et al.*, 2014[6]) and, most difficult part, the cars need to be able to take ethical decisions in case of so-called "edge cases" (Goodall, 2014[7]). Moreover, the cost of such precision technology is and will cut out the majority of the population (Tanzmeister et al, 2014[8]). Blockchain, as a self-validating tool, poses an insurmountable problem for all the intermediaries like banks (Iansiti et al, 2017[9])). Furthermore, blockchain consumes an incredible amount of energy (Digiconomist, 2022[10]), thus impacting the environment and the cost of the operations. However, one of the main challenges for the uptake of blockchain is also linked to the lack of the right digital skills, especially in the private sector, creating a skill gap in the job market (Shakina *et al.*, 2021[11]).
According to the literature reviewed to discuss this scenario, the EU digital cohesion in the temporal horizon spanning over the next 15 years would be:

5 https://digital-strategy.ec.europa.eu/en/policies/5g-action-plan

6 Nitsche, P., Mocanu, I. and Reinthaler, M. (2014), *Requirements on tomorrow's road infrastructure for highly automated driving*, IEEE. doi: 10.1109/ICCVE.2014.7297694

7 Goodall, N.J. (2014), *Ethical Decision Making during Automated Vehicle Crashes*, First Published January 1. doi: https://doi.org/10.3141/2424-07

8 Tanzmeister, G., Friedl, M., Wollherr, D. and Buss, M. (2014), *Efficient evaluation of collisions and costs using grid maps for autonomous vehicle motion planning, IEEE Trans. Intell. Transport. Syst.*, vol. 15, no. 5, pp. 2249–2260. doi: https://ieeexplore.ieee.org/document/6812209

9 Iansiti, M. and Lakhani, K. R. (2017), *The Truth About Blockchain, Harvard Business Review*, vol. 95, no. 1, pp. 119-127, Jan.-Feb. 2017. https://hbr.org/2017/01/the-truth-about-blockchain

10 Digiconomist (2022), *Bitcoin Energy Consumption Index*. https://digiconomist.net/bitcoin-energy-consumption/

11 Shakina, E., Parshakov, P. and Alsufiev, A. (2021), *Rethinking the corporate digital divide: The complementarity of technologies and the demand for digital skills*, Technological Forecasting and Social Change. Volume 162, January 2021, 120405. https://doi.org/10.1016/j.techfore.2020.120405

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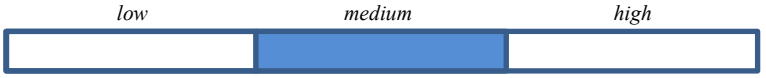
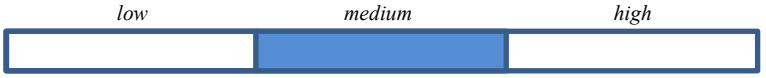
Measure of digital cohesion in Scenario 1

Digital compass dimensions	Advancement for digital cohesion
Digital infrastructures	
Digital skills	
Digital public administration	
Digital business	

Scenario 2 - Halfway there, digital cohesion is improving

Scenario 2, named **Halfway there, digital cohesion is improving** and depicted in Figure 6.14, is built on the **mode** of the experts' consultation results. Here the technological uptake has increased: some technologies such as 5G/6G, high speed computing, large scale group decision making and wearable biosensors are well-known and spread while others have been less adopted such as unmanned aerial vehicle, automated driving, vehicle to everything communication, AI based healthcare and blockchain.

While the first group of technologies can be considered as more beneficial for society as a whole, also fostering the digitalisation process of the public sectors, the lower relevance of the second group can be explained, with regard to possible barriers for the general public's uptake. For this second group of technologies the obstacle might be the lack of the appropriate digital skills (Van Dijk.*et al.*, 2014[12]) or digital infrastructures (Shenglin *et al.*, 2017[13]), which for these specific technologies might be still too sectoral.
Some of the consequences of the technological evolution have less impact than expected, such as IoT malwares, infodemic, deepfakes, probably because users have become more familiar with the digital skills required to handle these threats and maybe because of a better public governance of these malicious online threats and this can reflect the increased relevance of digital constitutionalism. Also, the consequences of COVID and its social implications are not that pronounced. Conversely, opportunities are rising from the digital transformation such as a renewed attention to the importance of the educational and tailored opportunities offered by the SPOC and MOOCs which are facilitating the acquisition of personalised and low-cost knowledge (Mahajan, 2019[14]).

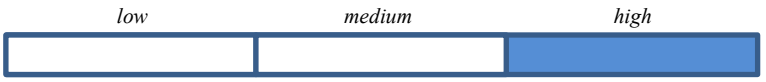
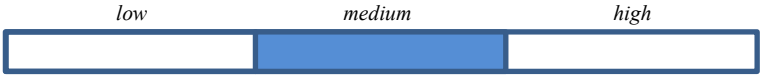
12 Van Dijk, J.A.G.M. and Van Deursen, A.J. A. M. (2014), *Digital skills*, Palgrave Macmillan's Digital Education and Learning. https://doi.org/10.1057/9781137437037

13 Shenglin, B., Simonelli, F., Ruidong, Z., Bosc, R. and Wenwei, L. (2017), *Digital Infrastructure: Overcoming the digital divide in emerging economies*, CEPS Special Report, 5 April 2017. https://www.g20-insights.org/wp-content/uploads/2017/05/Digital_Overcoming-Digital-Divide-II.pdf

14 Mahajan, R., Gupta, P. and Singh, T. (2019), *Massive Open Online Courses: Concept and Implications*, Indian Pediatr 56, 489–495. doi: https://doi.org/10.1007/s13312-019-1575-6

According to the literature reviewed to discuss this scenario, EU digital cohesion in the temporal horizon spanning over the next 15 years would be:

Measure of digital cohesion in Scenario 2

Digital compass dimensions	Advancement for digital cohesion
Digital infrastructures	
Digital skills	
Digital public administration	
Digital business	

Scenario 3 - Connected but unsafe, digital cohesion is still far

For creating Scenario 3 «**Connected but unsafe, digital cohesion is still far**» depicted in Figure 6.15, the weak signals have been analysed by considering the **lowest value** of the experts' consultation results.

In this scenario 5G and 6G networks are the main factors impacting digital cohesion, both in a positive and negative perspective, because this signal also triggers the spread of IoT malwares, threatening institutions, private sector, and citizens' safety. This is a major threat for the European digital cohesion, because the digitalisation, particularly if fast, is a catalyst for unpredictable cyberattacks and damages (Strelicz, 2021[15])

Also unmanned aerial vehicles are becoming more and more popular, employed both for personal and commercial purposes. The uptake of this technology presents opportunities in areas that address current business problems, such as low productivity, rather than more transformative applications, like air taxis, or areas that are only just beginning to generate interest, like infrastructure (McKinsey, 2017[16]).

