COMMISSION STAFF WORKING DOCUMENT

Implementation of the Digital Decade objectives and the Digital Rights and Principles

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

Report on the state of the Digital Decade 2023

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Contents

1 Introduction

The Digital Decade Policy Programme 2030[1] is the new framework guiding Europe's digital transformation. The policy programme establishes digital targets and objectives to be pursued through a cooperation cycle with Member States.

To complement the State of the Digital Decade report which measures progress annually at EU level on all aspects of the Digital Decade, this Staff Working Document (SWD) analyses in more detail Europe's advancement towards the Digital Decade objectives and the implementation of Digital Rights and Principles. The SWD's analysis is based among others on existing studies as well as consultation activities, notably in the context of the FUTURIUM community set up for the Digital Decade.

Chapter 2 presents **a horizontal analysis of the challenges and progress made with regards to the general objectives set out in the policy programme and the commitments made in the Declaration on Digital Rights and Principles** for empowering people and the society, as well as on a specific focus on resilience and sovereignty and environmental sustainability.

Chapter 3 highlights **the potential of the Digital Decade for regions and municipalities and the role that they can play in delivering digital Decade objectives and targets.**

Chapter 4 sketches out the **external dimension of the Digital Decade** with main actions taken at international level.

Chapter 5 presents an **outlook of the EU budgets and programmes** contributing to the Digital Decade objectives and targets, including actions taken and planned under the Recovery and Resilience Facility (RRF).

Chapter 6 provides an overview of which key **EU policy actions taken since 2020** are contributing to the Digital Decade and how they are progressing.

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[1] DECISION (EU) 2022/2481 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 14 December 2022 establishing the Digital Decade Policy Programme 2030

2 General objectives and the Declaration on Digital Rights and Principles

This chapter presents an analysis of the challenges and progress made with a specific focus on the implementation of the Declaration on Digital Rights and Principles including the objectives that relate to empowering people and the society, resilience and sovereignty and environmental sustainability. It complements the analysis of progress towards the Digital Decade targets presented in the cardinal point thematic reports, which also contribute to implementing and promoting the objectives and principles.

Successfully managing the digital transition and taking advantage of its long-term benefits goes beyond technology innovation, development, and adoption. Achieving a digital transformation that enables the EU to become truly sovereign, resilient, and competitive as well as more sustainable will require the strong and long-lasting support of the European people for conducting the necessary reforms and policy actions. The digital transformation significantly affects all areas of people's lives bringing many benefits but also raising challenges[2]. The current geopolitical and economic context as well as disinformation or digital divide illustrate that it is particularly relevant to put people at the centre of this transformation so that they can fully benefit from more jobs and prosperity and a better quality of life for all. It is therefore critical that digital technologies benefits are accessible to all and everywhere, contribute to reducing divides, benefit consumers and ensure that EU's values are at the centre of our digital future.

2.1 Monitoring the Declaration on Digital Rights and Principles

The **European Declaration on Digital Rights and Principles for the Digital Decade**[3] proposes a vision and concrete commitments for how rights and freedoms enshrined in the EU's legal framework as well as European values translate into a digitally transformed world. It was signed in December 2022 with the aim to give everyone a clear reference point about the type of digital transformation the EU would envisage. It also provides **a guide for policy makers and companies when dealing with digital technologies, measures, and policies**.

As explained in the Declaration, the EU wants to secure European values by **putting people at the centre of the digital transformation**; supporting solidarity and inclusion through connectivity, digital education, training and skills, as well as fair and just working conditions and access to digital public services; ensuring freedom of choice and a fair digital environment; fostering participation in the digital public space; increasing safety, security and empowerment in the digital environment, in particular for young people; and promoting sustainability.

While the Declaration has a declaratory nature and, as such, does not affect the content of legal rules or their application its political importance should not be underestimated. It was signed at the highest level of the European Union and the signatories have acknowledged that its promotion and implementation are a shared commitment and responsibility of the EU and its Member States. Moreover, the Digital Decade Policy Programme provides that **Member States and the Commission must take the digital rights and principles set out in the European Declaration into account** when cooperating to achieve the general objectives of the Digital Decade Policy Programme.

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[2] Millard, J., Impact of digital transformation on public governance, Manzoni, M. and Schade, S. editor(s), Publications Office of the European Union, Luxembourg, 2023, doi:10.2760/204686, https://publications.jrc.ec.europa.eu/repository/handle/JRC133975.

[3] European Declaration on Digital Rights and Principles for the Digital Decade 2023/C 23/01, PUB/2023/89, OJ C 23, 23.1.2023, p. 1–7

As the EU enters its first cooperation cycle to achieve the 2030 on digital skills, digital infrastructures, and digitalisation of businesses and public services, it is important to also measure progress on the promotion and the implementation of the digital rights and principles.

Given the strong links that exist between the Declaration and the general objective of strengthening digital citizenship - empowering people and the wider society - both are analysed in this chapter within the appropriate Declaration chapter headings.

2.1.1   Methodology and vision for the next reports

The Commission has committed to regularly report to the Parliament and the Council on the progress made in promoting and implementing the Declaration. While it may be too early to report on progress a few months thoroughly and systematically after the Declaration was signed, this annex provides some useful findings outlining what has been done in the areas covered in the Declaration since 2020 - the start of the Digital Decade.

The findings below draw on various sources, including the Digital Economy and Society Index (DESI); Member States' replies to the Digital Decade fact-finding questionnaires; feedback from stakeholders; the 2023 Report on the monitoring of the Berlin Declaration; existing reports and studies on the implementation of EU legislation and policies, such as the Media Pluralism Monitor, GDPR, and the Better Internet for Kids annual report.

Moreover, the **2023 Special Eurobarometer Report on the Digital decade** gives an insight into people's perceptions regarding digital rights and principles.

It is against this baseline that the Commission intends to measure the progress made in the promotion and the implementation of the Declaration in the coming years. To this end, data gaps identified in this year's exercise, e.g., in the area of security and workers' rights, will have to be filled. Moreover, only a few Member States have reported on digital principles in their replies to the fact-finding questionnaires. **Member States are invited to provide more information in their national roadmaps**, as the implementation of the Declaration is a responsibility shared between the EU and the Member States. In addition, richer input will be gathered from stakeholders, including industry and civil society, and the Commission services have the intention to commission a study to support monitoring.

2.1.2   Digital rights and principles - results of Eurobarometer survey

It is early to draw firm lessons on the progress in the promotion and implementation of the European Declaration on Digital Rights and Principles signed in December 2022. Nevertheless, the Special **Eurobarometer Survey conducted earlier this year shows that there is no room for complacency**: although variations may exist at national level, **only half (50%) of Europeans consider that digital rights are well protected in Europe, while over one in three (36%) think more needs to be done**. At the same time, **four in ten Europeans (41%) are not aware that their rights that apply offline should also be respected online**. There are notable differences between Member States in this regard. While more than eight in ten citizens in Luxembourg (84%), Slovenia (83%), and Denmark (82%) are aware that their rights should also be respected online, the awareness seems much lower in Bulgaria (34%), Romania (39%), and Italy (40%). Greater awareness across Member States would impact how people exercise and claim their rights online - likely adding to the over one in three Europeans (36%) who think more needs to be done to protect digital rights in Europe.

Looking more specifically at the various chapters of the Declaration, **more than half of the respondents (56%) are of the opinion that getting basic and advanced digital education, training, and skills is well protected in their in their country, with the same proportion thinking the same about getting access to safe and privacy-friendly digital technologies.** A clear majority (60%) of

Europeans think that freedom of assembly and of association are well protected in the digital environment.

Furthermore, **values of solidarity and inclusion** appear to be relatively well reflected in digital policies. A slight majority of Europeans thinks that the following rights and principles are well protected: getting easy online access to all key public services in the EU (54%), affordable high-speed internet connections for everyone (53%), access to a trustworthy, diverse and multilingual digital environment (52%), fair and healthy working conditions in the digital environment, and online privacy and getting access to the right information on the environmental impact and energy consumption of digital technologies (both 51%).

In contrast, less than half (48%) of Europeans think that digital products and services that minimise damage to the environment and society is well applied in their Member State. A similar proportion (49%) thinks that digital rights and principles are applied well in their country in terms of effective **freedom of choice online**, including when interacting with artificial intelligence (e.g., chatbots, digital assistants). Moreover, while, on the one hand, a slight majority of Europeans (51%) consider that **their privacy online is well protected,** on the other hand, **having control over one's own data, i.e. how it is used online and with whom it is shared, is not well protected according to four in ten Europeans (39%)**, and well protected according to less than half of citizens (49%). Regarding children and young people, **only 45% of Europeans consider that their country is ensuring a safe digital environment and content for them**. Overall, more than four out of ten (43%) are worried about the safety of children online.

These findings are only a snapshot of perceptions, and **it will be important to have more comprehensive data in the coming years, in particular from Member States**, notably through their national roadmaps with a view to enabling a more consistent mechanism to monitor effective progress at EU and national levels over the years.

2.1.3   Chapter I: Putting people at the centre of the digital transformation

Putting people at the centre of the digital transformation of our societies and economies is at the core of the European Union vision outlined in the Digital Decade policy programme general objectives (article 3) and the European Declaration on Digital Rights and Principles. The Union believes that the rapidly growing presence and impact of digital technology should benefit everyone and must not undermine individual rights online.

According to the Berlin Declaration Monitoring 2023[4], Member States have increased their overall scores on the **promotion of fundamental rights and democratic values in the digital sphere**, such as non-discrimination, freedom of expression or a high level of consumer protection, raising the EU average from 73% in 2021 to 85% in 2022. Member States are reported as having stepped up their efforts to increase awareness of the relevance of a value-based digital transformation through knowledge-sharing platforms and events. To a lesser extent, Member States have advanced on measures translating fundamental rights in the digital sphere into concrete tangible policies by incorporating them into public sector innovation policies and technology procurement rules, scoring 75% in 2022.

It contrasts to some extent with the perceptions of citizens. **Only half (50%) of Europeans think that the EU protects well their rights in the digital environment,** a slight increase since 2021 (+2 pp), **while over one in three (36%) think the opposite**, as shown by the new Special Eurobarometer. Younger and higher-educated respondents are overall more likely to think that their digital rights are well protected in their country. Citizens feel most protected in Ireland (69%)

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[4] Report on the monitoring of the Berlin Declaration, Directorate General for Informatics, European Commission, June 2023

while citizens from Greece are the most worried (51%). **More than four out of five Europeans (86%) consider that Member States should collaborate more to ensure EU values and rights are respected online.**

The European Union is taking action to ensure that the values of the EU and the rights of individuals are respected online as well as offline. The following chapters outline the action of the EU and Member States on specific sectors and issues and show the human-centric vision of digital transformation that is at the core of EU landmark legislation, such as the Digital Services Act, e-Privacy or General Data Protection Regulation.

The EU and its Member States have also committed to ensuring responsible and diligent action by all actors in the digital environment. A number of stakeholder initiatives are also active in this area.

The EU and Member States have also committed to **promote this human-centric vision of digital transformation with international partners**, both in bilateral and multilateral settings. The Declaration can guide EU partners towards a digital transformation that puts people and their human rights at the centre throughout the world. It has been a key source of inspiration for the December 2022 OECD Ministerial Declaration on a Trusted, Sustainable and Inclusive Digital Future, and for the Declaration on the Future of the Internet (DFI) launched in 2022. It also feeds into the **United Nations Global Digital Compact**, to be agreed at the upcoming Summit of the Future in September 2024 (cf. section 3), as well as into negotiations ongoing at the Council of Europe on an international framework convention on artificial intelligence (AI).

Best practice[5]

Germany provides a good example of an initiative put in place to foster fundamental rights and democratic value with the portal Germany4Ukraine, created in response to the increased arrival of Ukrainians in Germany following the Russian invasion of their country. As a reaction to this situation, the Federal Ministry of the Interior and Community quickly set up the help portal as a central and secure digital point of contact for Ukrainian refugees. The online portal was published in a basic version on 16 March 2022 and shortly thereafter an associated mobile application was made available in all common app stores. Since then, the portal's offerings have been extensively expanded. It currently contains information on eleven key topics in Ukrainian, Russian, English, and German. It currently records over 1 040 000 website visits and 64 000 app downloads.

Finland

Finland provides a good example for including fundamental rights in its technology procurement rules through a Code of Conduct, which specifies the minimum requirements regarding responsibility that have to be part of any procurement contract. They include, for example, compliance with the United Nations Universal Declaration of Human Rights and local legislation as well as obligations relating to employment terms and working conditions, environmental protection, and corruption prevention.

2.1.4 Chapter II: Solidarity and inclusion

With the Declaration on Digital Rights and Principles and the general objectives of the Digital Decade, the European Union and Member States stress the need to **promote solidarity and inclusion** with regards to digital technology and services to support a fair and inclusive society and economy. They have committed, among other things, to a digital transformation that leaves nobody behind, which should benefit everyone, achieve gender balance, and include notably

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[5] Report on the monitoring of the Berlin Declaration, Directorate General for Informatics, European Commission, June 2023

elderly people, people living in rural areas, persons with disabilities, and marginalised or vulnerable people. Over four out of five Europeans (85%) believe that **Member States should cooperate more to ensure that digital technologies and services are accessible to everyone.**

According to the Berlin Declaration Monitoring 2023, a vast majority of **EU Member States (74%) are implementing measures to ensure that digital public services and information are inclusive and accessible**, including for persons with disabilities and in line with the Web Accessibility Directive[6] and the European Accessibility Act[7]. Moreover, most Member States (82%) enable citizens to use their mobile devices to carry out digital public services and cooperate at EU level to ensure mobile device interoperability across borders.

Despite the increasing digitalisation of many aspects of our lives, some **marginalised groups and** persons with disabilities **continue to be left behind with regard to their digital literacy and access to digital services which are key to education, social inclusion and labour market participation[8]**.

The 2023 Commission's Report on Access to Essential Services in the EU identifies lack of digital skills as one of the main barriers preventing vulnerable groups to access digital communications. It also shows that 7.6% of people at-risk-of-poverty could still **not afford an internet connection at home** in 2022 in the EU, with Romania, Bulgaria and Hungary recording values over 25%, 20.5% and 16.5%[9]. The 2021 report[10] of the EU Fundamental Rights Agency (FRA) shows that remote learning presents particular challenges to children from disadvantaged backgrounds and at-risk-of-poverty, for example Roma children. As the 2023 DESI shows, the **gender gap** persists: approximately only one in five ICT specialists and ICT graduates were women according to the latest figures, which may affect the way digital solutions are devised and deployed (SWD thematic report on skills).

The digital divide between generations is also significant[11]. As shown by 2022 Eurostat data[12], over 99% of 16-24 years olds are using the Internet in the EU 27 compared to around 83% of individuals aged between 55-74. There are even bigger differences regarding the uptake of e-commerce: According to the Consumer Conditions Scoreboard 2023 e-commerce is taken up by 81% of those aged from 18 to 54 but only by slightly over half (51%) of those over the age of 64. Similar differences exist by education, with only 51% of people with lower secondary education or below making purchases online, compared to 79% of respondents with tertiary level education. A rural/urban divide in the use of online buying is also apparent.