Some rare forms of AI and high-speed computing and AI healthcare are used for specific and highly technical tasks. The vast majority of the private sector though, due to cost, security, performance, in addition to the need for great power and cooling capacity, is still hesitant to move to high-speed computing (Thekkedath, 2020[17]). These barriers also stopped the increased demand of this technology

15 Strelicz, A. (2021), *Risks and threats in cyberspace – The key to success in digitisation*, J. Phys.: Conf. Ser. 1935 012009. doi: https://iopscience.iop.org/article/10.1088/1742-6596/1935/1/012009

16 McKinsey (2017), *Commercial drones are here: The future of unmanned aerial systems*. https://smart-cities-marketplace.ec.europa.eu/sites/default/files/commercial-drones-are-herethe-future-of-unmanned-aerial-systems.pdf

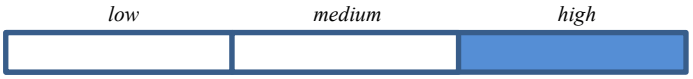
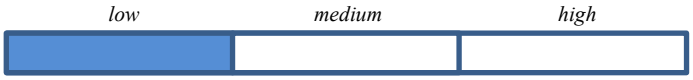
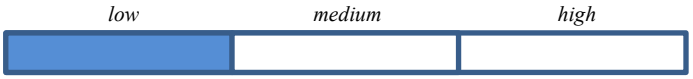
17 Thekkedath, B. (2020), *Challenging the Barriers to High Performance Computing in the Cloud.* https://www.hpcwire.com/solution_content/aws/manufacturing-engineering-aws/challengingthe-barriers-to-high-performance-computing-in-the-cloud/

needed during the COVID-19 pandemic for enabling AI biomedical research (Coughlin, 2021[18]) and P4 medicine.

In selected niche sectors, virtual reality is now used as a workplace and blockchain is employed as a safe way to protect payments and data exchange, but the spread of these technologies remains limited. In general, the scenario depicts a reality where connectivity has improved but cyberattacks are an everyday threat, and only the IT experts and some niche companies are benefiting from the technological advancement in a safe way.

According to the literature reviewed to discuss this scenario, EU digital cohesion in the temporal horizon spanning over the next 15 years would be:

Measure of digital cohesion in Scenario 3

Digital compass dimensions	**Advancement for digital cohesion**
Digital infrastructures	
Digital skills	
Digital public administration	
Digital business	

[18] Coughlin, T. (2021), *HPC, From Niche To Mainstream*, Jan 28, 2021 (forbes.com). https://www.forbes.com/sites/tomcoughlin/2021/01/28/hpc-from-niche-tomainstream/?sh=699b64d77695

Scenario 4 - So far so good, digital cohesion is achieved

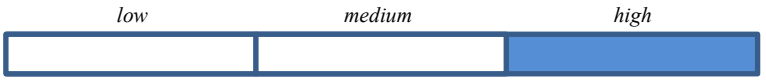
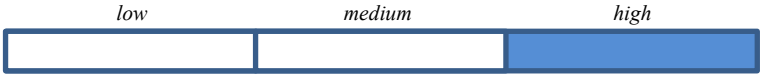
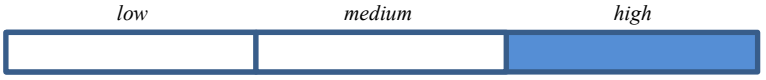
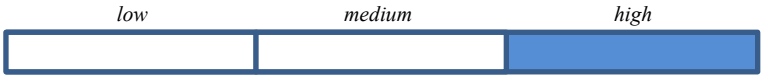
The Scenario 4 «**So far so good, digital cohesion is achieved**» is built by selecting the **highest values** of the experts' consultation results.

The scenario presents for each signal the maximum impact on digital cohesion, resulting in an even uptake of the technologies by the private sector, by the public administration and by the citizens. Digital skills and digital infrastructures are the main enablers for the transformation of the private sector and of the public administration. This is because skills and connectivity are among the strongest drivers for the wide public adoption of these technologies (Lynn *et al.*, 2022[19]), (Vitolina, 2015[20]). At the same time, the digital cohesion achievement means having overcome all the barriers that generated the digital divide, e.g. affordability, geography, age and gender and digitalisation is a horizontal and shared aspect of the European society, accessible and accessed by all citizens (Vartanova *et al.*, 2019[21]).

The gain in relevance and participation in the digital society will also cause the increase of malicious attempts to influence or defraud through IoT malware, deepfakes and infodemic, which will spread and impact the digital transformation at large.

According to the literature reviewed to discuss this scenario, EU digital cohesion in the temporal horizon spanning over the next 15 years would be:

Measure of digital cohesion in Scenario 4

Digital compass dimensions	Advancement for digital cohesion
Digital infrastructures	
Digital skills	
Digital public administration	
Digital business	

19 Lynn, T., Rosati, P., Conway, E., Curran, D., Fox, G. and O'Gorman, C. (2022), *Infrastructure for Digital Connectivity*, In: Digital Towns. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-030-91247-5_6

20 Vitolina, I. (2015), *E-inclusion Process and Societal Digital Skill Development*, Discourse and Communication for Sustainable Education, vol. 6, pp. 86-94. doi: 10.1515/dcse-2015-0006.

21 Vartanova, E. and Gladkova, A. (2019), *New forms of the digital divide*, In: Josef Trappel (ed.) Digital media inequalities: Policies against divides, distrust and discrimination, pp. 193-213. Göteborg: Nordicom. http://norden.diva-portal.org/smash/record.jsf?pid=diva2%3A1535724&dswid=-2831

Scenario 1 - AI out of control

In Scenario 1, described above, it is shown that there is a group of technologies developing faster: 5G/6G networks, high-speed cloud computing, unmanned aerial vehicles, large scale group decision making, SPOCs and MOOCs, vehicle to everything communication, AI based healthcare and wearable biosensors. Besides SPOCs and MOOCs, these technologies are linked together by three "technological enablers" which are high-speed computing, AI and IoT. Moreover, they are interconnected: high-speed computing enables the functioning of AI and IoT, while the convergence of AI and IoT can create intelligent machines that simulate smart behaviour and supports in decision making with little or no human interference. In this context where these technologies have the capacity to process an incredible amount of data and learn from it, the occurrence of the Wild Card "AI out of control" does not seem that impossible. Even if in Scenario 1 these technologies do not seem to have reached the widest uptake, still in a world where everything is interconnected damage can be extensive.

As mentioned in the description of Scenario 1, most scientists think that the most effective preventive measure is to have strict rules and control over the ethical and implications of AI.

Policy needs: the view for a future regulatory framework for AI in Europe, as advised by the EC High-Level Expert Group on Artificial Intelligence (AI HLEG) (European Commission - AI HLEG, May 2021) could create an 'ecosystem of trust' with a human-centric approach, preventing AI to become harmful for the society.

Scenario 2 - Extreme automation in the public sector

Compared to the previous one, Scenario 2 presents a two-speed technological development: while sectoral technologies uptake is slowing down, the general public and the public administration are increasing the adoption of 5G/6G, high speed computing, large scale group decision making and wearable biosensors. Applying these technologies which gather and process huge amounts of personal data to the public sector, could lead to the occurrence of the Wild Card "Extreme automation in the public sector". By following an initial need to optimise the work, even with the raise of the importance of the digital constitutionalism and the decrease of malicious cyberthreats, concerns linked with privacy and transparency of the processes would be inevitable.

Policy needs: there are many pilot projects , also mapped by the European Commission AI Watch Team , and foresight research (Andersen et al. 2020), (Barcevičius et al., 2019), (Misuraca et al., 2020) concerning which measures would help preventing an unfair extreme automation of the public administration and all the recommendations seem to point in the direction of the international cooperation for the creation of standards and the assurance of transparency. In particular, there is a strong point in favour of transparent procedures for the assessment (Loi, 2021) of the design and appropriate mix of regulatory approaches on the public sector adoption of emerging digital technologies and their associated social, ethical and legal implications, also putting in place public-private partnerships (Ubaldi et al., 2019).

Scenario 3 - A disruptive digital pandemic

Scenario 3 presents a situation where the occurrence of cyberattacks is a major threat for society. Together with a greater interconnection given by the development of 5G/6G networks, a digital pandemic (as a Wild Card described above) would likely spread fast and with severe consequences,

especially for the public administration and the general public, lacking the right skills to manage cyberthreats and to contain the damages and instead increasing the infection of the malwares. Only the private sectors, having invested more in advanced skill training, would be more prepared but still not safe.

Policy needs: One of the most important actions for a preventive approach is to support research and innovation in the cybersecurity field. Moreover, the political step needed is increased accountability of Member States for the actions of non-state actors in their territories and for more effective sanctions for cybercrimes by the international community (Weber et al., 2021).

Scenario 4 - End of Moore's Law

Scenario 4 describes the potential achievement of digital cohesion through the uptake of all the technologies by the society at large. To envisage the full functioning of all these technologies it is logical to assume that the barriers existing in 2022 in terms of processing power will be overcome. These barriers are linked to the impossibility to further reduce the dimensions and increase the processing power of the current processors making them inadequate to support the development of the above-mentioned technologies. It's the ending of Moore's Law which will trigger the exploring of new ways and concepts for empowering high-speed computing, IoT and AI and which will pave the way for the achievement of digital cohesion.

Policy needs: Recent global semiconductors shortages had a serious impact on many industries. As countries around the world are trying to secure semiconductor supplies, there is growing competition to convince companies to invest (Ezell, 2021). The sum of semiconductor incentives from European governments over 2020 – 2030 is respectively just 10% and 50% of what China and the US have promised over the same period. As part of a $2 trillion (Pramuk, 2021) economic stimulus package, U.S. President Joe Biden earmarked $50 billion for semiconductor manufacturing and research (Clifford, 2021). A bill known as the CHIPS for America Act is also working its way through the legislative process. Countries like Japan, South Korea and China are all boosting investment into semiconductors too. Therefore, the primary challenge for the EU will be in attracting new players. The European Chips Act is an effort toward this objective: it will increase investment into chips with the aim of boosting Europe's share of global production. Since there are no European firms that can manufacture leading-edge chips, it will be crucial to convince Intel, Taiwan's TSMC or South Korea's Samsung to build factories.

Questions for the ESPAS discussion

a) **In addition to the above, have we come across any additional evidence that digital divides are accentuating in the European Union, in particular at the local and regional level?**

Coverage of rural areas – defined as areas with less than less than 100 people per km^2 – remains cost intensive and is one of the main challenges to overcome for attaining the EU targets on digital connectivity. NGA and ultrafast NGA networks generally have a low penetration rate in these areas, which are mainly the result of low population density resulting in lower demand, and difficult terrain that complicates installations. In addition, many rural areas show an average per-capita income

generally lower than that of cities, which can lower the readiness of rural consumers to spend on digital services. These factors lead to negative effects on rural broadband implementation, including:

- lower take-up rates (or penetration rate: the percentage of households having a broadband subscription compared to the total number of households) even if the supply side is strong;
- increased costs and efforts for mapping public passive infrastructures (such as poles, ducts); and
- lower scalability and lower interest of established market incumbents.

Regarding 5G, the European Court of Auditors (ECA) noticed that there is currently no definition of the expected quality of service for example in terms of minimum speed or maximum latency. According to the data included in the 5G observatory, only two Member States defined so far minimum requirements of 5G performance. This creates the risk that Member States apply different minimum requirements.

If it persists, this situation could lead to inequalities in the access and quality of 5G services in the EU ("digital divide"): people in parts of the EU would have better access and quality of service to 5G than others. This digital divide could also affect the potential of economic development.

The Commission has accepted the ECA recommendation to develop, together with Member States, a common definition of the expected quality of service of 5G networks. It committed to do it by December 2022.

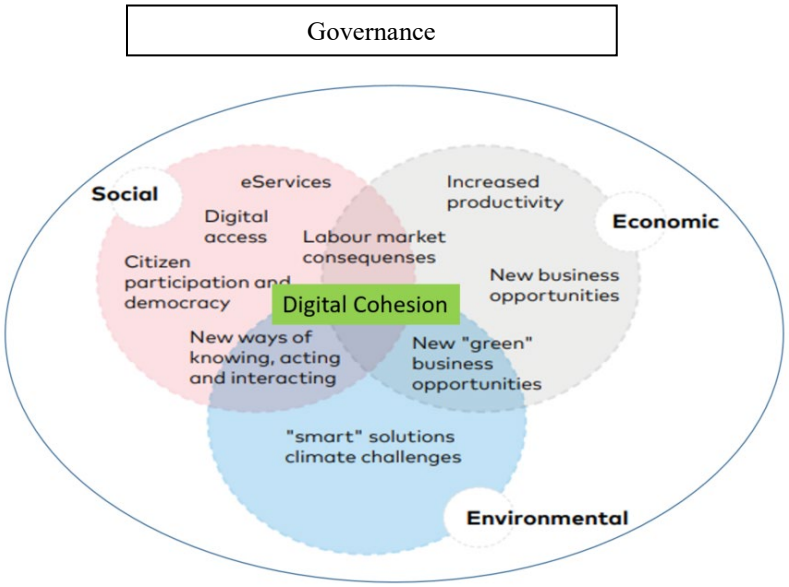
Regarding digital skills, the DESI does not include data at local level. Nevertheless, already looking at Member State level data, it is possible to see a widening of the gap between Member States.

b) Can digital cohesion provide an answer to this trend, and how can it be defined? Where can we draw inspiration from cohesion policy approaches?