Worryingly, the WBA's Digital Inclusion Benchmark (DIB) from March 2023 **shows that less than 14% of the world's major tech companies have made progress on digital inclusion**. The majority of tech companies are still lagging behind in their responsibility to ensure that people are able to

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[6] Directive (EU) 2016/2102

[7] Directive (EU) 2019/882

[8] The **digital divide between persons with and without disabilities** is significant. As shown by 2022 Eurostat data 94% of persons without a disability are using internet across the EU compared with 84% of those with disabilities (Statistics | Eurostat (europa.eu)). The Strategy for the Rights of Persons with Disabilities (2021-2030) recalls that around 64% of persons with disabilities have an internet connection at home compared to about 88% of persons without disabilities (The Strategy for the Rights of Persons with Disabilities (2021-2030) - European Commission (europa.eu), p. 6).

[9] Commission's Report on Access to Essential Services in the EU (SWD(2023) 213 final/2). Available at https://ec.europa.eu/social/main.jsp?langId=en&catId=89&furtherNews=yes&newsId=10595.

[10] FRA Fundamental Rights report 2021, Figure 5.2., page 130

[11] FRA paper, 2020: https://www.bmfsfj.de/resource/blob/160708/718712aca2e438178bc34cf3993cb15a/background-paper-fra-conference-data.pdf

[12] Eurostat, 2022 : https://ec.europa.eu/eurostat/databrowser/bookmark/13a775eb-9df0-4ae8-a8b3-69f93a3e1e03?lang=en

use digital technology in a way that benefits them. However, there are a **handful of companies - mostly European - leading the way on digital inclusion.**

During a stakeholder workshop organised by the European Commission to feed into this report[13], civil society representatives noted that the public sector can set a good example for the industry, for instance by ensuring that the digitalisation of public services does not lead to the exclusion for some.

In order to create a 'Union of equality', ensuring the accessibility of online services is key. While the 2022 review of the Web Accessibility Directive[14] shows that the Commission and the Member States have fulfilled their obligations, there is still much progress to be made in practice for all public sector websites and mobile applications to be fully accessible to persons with disabilities. Under the European Accessibility Act[15,] a wide range of products and services, including electronic communications, e-commerce and ICT equipment must be made accessible for persons with disabilities also in the private sector.

In the context of inclusion, the EU and Member States have also undertaken to develop a digital transformation that promotes cultural and linguistic diversity. However, the Fundamental Rights Agency (FRA)[16] found that **while technologies and the availability of tools for English related to natural language processing (NLP), which help computers process and analyse large amounts of natural language data, have improved considerably in recent years, tools for other languages are still lagging far behind.** To date, the EU and Member States do not seem to be taking enough measures to foster more language diversity in natural language processing (NLP) tools as a way of mitigating bias in algorithms and improving the accuracy of data. The proposal for an Alliance for Language Technologies, to be implemented through an European Digital Infrastructure Consortium (EDIC), aims to address the shortage of European language data training through development of large multi-language models.

In the Declaration and as general objectives, the EU and Member States have undertaken to develop adequate frameworks so that all market actors benefiting from the digital transformation assume their social responsibilities and make a fair and proportionate contribution to the costs of public goods, services, and infrastructures, for the benefit of all people living in the EU. As part of an open dialogue with all stakeholders, the Commission has held during the first semester of 2023 an exploratory consultation to gather views on the potential developments of the connectivity sector and its infrastructure.

Best practice

*In order to address the digital gender divide, **Slovenia** has put in place the Female Engineer of the Year award to inspire young girls to choose engineering careers by providing role models and highlighting their work[17]. Similarly, **Italy** promotes the Girls Code it Better initiative focusing on girls in secondary education and on boosting their interest towards digital and innovation-related topics through a course delivered during extracurricular afternoon classes[18].*

*In **Finland**, universities and non-governmental organisations are cooperating on the OdigO Project - Lapland, an online programme for seniors that is accessible to anyone interested in the topic and*

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[13] For more information, see *Report on Outreach and Consultation Activities, Digital Decade Policy Programme*.

[14] Web Accessibility Directive (Directive (EU) 2016/2102)

[15] Directive (EU) 2019/882 of 17 April 2019 on the accessibility requirements for products and services

[16] https://fra.europa.eu/en/publication/2022/bias-algorithmhttps://fra.europa.eu/en/publication/2022/bias-algorithm

[17] https://digital-skills-jobs.europa.eu/en/inspiration/good-practices/female-engineer-year-slovenia.

[18] https://digital-skills-jobs.europa.eu/en/inspiration/good-practices/girls-code-it-better-italy.

Connectivity

The Declaration provides that everyone should have access to affordable and high-speed digital connectivity everywhere in the EU, while general objectives refer to ensuring that "digital technologies and services are accessible to all, everywhere in the Union". This is a key prerequisite in order to promote equal chances in an increasingly digitalised world. As detailed in the SWD thematic report on infrastructure, **97% of EU households had Internet access** in 2022[20]. Overall, 73% of households had fixed very high-capacity network (VHCN) and 81% 5G coverage. While Malta was leading with a 100% VHCN coverage in 2022, with 7 other Member States above 90% coverage[21], some Member States had much lower coverage, e.g., Greece (28%), Czechia (53%) and Italy (54%). There is also a persistent rural/urban digital divide: despite progress over the last years, broadband coverage of rural areas remains challenging, with 9% of households not covered by any fixed network.