The vision set out in the 2030 digital compass tackles many aspects that, if not dealt with, could exacerbate the digital divide in the EU. Improving and making available digital infrastructures to all is key. However, it is not enough. People need to know how to make the best out of it. Not only private individuals should be involved, but also (or mainly) providers of public services and businesses.

Scientia potentia est (Knowledge is power). But without data there cannot be knowledge. To facilitate the smooth circulation of data, interoperability across all levels of government and across public services is needed. People and entities should at the same time feel confident that the digital data they create, share or use are accurate and kept secured. Also, trust in the availability of digital services is essential. Without this confidence, digital cohesion cannot be achieved. For this reason, cybersecurity and digital resilience must be a priority in the EU.

c) Which dimensions would need to be included in a 'governance model' for digital cohesion – see the proposal below? How can societies become more resilient through digital transformation?



d) How can digital cohesion be measured? What types of data are available, including at local and regional level?

As mentioned previously, the DESI is an excellent starting point to measure digital cohesion. Unfortunately, data are updated only once per year. LORDI (Local and Regional Digital Indicators, developed under the Living-in.EU initiative) – once implemented through an ESPON horizontal action – will offer subnational data at municipal level. The Local and Regional Digital Maturity Assessment Tool (LORDIMAS) should be available as of beginning of 2023 and should provide evidence, based on the voluntary participation of cities and municipalities, on digital transformation at local level, including benchmarking against cities of a similar size, from the same Member State and/or how they have been developing in time etc.

e) What role can the European Union play in promoting digital cohesion? Which actors would need to be involved?

Other than funding (see below), for which in any case most of the investments will have to be carried out by private entities or Member States. The EU has the responsibility to set the vision and put in place a framework promoting digital cohesion. In order to promote the digital revolution, there are mainly two possibilities:

1. Focus on promoting the 'champions'. The intent is that these 'champions' will act as magnets attracting others (entities and people) and 'drag' towards digital transformation. The risk here is that these 'champions' will be too advanced, and therefore other entities will not be able to understand and follow them.

2. Provide widespread support, mainly to entities and people that have a lower starting point, in order to raise the average. The risk here is to level to the lowest common denominator, therefore not promoting excellence.

The challenge is to find the perfect balance between these two approaches.

f) Which funding instruments can be linked to digital cohesion, or are already available?

Many EU funding instruments can be linked to digital cohesion:

- The ESIF can support the development of digital infrastructures, the digital transformation of business and skill development of people;

- Horizon 2020 and Horizon Europe finance research projects in this domain;

- The Connecting Europe Facility aims to support and catalyse investments in digital connectivity infrastructures, promoting connectivity for all;

- The Digital Europe Programme (DEP) aims to build the EU's strategic digital capacities and to facilitate the wide deployment of digital technologies;

- Erasmus+ can finance the development of skills;

- The EIB provides loans for projects supporting digital cohesion;

- The RRF can also provide significant support to the digital infrastructure.

g) What further implications can persisting/increasing digital divides across all the sectors have?

Further increasing the gap will have an impact not only on the digital divide, but also on the economic development of EU regions and their population. Richer regions will become even richer and the ones lagging behind will need even further assistance and support just to keep providing a minimum standard of living for its inhabitants.

Most of the relevant data to measure digital cohesion are available at aggregate level. This risks hiding huge disparities and prevents tackling the issue. Improving data granularity (in time and space) could be a key element for developing better policy options. A number of key aspects will need to remain priority objectives in the coming decades if the EU wants to achieve digital sovereignty and digital cohesion. Public services should be at the forefront of digitalisation, guaranteeing the interoperability of systems throughout the EU. Digital systems should be secure and resilient in order to be trusted. To develop a workforce that could ensure digital cohesion, STEM studies (science, technology, engineering, and mathematics) should be further promoted. With an ageing EU population, it will be crucial to keep everyone up to date with digital technologies.

h) What possible combinations of scenarios of digital cohesion can be predicted in different parts of the EU? Will there be differences – if so, which exactly – between the EU and third countries?

Based on the first iterations of the ESPAS Ideas Paper on "*The impact of green and digital transitions in the role of EU organised civil society. Scenarios for EU's civil society in 2050*", drafted by the EESC, the following scenarios can be identified:

- **Green focus: Climate is the main focus**, with increasing green and digital inequalities, which is still favourable for democracy and civil rights.

- **Digital focus**: Public health crises, extreme weather and technological development have boosted digital transition. People and businesses spend more of their time on digital platforms, especially in the metaverse(s). This scenario is less favourable for democracy because of a "silent citizenship" with digital exclusion (poorer citizens having access to less features in the metaverse(s)).

- **Conflict-based civil society**: Civil Society organisations play a crucial role in a highly conflictive political context, with digital tribalism reflecting social divisions that substitute open political debate.

In addition, different states or even continents could follow different paths, such as:

- Russia, due to sanctions imposed after the invasion of Ukraine, may be completely cut from digital technologies, lose access to spare parts and machinery needed to produce new products and left to rely on obsolete technologies. This could result in a backwards digitalisation trend.

- China, more prone to follow the "Digital focus" scenario, could be more alienated from the rest of the world, but its internal digitalisation level would still be very high;

- The USA, the European Union and countries from South-East Asia could follow the path of a "Green focus" scenario, with human-centric technologies and human rights' priority over technology. In this scenario, it will be important to strike the right balance between creativity and regulation of the metaverse.

i) **How will digital cohesion be affected through (much needed and often compulsory) investments into the cyber-resilience and digital skills?**

The recent Commission proposal of a Cyber Resilience Act could indeed have potential budgetary implications on business and public administrations, although it is intended to protect consumers and businesses from products with inadequate security features.

As already mentioned above, together with a greater interconnection, a fast-spreading digital pandemic would have devastating effects on public administration and on the general public. As they are in charge of services of general interest, local and regional authorities in most Member States require digitally resilient IT systems and staff who have the skills to manage cyberthreats and to contain the damages.