According to the 2023 Special Eurobarometer, only a slight majority of Europeans (53%) think that everyone has access to an affordable high-speed internet connection, and **more than one third (35%) stress the need for better connectivity**. Europeans rank improving the availability of high-speed internet as the second most important action that their country should prioritise with regards to digitalisation. In addition, **75% of Europeans continue to call for better prices**, **despite the decreasing mobile and fixed broadband prices**, as shown by the Retail Broadband Prices in Europe from the 2023 study. The report shows that on fixed broadband, there has been an overall decrease in prices at EU level in 2022 compared to last year (i.e., 2021) for offers in the speed category of ≥100 Mbps. There was a change in prices for all baskets, including Single Play, Double Play, and Triple Play. The figure 1 below shows that there is a price decline for Single Play ≥30 - <100 Mbps, while Double Play and Triple Play offers experienced a slight increase (1.69% and 2.42% respectively) in comparison to last year. The most significant decrease of prices of about 9% was observed in Single Play offers with speeds from 100 Mbps to 999 Mbps. In the gigabit category, Triple Play offers have experienced a more notable decrease, with prices dropping by approximately 4.14%.
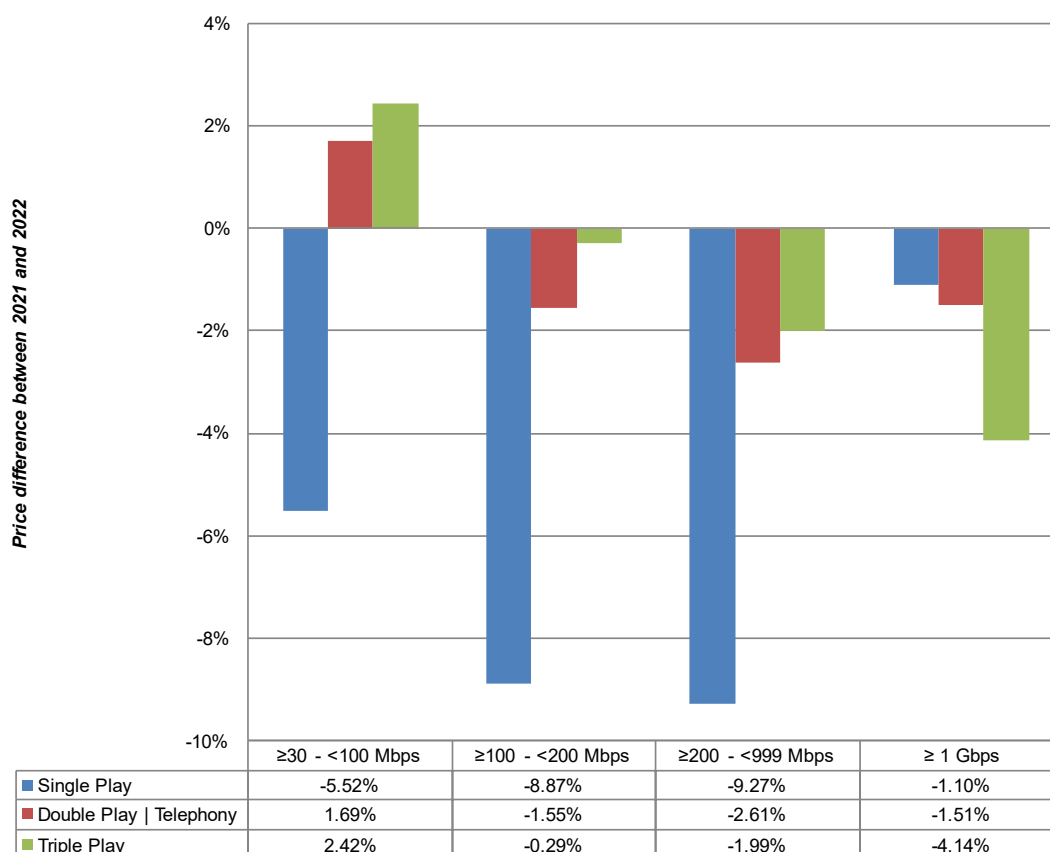
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[19] https://digital-skills-jobs.europa.eu/en/inspiration/good-practices/odigo-project-lapland-finland

[20] Source: Broadband coverage in Europe studies for the European Commission by Omdia and Point Topic

[21] Malta, Netherlands, Denmark, Romania, Luxembourg, Spain, Portugal, and Latvia

*Figure 1 - **Price changes in least expensive broadband prices**, EU level (2021-2022)*

	≥30 - <100 Mbps	≥100 - <200 Mbps	≥200 - <999 Mbps	≥ 1 Gbps
■ Single Play	-5.52%	-8.87%	-9.27%	-1.10%
■ Double Play | Telephony	1.69%	-1.55%	-2.61%	-1.51%
■ Triple Play	2.42%	-0.29%	-1.99%	-4.14%

The latest Commission report on the implementation of the Regulation on open internet access, which aims to ensure that all users can continue to benefit from online content and services without discrimination, prioritisation, restriction or interference from internet service providers as technologies develop, confirmed that the Regulation continues to guarantee the essential balance between the protection of end-users' rights and the support of a competitive environment in the EU's Digital Single Market.

Best practice

*Many Member States have made steps towards improving connectivity. In **Ireland**, the Mobile Phone and Broadband Taskforce, made up of state actors and industry representatives, aims to identify and overcome barriers to improved connectivity, such as permit granting, planning and licensing processes and more efficient use of infrastructure and assets.*

*Following the first Connecting Europe Facility (CEF) - Digital call for proposals in 2022, the Commission also selected seven 5G for Smart Communities projects that will deploy 5G connectivity and enable innovative use cases for public services and services of general interest. The projects started in Q1 2023 with a timeframe of three years. For instance, in **Belgium**, the EU-funded Flanders Smart Fields project will provide standalone 5G coverage for the Westhoek region in Belgium to support innovative applications in healthcare and education.*

Digital education, training and skills

The Declaration provides that everyone has the right to education, training and lifelong learning and should be able to acquire all basic and advanced digital skills while the general objective of the Digital Decade commits to "*bridging the digital divide by promoting continuous opportunities for all individuals, developing basic and advanced digital skills and competencies*" and to gender balance.

According to DESI 2023, **54% of Europeans had at least basic digital skills and only 26% above basic digital skills** in 2021 (cf. 'Digital Decade cardinal points: digital skills, digital infrastructures, digitalisation of businesses and digitalisation of public services', SWD(2023) 571). This means almost half of Europeans do not have the skills needed to access the opportunities offered online such as obtaining information from public authorities, using online banking or buying online. In eight Member States, the share of individuals with at least basic digital skills is lower than 50%. Differences between Member States are stark: while the Netherlands and Finland are close to reaching the EU 2030 target (80%) with 79% of people having at least basic digital skills in 2021, Bulgaria and Romania have only reached about 30%.

Levels of digital skills vary within different segments of the population. While 71% of young adults (aged 16-24) and 79% of individuals with high formal education have at least basic digital skills, only 35% of those aged 55-74 and 29% of the retired and the inactive have at least basic digital skills. A gap is also visible between the rural and urban areas: only 46% of individuals living in rural areas have at least basic digital skills compared to 61% of people living in urban areas.

According to the new Special Eurobarometer, **almost one third of Europeans (30%) do not feel appropriately equipped for the digital decade**, with numbers highest among citizens from Greece (47%). Even if the **majority of Europeans (56%) feel that they are getting necessary basic or advanced digital education, training and skills**, with the best results in Malta (80%) and Luxembourg (75%), they think supporting more education and training in digital skills should be among the top five digital priorities of their country.

However, to date, Member States seem to face difficulties in equipping people with the necessary digital skills. The 2023 Berlin Declaration Monitoring shows that they score 100% on offering digital skills training for the public sector but **only 61% on promoting initiatives to equip the general public with digital skills**.

Over the last few years, digital technologies have significantly contributed to increasing the quality of education and training in Europe, and made it more accessible and inclusive, helping us respond to the COVID-19 pandemic or the war in Ukraine with solutions such as distance learning. Despite many initiatives, efforts have so far not resulted in systemic digital transformation in education and training[22].

Leverage digital tools for innovative education solutions also requires appropriate teacher training. Yet **fewer than half of teachers in the EU (49.1%) reported that ICT was included in their formal education or training**, and only 39% of teachers felt well prepared to use digital technologies for teaching[23]. The EU supports Member States in the digitalisation of schools with significant amounts disbursed through various EU programmes; however, a report of the European Court of Auditors from April 2023 found that a lack of strategic use of this EU funding in Member States undermines its full impact.

High-speed internet connections were still rare in European schools in 2019, in particular in rural and remote areas (including outermost regions). Only 11% of EU students in primary, 17% in lower secondary and 18% in upper secondary education were in schools that had an internet speed above 100 Mbps[24]. When it comes to school equipment, the share of students attending schools where more than 90% of digital equipment was operational ranged from 61% at primary school level to 73% at upper secondary level.

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[22] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023SC0205&qid=1659174525177 (our SWD published on 18/04)

[23] OECD (2019), TALIS 2018 Results (Volume I): Teachers and School Leaders as Lifelong Learners, TALIS. Paris: OECD Publishing

[24] European Commission (2019). 2nd Survey of Schools: ICT in Education. Luxembourg, EU Publications Office

In order to support Member States and the education and training sector in providing high-quality, inclusive and accessible digital education and training and develop the digital skills of European citizens, the European Commission has adopted in April 2023 two Proposals for a Council Recommendation in the context of the European Year of Skills.