Given the high likelihood of a major security incident on these infrastructures in the foreseeable future, with paralysing implications for citizens , policy decisions are needed in favour of pre-emptive investment in digital resilience at local and regional level. The need to prioritise such investment over other actions is an issue that a large number of local representatives may not be aware of, hence the interest to look into the *cost of digital non-resilience* (compare to "cost of non-Europe") and how measures at national level could be coupled with actions at subnational level, including awareness-raising campaigns.

Methodology for the ESPAS Ideas paper

- Collection of secondary data (existing studies and research)
The ESPAS ideas paper and discussion on digital cohesion is inspired by the CoR foresight study on Digital Cohesion, which is based on the OECD foresight methodology[22] and has the following aims:

- Horizon scanning: researching the potential impacts of an accelerated digitalisation for local and regional authorities and for digital cohesion in Europe;
- Megatrends' analysis: exploring and reviewing of key mega-trends linked to digital cohesion at the intersection of multiple policy domains, with complex and multidimensional impacts in the future;
- Scenario planning: developing multiple scenarios on how digital cohesion could be achieved or not in order to explore and learn from these in terms of implications for the present and
- Visioning and back-casting: developing a vision of ideal implementation of these digital megatrends for digital cohesion, and working backwards to identify what steps are needed to be taken to achieve this vision.

The CoR foresight study is based on desk/literature research and structured interviews and has run between October 2021 and July 2022.

- Expert seminars:
- Meetings of the Broadband Platform (13 CoR Members and DG Connect)

An ESPAS Ideas Paper Seminar

22 https://www.oecd.org/strategic-foresight/ourwork/Strategic%20Foresight%20for%20Better%20Policies.pdf

ANNEX – Figures and graphs

Figure 6.1: 2021-2019 change of individuals using the internet daily (percentage points)[23]

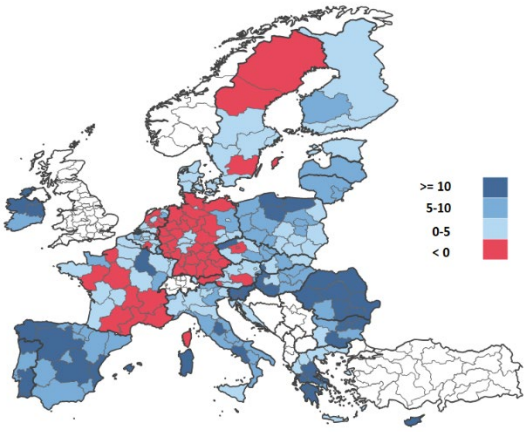


Figure 6.2: Percentage of individuals accessing internet at least once a week (including daily access)[24]

	2021		
	urban areas	towns and suburbs	rural areas
Ireland	99	96	98
Denmark	98	97	96
Luxembourg	97	98	96
Netherlands	93	94	96
Sweden	96	95	93
Finland	97	95	92
Belgium	91	92	90
Spain	93	91	89
Estonia	93	87	88
Latvia	92	90	87
Austria	92	90	87
Cyprus	91	95	86
Germany	91	88	87
France	91	88	87
Slovenia	90	88	86
Slovakia	92	88	84
Czechia	92	88	83
Hungary	92	87	82
Lithuania	89	87	82
Poland	89	84	79
Romania	87	84	76
Italy	83	80	76
Croatia	88	82	75
Malta	88	86	73
Portugal	85	80	70
Greece	83	81	64
Bulgaria	82	73	64

23 Notes: No data for Åland, Kontinentalna Hrvatska and Mayotte. Data for Greece, Poland and Germany are at NUTS1 level. Map created by Progress Consulting S.r.l. on the basis of Eurostat data accessed in May 2022.

24 Eurostat data accessed in May 2022. In 2021, break in time series for Ireland and Germany

Figure 6.3: Individuals who never use the internet, by degree of urbanisation, (%), 2021, by country[25]

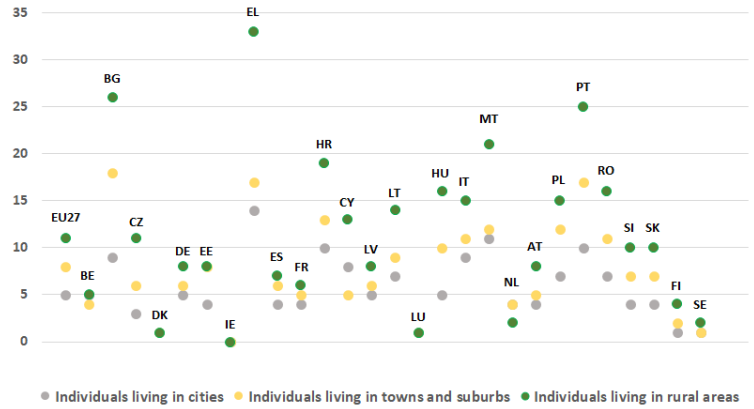


Figure 6.4: Percentage of individuals accessing internet at least once a week (including daily access) in 2019 and 2021[26]

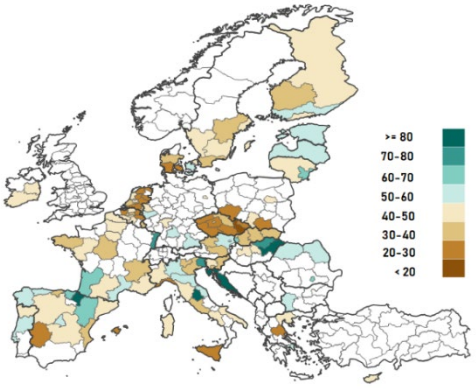
Examples of countries increasing the digital divide (2019-2021)

		urban areas	towns and suburbs	rural areas
Germany	2019	93	91	90
	2021	91	88	87
Netherlands	2019	96	95	96
	2021	93	94	96
Sweden	2019	95	96	94
	2021	96	95	93

Examples of countries reducing the digital divide (2019-2021)

		urban areas	towns and suburbs	rural areas
Ireland	2019	91	88	85
	2021	99	96	98
Slovenia	2019	86	84	76
	2021	90	88	86
Romania	2019	80	72	64
	2021	87	84	76
Bulgaria	2019	75	68	54
	2021	82	73	64

Figure 6.5: Ratio of female vs. male employed in the I&C sector, %, 2021[27]



25 Source: Eurostat data accessed in May 2022

26 Eurostat data accessed in May 2022. In 2021, break in time series for Ireland and Germany

27 Source: Eurostat data accessed in May 2022. Map created by Progress Consulting S.r.l. Notes: several data gaps (white color).

Figure 6.6: Digital infrastructures coverage, total and rural, 2020, % of households[28]

	Fixed broadband	NGA[1] broadband	VHCN[2]	4G (LTE) mobile
Total	97.4%	87%	59%	99.7%
Rural	89.7%	60%	28%	98.6%

Figure 6.7: 5G mobile coverage, % of populated areas, 2020[29]

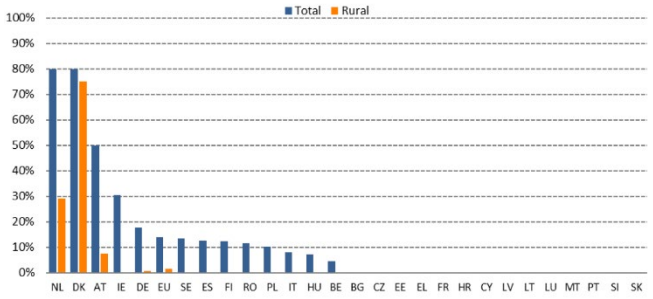


Figure 6.8: NGA broadband coverage, % of households, 2013-2020, EU27

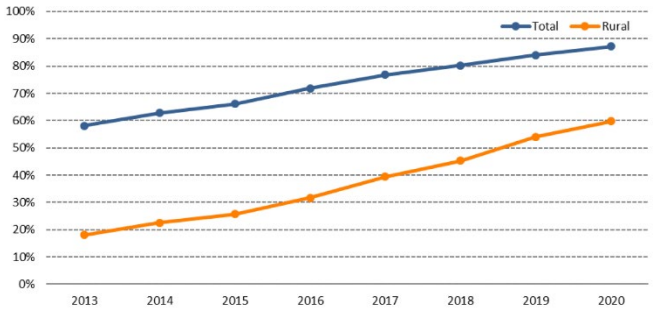
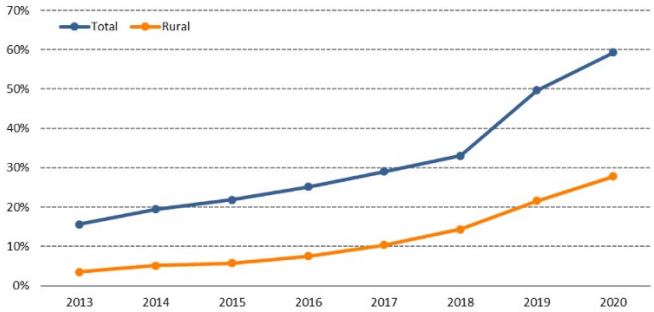


Figure 6.9: Fixed VHCN coverage, % of households, 2013-2020, EU27



28 Source: EC-DG CONNECT (2021)

29 Source: EC-DG CONNECT (2021)

Figure 6.10: High-growth enterprises, by urbanisation level, by country, 2018[30]

30 Data source: Eurostat, accessed in May 2022. No data for BE, CY, DE, EL, IE, LU, PL, SI. Malta has only enterprises in predominantly urban areas.

Figure 6.11: Interacting with public authorities through the internet, % of individuals, 2021[31]

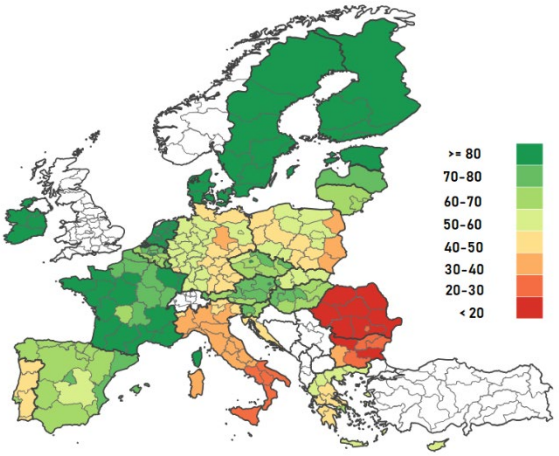
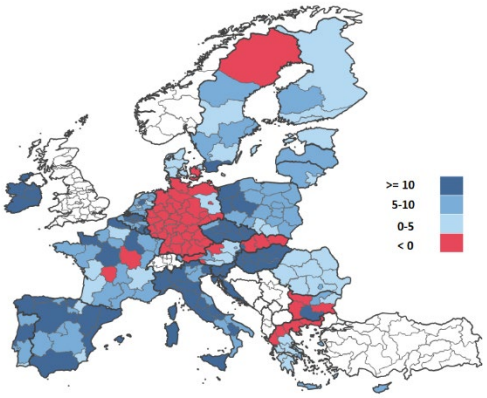


Figure 6.12: 2021-2019 change, individuals interacting with public authorities through the internet, p.p.[32]



31 Data source: Eurostat, accessed in May 2022. Map created by Progress Consulting S.r.l. Notes: no data for Åland, Mayotte and Kontinentalna Hrvatska; data for DE, EL and PL are at NUTS1 level.

32 Data source: Eurostat, accessed in May 2022. Map created by Progress Consulting S.r.l. Notes: no data for Åland, Mayotte and Kontinentalna Hrvatska; data for DE, EL and PL are at NUTS1 level.