> **Best practice**
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> *In 2022, several Member States put in place good practices related to the development of basic or advanced digital skills. For instance, in **Ireland**, the Skills to Advance initiative offers upskilling and reskilling opportunities[25].*
>
> *In order to educate people about artificial intelligence (AI) and empower them to make informed choices, **Germany** has put forward in 2020 an AI Campus, a free digital platform with a selection of courses on AI and data literacy, with the objective to build networks between learners, training providers of AI courses, and educational experts.*

Fair and just working conditions

Everyone has the right to fair, just, healthy and safe working conditions and appropriate protection in the digital environment. According to European citizens this is not always the case. The 2023 Special Eurobarometer shows that only **half (51%) of Europeans think that people working in the digital environment are benefitting from fair and healthy working conditions**, including the work-life balance, while one third (33%) think the opposite.

The Declaration provides that people should be able to **disconnect** after working hours and benefit from a work-life balance[26]. The European Parliament adopted a Resolution on the right to disconnect in 2021[27], notably calling for a proposal for a directive on minimum standards and conditions on the right to disconnect and an EU legislative framework on telework. The Resolution also highlighted the importance of social partners' autonomy and their role in implementing rules to address the challenges of digitalisation, telework and the right to disconnect.

The EU cross-industry social partners' work programme for 2022-24[28] includes the review and update of the 2002 Autonomous Agreement on Telework, with a view to a legally binding agreement to be transformed into EU law. The European cross-industry social partners are currently negotiating a new agreement on teleworking and the right to disconnect, intended to be put forward for adoption in the form of a legally binding agreement implemented via a Directive.

At national level, several Member States, including France, Belgium, Italy, Spain, Greece, Slovakia, Ireland and Portugal have put in place legislation that includes the right to disconnect, with France being the first EU country to legally recognise the right to disconnect in 2016.

With regards to **platform workers**, the European Commission put forward in December 2021 a Proposal for a Directive on improving working conditions in platform work, currently under negotiation. This Proposal notably includes measures to correctly determine the employment status of people working through digital labour platforms. The proposed Platform Workers Directive aims at promoting transparency, fairness and accountability in algorithmic management and the use of artificial intelligence in the workplace and human oversight. It would complement

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[25] https://digital-skills-jobs.europa.eu/en/inspiration/good-practices/skills-advance-ireland.

[26] While no right to disconnect exists in EU law as such, the Working Time Directive from 2003 sets minimum daily and weekly rest periods and limits weekly working time and the length of night work. A report on the implementation of the directive, which looks also deals with telework, was adopted in March 2023.

[27] European Parliament resolution of 21 January 2021 with recommendations to the Commission on the right to disconnect (2019/2181(INL)), OJ C 456, 10.11.2021, p. 161.

[28] European social dialogue work programme 2022-2024 | BusinessEurope

the proposed Artificial Intelligence Act that is currently under negotiation, which proposes a risk-related approach to the use of AI.

Several Member States have already adopted platform work legislation at national level, some of which has been inspired by the Commission proposal. In most cases, focus is on correct classification of employment status, including in Spain, Belgium, Portugal, Croatia and Malta. France and Greece have also adopted legislation, providing additional rights for self-employed platform workers, namely collective rights and protections in the area of health and safety.

It is worth underscoring that digitalisation and automation of working environment could constitute both advantages and disadvantages for persons with disabilities. The technologies and processes could be designed and implemented in an accessible and inclusive way to be usable by persons with disabilities. On the other hand, they could be helpful in providing reasonable accommodation at work, for example through captioning, predictive text or visual recognition.

> ***Best practice***
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> *In 2021, **Greece** adopted a new labour law including provisions for platform workers. In particular, it defines what a digital platform is under Greek employment law, as well as the contractual relationship between digital platforms and service providers. It provides for a presumption of employment relationship. The law also guarantees trade union rights for the providers of independent services. Platforms must inform service providers of their statutory rights before the commencement of their duties and provide them with a written and a digital copy of their contract. Health and safety of the service provider remains the sole responsibility of the platform[29].*

Digital public services online

According to the Special Eurobarometer survey, four out of five (81%) Europeans think that digital technologies will be important to access public services online by 2030. European citizens think that improving online access to and usability of public services should be one of the top five priorities of their government with regards to digitalisation.

The Declaration states that everyone should have online access to key public services in the EU. Specifically, the EU and Member States committed to facilitating and supporting seamless, secure and interoperable access across the EU to digital public services designed to meet people's needs in an effective manner, including in particular digital health and care services, such as access to electronic health records. A similar commitment is made in the general objective of the Digital decade[30].

Overall, the online **availability of digital public services for citizens in the EU is scored 77 out of 100** in 2022, according to 2023 DESI data (cf. 'Digital Decade cardinal points: digital skills, digital infrastructures, digitalisation of businesses and digitalisation of public services', SWD(2023) 571). Malta, Luxembourg, Estonia and Finland performed the best on this measure, scoring more than 90, while Romania is lagging behind with a score of 48. Still according to DESI, 71% of citizens have online access to their electronic health records.

When it comes to digital public services, equitable access to electronic health records with secure means of authentication is key. The EU performs quite well on this indicator, with an EU average

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[29] Greek Law no. 4808/2021 | Initiative | Eurofound Platform Economy Repository (europa.eu)

[30] online participation in democratic life is possible for everyone, and that public services, health and care services are also accessible in a trusted and secure online environment for everyone, in particular for disadvantaged groups including persons with disabilities, and in rural and remote areas such as outermost regions, offering inclusive, efficient, interoperable and personalised services and tools with high security and privacy standard.

score of 71 and with Denmark (95), Lithuania (91), Finland (89), Estonia (89), Austria (88) and Poland (86) in the lead. On the other hand, Ireland does not enable such an access for citizens at all.

According to the Eurobarometer survey, almost one third (32%) of Europeans think that it is difficult to access digital public services, while 54% think it is easy, in particular in Luxembourg, Malta, Ireland and Finland (over 70%).

In the Declaration, the EU and Member States committed to ensuring that people living in the EU are offered the possibility to use an accessible, voluntary, secure and trusted digital identity that gives access to a broad range of online services. This should be the case once Member States will have provided their citizens and residents with a trusted and secure way to authenticate and share qualified data attributes online through a 'digital wallet' that would allow transactions across the EU, in line with the proposed Regulation establishing European Digital Identity Framework, revising the current eIDAS Regulation[31]. The proposal is currently under legislative discussion. Until adoption of the revised Regulation, Member States which have notified at least one national eID means under the current eIDAS Regulation are deemed to meet this commitment.

The EU also aims to ensure that digital public services are accessible to citizens of any Member State without discrimination. The Interoperable Europe Act[32] proposed by the European Commission seeks to help the EU and Member States to deliver better public services, **interoperable** by default, to citizens and businesses.

In the area of safe and secure public administration, a proposal to establish an EDIC for the coordination of the activities of the European Blockchain Service infrastructure (the EDIC for the European Blockchain Partnership and European Blockchain Service Infrastructure (EBSIC-EDIC) that would further enable cross-border exchanges between public authorities, public and businesses) has been submitted by Member States. Another proposal to set up The Innovative Massive Public Administration InterConnected Transformation Services (IMPACTS) EDIC that focuses on cross-border services provision for European citizens though advanced ICTs and open principles and standards has been pre-notified.

Best practice

In order to increase the online availability of digital public services for citizens and businesses, ***Portugal*** *put forward a dedicated web portal which offers information and documentation of technical architectures of the public administration platforms, e.g. digital identity, open data portal, interoperability platform, electronic notifications system, or a single digital gateway for public services ePortugal.*

2.1.5 Chapter III: Freedom of choice

Interactions with algorithms and artificial intelligence (AI) systems

The Declaration provides that artificial intelligence (AI) systems should benefit people including by making their own informed choices in the digital environment while being protected against risks and harm to health, safety and fundamental rights. Such commitment is also linked to the general objective set in the Digital Decade to "*promoting a human-centred, fundamental-rights-based, inclusive, transparent and open digital environment where technologies and services observe and enhance Union principles, rights and values*".

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[31] Regulation (EU) No 910/2014 on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC.

[32] The proposal was adopted by the Commission on 18 November 2022 and is currently under inter-institutional negotiations.

According to the <u>Special Eurobarometer</u>, **only 49% of Europeans believe that they are getting effective freedom of choice online, including when interacting with artificial intelligence** (e.g., chatbots, digital assistants), with citizens in the Netherlands (43%) and Greece (42%) being the most sceptical. According to the WBA's <u>Digital Inclusion Benchmark 2023</u>, only approximately 22% of companies have made commitments to ethical Artificial Intelligence principles.

Further to the release of ChatGPT and other generative AI tools in late 2022, there have been growing concerns about the risks posed by digital technologies to the functioning of our societies. The **Artificial Intelligence Act**, proposed by the Commission in April 2021 and still under negotiation among EU legislators, should be instrumental in reinforcing the protection of safety and fundamental rights of citizens in the digital environment. It aims to address several commitments undertaken in the Declaration. It supports the objective of the Union to be a global leader in the development of secure, trustworthy and ethical artificial intelligence systems. It should ensure an adequate level of transparency about the use of AI systems, and that people are empowered to use them, informed and aware when interacting with them. A number of mandatory requirements are introduced for AI systems posing significant risks to the health and safety or fundamental rights of persons. For example, such AI systems would have to be based on adequate datasets to avoid discrimination and enable human oversight.

Implementing these principles and commitments in practice is a challenge. As an illustration, the Fundamental Right Agency (FRA) 2022 <u>report</u>[33] highlighted the complexities of bias detection and assessment of potential discrimination. Its 2020 <u>report</u>[34] also showed that a big part of Europeans is unaware of their rights. In addition, most people are not aware that they have the right to have a say when decisions are automated. The report finds that to effectively contest decisions based on the use of AI, people need to know that AI is used, and how and where to complain[35].

Better **transparency and user-friendliness** in the terms and conditions in relation to the use of digital services is also essential. FRA's <u>Fundamental Rights Survey</u>[36] from 2020 found that overall, only one in five Europeans always reads the terms and conditions when using online services (22%). Among those who read them at least sometimes, 27% did not understand them.

The **Digital Services Ac**t applies already at the end of August 2023 to 19 designated very large online platforms (VLOPs) and very large online search engines (VLOSEs). The rules will oblige the service providers to give authentic choices to users when interacting with certain algorithmic systems. For example, users should be able to understand why they are targeted with ads, or why

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[33] Bias in algorithms - Artificial intelligence and discrimination | European Union Agency for Fundamental Rights (europa.eu)

[34] https://fra.europa.eu/en/publication/2020/artificial-intelligence-and-fundamental-rights

[35] FRA's 2020 report '<u>Getting the Future Right – Artificial intelligence and Fundamental rights</u>', page 65. While the statistics quote the 2019 Eurobarometer survey, the report is also based on 91 interviews with officials in public administration and staff in private companies, in selected EU Member States. They were asked about their use of AI, their awareness of fundamental rights issues involved, and practices in terms of assessing and mitigating risks linked to the use of AI. There are some findings from those interviews about awareness of fundamental rights and legal frameworks in the AI context in section 4.2 (from page 58) of the 2020 report<u>https://fra.europa.eu/sites/default/files/fra_uploads/fra-2020-artificial-intelligence_en.pdf</u>).<u>https://fra.europa.eu/en/publication/2020/artificial-intelligence-and-fundamental-rights</u> 91 interviews with officials in public administration and staff in private companies, in selected EU Member States. They were asked about their use of AI, their awareness of fundamental rights issues involved, and practices in terms of assessing and mitigating risks linked to the use of AI. There are some findings from those interviews about awareness of fundamental rights and legal frameworks in the AI context in section 4.2 (from page 58) of the 2020 report). <u>https://fra.europa.eu/en/publication/2020/artificial-intelligence-and-fundamental-rights</u>

[36] FRA Fundamental Rights Survey, <u>Your rights matter: data protection and privacy</u> , page 9. (based on data from FRA's Fundamental Rights Survey carried out in 2019).

they are recommended certain content. They should also be able to choose not to be targeted with recommendations based on their profiles. Service providers will have to assess all risks stemming from their algorithmic systems and address them.

The new European Centre for Algorithmic Transparency, launched by the European Commission in April 2023 and hosted by the Joint Research Centre, aims to develop expertise and tools, in particular as regards platforms' algorithmic systems such as recommender systems, content moderation and advertising algorithms, in order to support the monitoring and supervision of the Digital Services Act.

On the research side, a commitment in the Declaration is to take measures to ensure that research in artificial intelligence respects the highest ethical standards and relevant EU Law. As a matter of fact, any project developing, deploying or using AI, be it in Horizon Europe or Digital Europe programmes, has to undergo a screening to check compliance with applicable ethical requirements provided for in the Grant Agreement[37].

Best practice

Spain *has launched a pilot for an AI regulatory sandbox, in close cooperation with the Commission. The main goal is to provide practical experience, best practices and lessons learnt based on the practical implementation of the requirements of the Proposed AI Act, including in relation to the risks to fundamental rights. Around 8-12 AI systems will be supervised following a public call for proposals. The project, funded under Spain's National Recovery and Resilience Plan has a budget of around EUR 4.3 million and will run for three years until 2025. Cooperation at EU level and involvement of other EU Member States will be ensured within the EU Expert Group on AI and Digitalisation of Businesses set up by the Commission. First results are expected in 2023[38].*

A fair, open and safe online environment

The Declaration provides that everyone should be able to effectively and freely choose which online services to use, based on objective, transparent, easily accessible and reliable information. Signatories committed in particular to ensuring a safe and secure digital environment based on fair competition, where fundamental rights are protected, users' rights and consumer protection are ensured, and responsibilities of platforms, especially large players and gatekeepers, are well defined.

The **Digital Services Act** (DSA)[39] and the **Digital Markets Act** (DMA)[40] bring comprehensive and ground-breaking legislative rules to address the societal and economic impacts of online services in the EU, ensuring the protection of fundamental rights and fostering opportunities for businesses.

The DSA and the DMA form a set of rules that apply across the EU. They have two main goals:

- To create a safer digital space in which the fundamental rights of all users of digital services are protected.

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[37] On self-assessment cf. https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/common/guidance/how-to-complete-your-ethics-self-assessment_en.pdf

[38] Resumen_Piloto_Sandbox_IA_Final_002_iRVZM8A5tSlmH6qfur4RAqNex4_87973.pdf

[39] Regulation (EU) 2022/2065 of the European Parliament and of the Council of 19 October 2022 on a Single Market For Digital Services and amending Directive 2000/31/EC (Digital Services Act) https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32022R2065&qid=1666857835014

[40] Regulation (EU) 2022/1925 of the European Parliament and of the Council of 14 September 2022 on contestable and fair markets in the digital sector and amending Directives (EU) 2019/1937 and (EU) 2020/1828 https://eur-lex.europa.eu/legal-content/EN/TXT/?toc=OJ%3AL%3A2022%3A265%3ATOC&uri=uriserv%3AOJ.L_.2022.265.01.0001.01.ENG

- To establish a level playing field to foster innovation, growth, and competitiveness in the European internal market and beyond.