Figure 6.13 Representation of Scenario 1

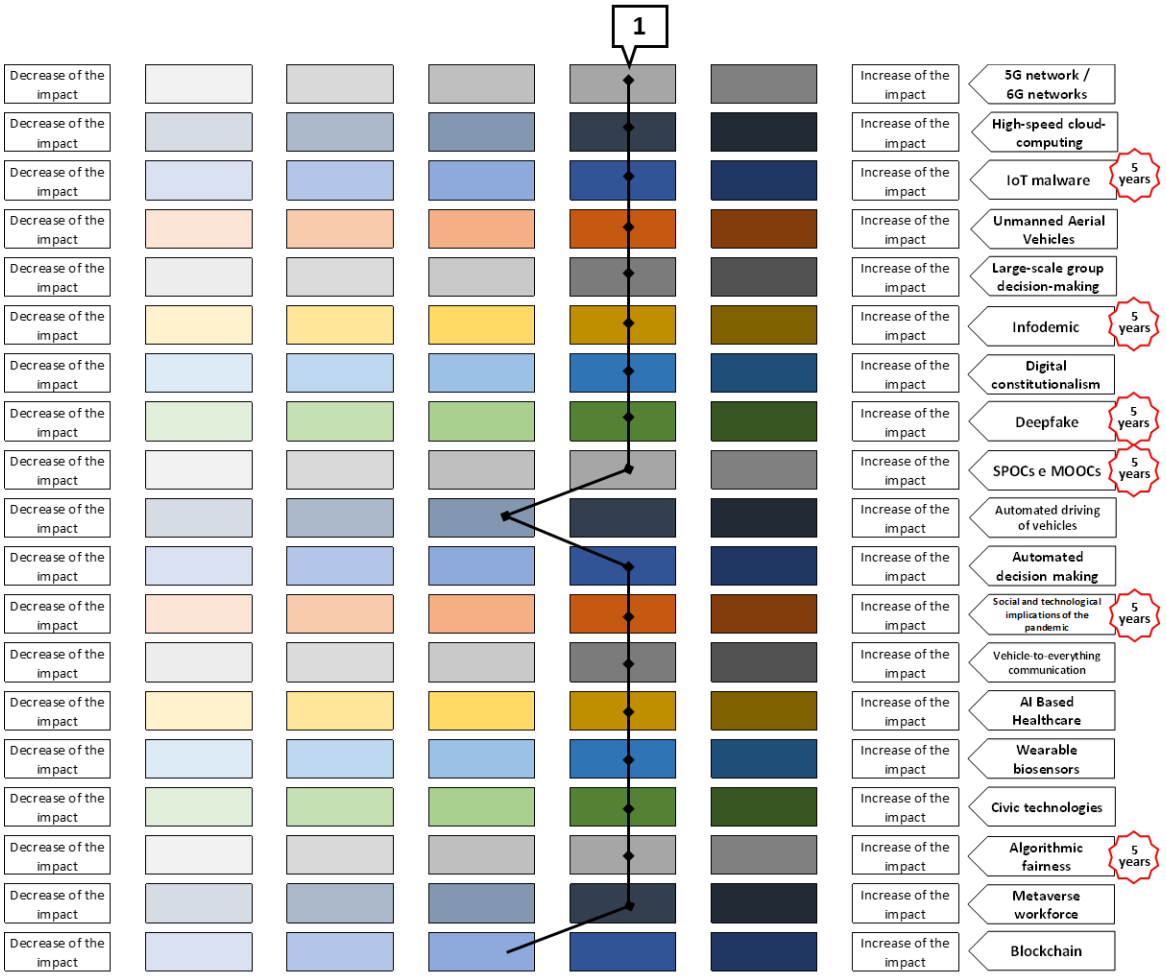


Figure 6.14 Representation of Scenario 2

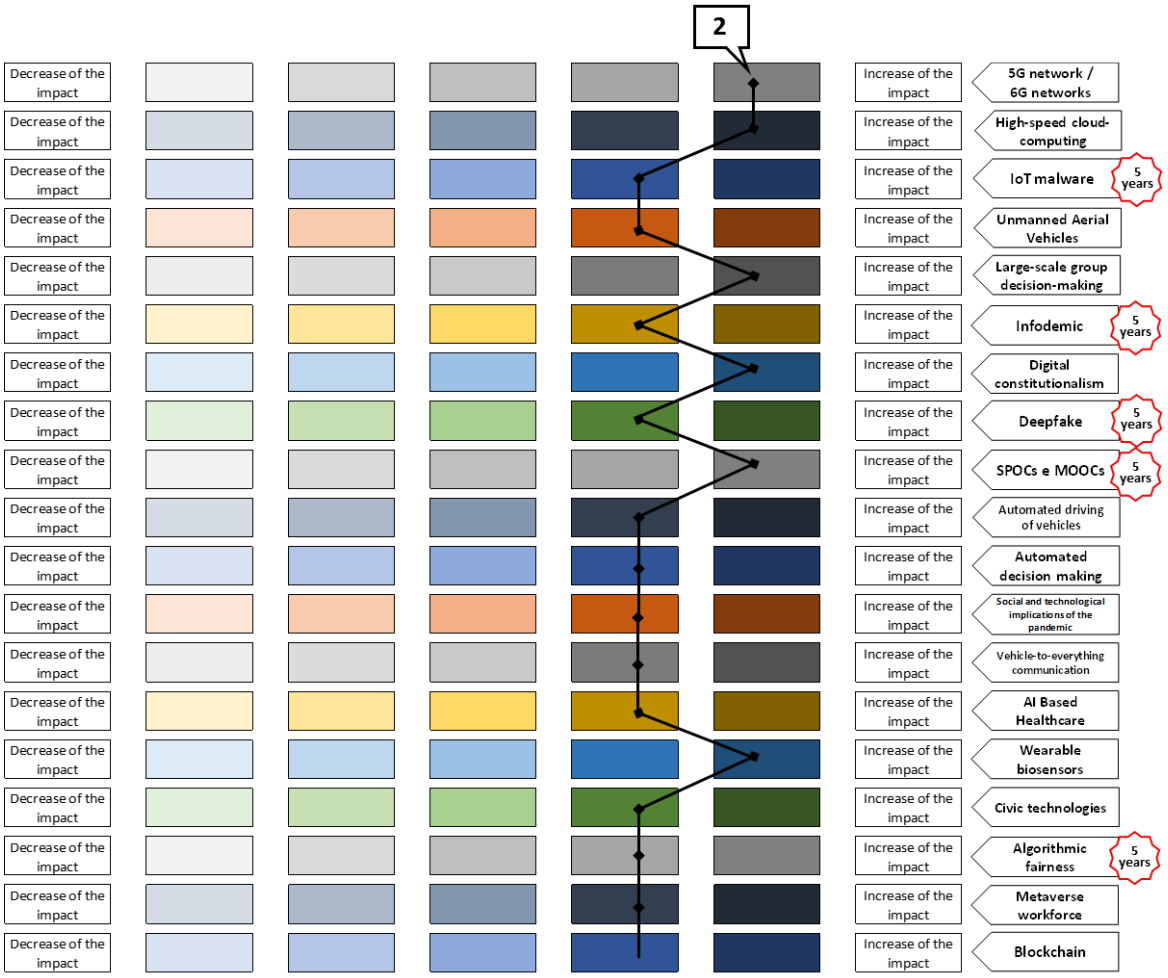


Figure 6.15 Representation of Scenario 3