On the one side, the DSA creates comprehensive new obligations for the providers of online intermediary services to reduce harms and counter risks online, introduces strong protections for users' rights online, and places digital platforms under a unique new transparency and accountability framework. Designed as a single, uniform set of rules for the EU, these rules will give users new protections and businesses legal certainty across the whole internal market.

Codes of conduct will continue to be an important tool to tackle all forms of illegal content online and respond to systemic risks, while protecting fundamental rights and freedoms. For example, the Commission is looking at how the EU Code of conduct on countering illegal hate speech online can add value to the DSA regulatory provisions in the future[41]. While monitoring by the Commission with the help of civil society partners had shown that the signatories had made significant progress on their responses to hate speech notifications since 2016, positive trends regarding both time of review of notifications and removal of hate speech content have slowed down more recently.

On the other side, the DMA is one of the first regulatory tools to comprehensively regulate the gatekeeper power of the largest digital companies. It complements, but does not change EU competition rules, which continue to apply fully. It aims at preventing gatekeepers from imposing unfair conditions on businesses and end users and at ensuring the openness of important digital services, such as app stores, online search engines or advertising services. Gatekeepers will carry an extra responsibility to conduct themselves in a way that ensures an open online environment that is fair for businesses and consumers, and open to innovation by all, by complying with specific obligations laid down in the legislation.

The DSA entered into force on 16 November 2022. The DMA entered into application on 2 May 2023 and both regulations are directly applicable across the Union. On 25 April 2023, the Commission adopted the first designation decisions under the DSA, designating 17 very large online platforms (VLOPs) and 2 very large online search engines (VLOSEs) that reach at least 45 million monthly active users in the EU, which had four months to comply with the rules[42]. On 3 July 2023, seven undertakings providing core platform services notified the Commission of meeting the quantitative thresholds laid down in Article 3(2) of the DMA, i.e. providing gateways for business users to reach end-users online[43]. The Commission had 45 working days to adopt a decision designating gatekeepers in relation to each of their core platform services. The designated gatekeepers will have a maximum of six months after the designation to ensure compliance with the obligations and prohibitions laid down in the DMA.

The Platform-to-business (P2B) Regulation[44] was the first step towards a comprehensive legal framework for the platform economy; this has since been complemented by the adoption of the DSA and the DMA.

The P2B Regulation, including its article 11 on internal complaint handling, applies to all medium-sized and large providers of online intermediation services. Therefore, its scope goes beyond the Digital Markets Act (Regulation (EU) 2022/1925) and extends this legal certainty to business building on a mix of 'gatekeeper' core platform services and other online intermediation services - including those that may interoperate with gatekeepers. In case of the DSA, Article 2(4) of the DSA

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[41] The voluntary Code was initiated in 2016 a voluntary Code of Conduct and signed by Facebook, Instagram, Twitter, YouTube, Dailymotion, Snapchat, jeuxvideo.com, TikTok (2020), LinkedIn (2021), Viber and Twitch (2022).

[42] See also press release https://ec.europa.eu/commission/presscorner/detail/en/IP_23_2413.

[43] See also press release: https://digital-markets-act.ec.europa.eu/gatekeepers_en.

[44] Regulation (EU) 2019/1150 of the European Parliament and of the Council of 20 June 2019 on promoting fairness and transparency for business users of online intermediation services

explicitly acknowledges that it applies without prejudice to the P2B Regulation, which regulates other aspects of online intermediation. While P2B is mainly focused on the asymmetries between the provider (platform operator) and the business user, the DSA pursues broader goals in building a safe, predictable and trustworthy online environment and for allowing Union citizens and other persons to exercise their fundamental rights.

According to the Consumer Conditions Scoreboard 2023, **more than half of consumers experienced problematic online practices,** such as hidden advertising in search results (75%). The share of consumers raising concerns about online targeted advertising is very high (94%). The most reported worries are about inappropriate use and sharing of personal data (70%), collection of online data and related profiling without explicit knowledge or agreement (66%) and the installation of cookies (57%).

In 2022, the European Commission initiated a Fitness Check of EU consumer law on digital fairness which covers various digital business-to-consumer commercial practices, including dark patterns, problems with personalisation use of AI chatbots for customer service and exploitation of consumer vulnerabilities. The results of the public consultation from February 2023 show that 42% of respondents considered that there are still legal gaps or uncertainties in the current consumer protection framework in the digital environment. In 2022, almost nine of ten consumers (89%) encountered manipulative practices known as dark patterns, leading consumers towards certain choices, 74% saw a lack of disclosure regarding paid promotions by social media influencers, and 69% experienced difficulties cancelling their digital subscriptions.

Moreover, the 2019 Modernisation Directive already adjusted several consumer protection Directives to the digital area. For example, consumers now benefit from more transparency when they are reading online reviews, searching for products or buying from online marketplaces; they also have stronger rules to defend their rights in case they become victims of unfair practices and national authorities have at their disposal larger penalties.

The EU and Member States have also undertaken in the Declaration to promote interoperability, transparency, open technologies and standards as a way to further strengthen trust in technology as well as consumers' ability to make autonomous and informed choices. The Commission has put forward an Interoperable Europe Act in November 2022 to strengthen cross border cooperation in public sectors across the EU. The Commission also promotes **open technology and standards**, for instance in the field of Smart Cities and Communities[45].

2.1.6 Chapter IV: Participation in the digital public space

Besides recalling the right to freedom of expression and information as well as freedom of assembly and of association in the digital environment, the Declaration includes a number of principles and commitments on access to a trustworthy, diverse and multilingual digital environment, with a view to contributing to a pluralistic public debate and effective and non-discriminatory participation in democracy. It notably highlights the **role of online platforms in mitigating the risks stemming from the use of their services in relation to disinformation**, which is now also object of a legal obligation for VLOPs and VLOSEs under the DSA**.** Such commitment is closely linked with the general objective of the digital decade to promote a digital environment that fosters democratic life, is human-centred and fully respects fundamental rights.

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[45] The Commission is in the process of standardising at ITU-T a framework stemming from a joint effort of Smart Communities (Living-in.EU). This technological framework, so-called MIMs Framework caters for an open, free, and interoperable set of specifications EU-value compliant, which should bring world-wide a set of easy-to-implement open and interoperable specifications to develop interoperable digital twins. This aims to encourage market entry, innovation, and cost efficiency so that industry and cities can benefit from.

According to the Special Eurobarometer, six in ten respondents (60%) think that freedom of expression and information online, e.g., via online platforms, social networks or search engines, as well as the right to freedom of assembly and of association in the digital environment are well protected in their country. Just over half of Europeans (52%) believe that they have access to a trustworthy, diverse and multilingual digital environment, including more diverse content, less disinformation, and less illegal content. One third (32%) of Europeans thinks the opposite is true, especially citizens from Greece (48%) and the Netherlands (43%). European citizens rank protecting users from disinformation and illegal content as the third most important action their country should prioritise.

The 2021 Annual Report on the Application of the EU Charter of Fundamental Rights Protecting Fundamental Rights in the Digital Age reported on the challenges to fundamental rights posed by online intermediaries such as social media platforms, which can both favour freedom of expression and of information and amplify the dissemination of illegal content. As regards illegal content consisting of online harassment and violence, FRA 2021 survey showed that 13% of women and 15% of men in the EU-27 have experienced cyber harassment in 2019. This percentage was higher among people aged 16-29 (27%)[46]. There have already been several sectorial initiatives adopted at EU level to tackle the problem of specific types of illegal content while at the same time guaranteeing the protection of fundamental rights[47].