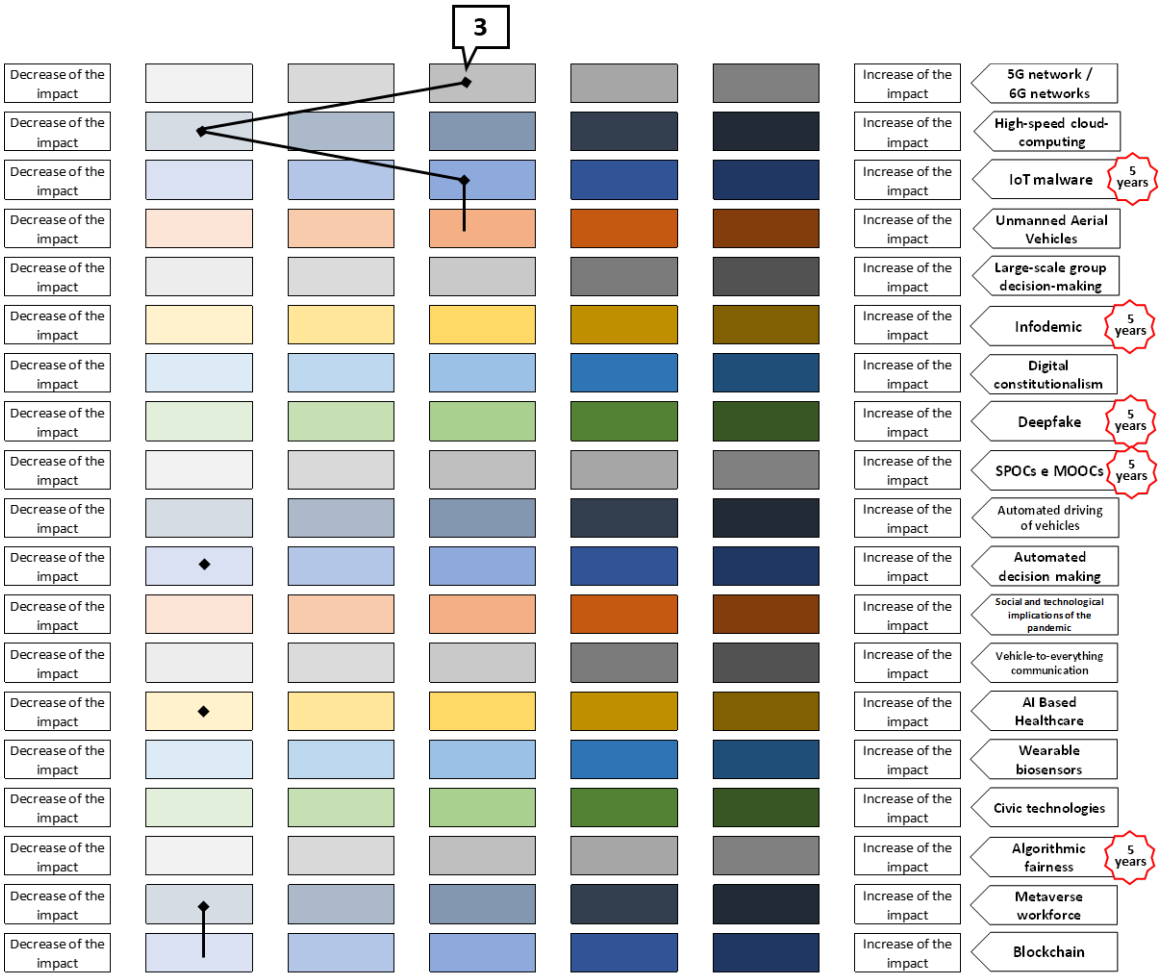
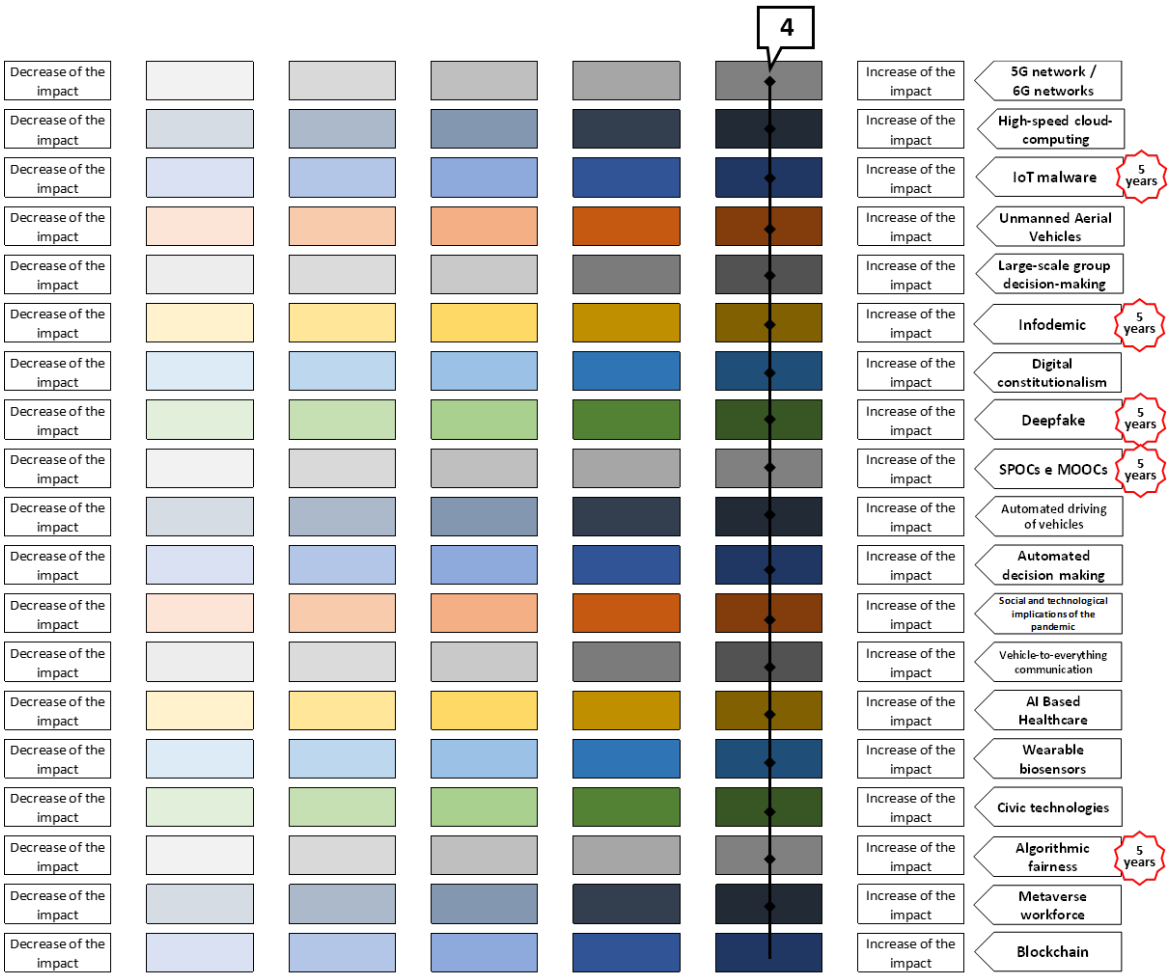


Figure 6.16 Representation of Scenario 4



ESPAS European Strategy and Policy Analysis System