Disinformation surrounding the COVID-19 pandemic and Russia's war of aggression against Ukraine have highlighted again the serious threats and harms it presents to the well-being of people and the security of societies around the world. Disinformation can put people's health in danger and threaten the success of vaccination campaigns, despite the availability of safe and efficient vaccines. It also forms part of hybrid warfare, disseminating war propaganda and disinformation to sow distrust and undermine support for joint EU action against aggressors. Disinformation is also a major challenge and threat to our democracies as it can have a major impact on political opinion building, influence the outcome of elections, undermine trust in democratic institutions, and polarise societies.

In addition, **new generative AI technologies - including *inter alia* powerful new chatbots and image generation and voice simulation software - raise fresh challenges regarding the spread of disinformation**. ChatGPT and other advanced chatbots are capable of creating complex and seemingly well-substantiated content in a matter of seconds. Image generation tools create high-quality, authentic-looking pictures and photos of events and encounters that never happened. Voice generation software can imitate the voice of a person based on a sample of a few seconds. While these technologies offer new avenues for increased efficiency and economic growth and for creative expression, generative AI also has a huge potential to create and amplify false information which can be harnessed by bad actors. Such technologies can notably facilitate the spread of false and malicious narratives with ease, at unprecedented scale[1] and efficiency, in particular, as manipulated pictures, deep fakes and voice imitation are very powerful ways to convince the audience. These threats underscore the need to take decisive steps to fight the spread of disinformation, including by requiring transparency on the part of online platforms and by empowering citizens with tools and skills that enable them to identify and reckon with disinformation encountered online.

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[46] Crime, safety, and victims' rights – Fundamental Rights Survey (europa.eu), page 56, figure 12.

[47] e.g., AVMSD, the code of conduct on countering illegal hate speech, the Recommendation on the safety of journalists, the Regulation on addressing the dissemination of terrorist content online, legislation on addressing online child sexual abuse, disinformation and political advertising, the General Product Safety Regulation (GPSR).

In recent years, the EU has been developing and implementing a coordinated framework for effectively countering disinformation and protecting democratic processes while fully respecting European values and fundamental rights, in particular the freedom of expression. The **2022 Code of Practice on Disinformation** sets out voluntary commitments by major online platforms and other relevant stakeholders to counter disinformation. Strengthened in 2022, the Code[48] contains commitments such as demonetising the dissemination of disinformation, enhancing cooperation with fact-checkers, addressing manipulative behaviours and providing researchers with better access to data. In addition, the Code commits platforms to take actions aimed at empowering users, including through dedicated media literacy campaigns, recommender systems that promote authoritative sources, and access to fact-checking products. The 2022 Code also includes a reinforced monitoring framework. The Commission intends to monitor the implementation of the Code by major online platforms across Europe. In January 2023, the Code's signatories published first baseline reports on how they turn the commitments from the Code into practice (February 2023), which provide an unprecedented level of transparency on measures taken to counter disinformation in the EU. It will be assessed whether the Code fulfils the requirements to become part of the coregulatory regime for VLOPs provided for in the Digital Services Act, linking it to the DSA's enforcement mechanisms.

The Commission also established the **European Digital Media Observatory** (EDMO)[49], which is independent from any public authority and brings together fact-checkers, media literacy experts and academic researchers to contribute to the fight against disinformation. Together with its regional hubs covering 100% of the EU population, EDMO focuses on detecting, analysing and exposing disinformation campaigns, conducting research on the phenomenon of disinformation and fostering media literacy. The Code of Practice and EDMO have also provided important mechanisms for addressing Russian propaganda and disinformation around the war in Ukraine, a top priority of the EU's anti-disinformation policy. The EU also supports media literacy activities through the Creative Europe program.

The European Digital Media Observatory (EDMO[50]) 2022 report[51] found that the problem of disinformation is typically addressed by non-legislative methods in EU Member States[52]. Among the handful of countries that have tried to use a legal approach, some of the measures are still controversial mainly because they might affect freedom of expression. EDMO notes that countries registering the lowest risk levels in the Media Pluralism Monitor are relying on media literacy efforts. The report mentions examples from Finland and Estonia which show that media literacy is a successful tool when it comes to increasing a society's resilience to disinformation and misinformation. EDMO however argues that in the context of coordinated disinformation campaigns, media literacy campaigns cannot work as a standalone solution.

The implementation of the Digital Services Act will create a more responsible and transparent online environment in which the largest online platforms and search engines will need to take effective mitigating actions against the risks related, amongst others, to the spread of disinformation. The **DSA** notably prescribes VLOPs and VLOSEs to perform an annual or, where

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[48] 2022 Code of Practice on Disinformation

[49] https://edmo.eu/

[50] The European Digital Media Observatory (EDMO) is an entity independent from any national or EU public authority governed by an independent board composed of experts in relevant fields. It interconnects regional hubs, which leverage their specific knowledge of local information environments in order to better focus detection and analysis of disinformation threats and trends across Europe. With a total investment of 26 million EUR the aim is to establish EDMO hubs to cover the whole EU.

[51] EDMO report 'Policies to tackle disinformation in EU member states – part 2', July 2022

[52] The report zoomed in on nine EU Member States which held elections in the past years or introduced regulations related to disinformation, concretely BU, ET, FI, FR, DE, HU, PT, SL and SK.

necessary, more frequent, risk assessment and to take measures that oblige the service providers to adapt their systems to mitigate the risks, including amplification of disinformation and the spread of illegal content. This covers also, for example, how the platform is misused through inauthentic behaviours and automated exploitation of its systems. The DSA also includes a faster, targeted crisis response mechanism, for critical situations that pose a threat to public security or public health.

Under the DSA, the designated VLOPs and VLOSEs will have to put in place solid approaches to content moderation, starting with clear explanations in their terms and conditions for the restrictions they apply to content or user accounts, providing easy to use reporting mechanisms for users to flag illegal content when they see it, or cooperating with trusted flaggers, such as hotlines for the protection of children. Platform providers will have to apply policies for suspending repeat infringers, but also to provide efficient complaints-handling mechanisms to users whose accounts or content was restricted. The designated VLOPs and VLOSEs bear broader risk management obligations, not only limited to disinformation and illegal content, but also covering the sale of illegal goods or services, risks to fundamental rights, protection of minors, gender-based violence or mental and physical well-being. While the Commission is responsible for the direct supervision of very large online platforms and search engines, it is also engaging in parallel with Member States, ahead of the appointment of the independent authorities which will coordinate supervision and assistance, at national level and through the forthcoming advisory European Board for Digital Services. Member States should complete this process by 17 February 2024 at the latest.

In terms of **media freedom and pluralism**, I Media Pluralism Monitor (MPM) 2022[53] reported an improvement on the transparency of media ownership following the implementation by several Member States of EU legislation regulating the matter, namely in Croatia, Cyprus, Estonia, Greece, Poland, Portugal and Spain[54]. Media freedom and media pluralism has effectively become an important area of action at EU level. The 2020 European Democracy Action Plan and Media and Audio-visual Action Plan had announced a series of initiatives to support and safeguard media freedom and pluralism. Besides the 2021 Recommendation to Member States on the safety of journalists, the Commission has adopted in April 2022 a Proposal for a Directive[55] to protect journalists and civil society organisations against abusive litigation (SLAPP). In 2021 the Commission adopted the **proposal for a European Media Freedom Act** (EMFA), currently under negotiation. The objective of the Act is to coordinate key national rules and approaches on media pluralism thereby safeguarding the integrity of the internal market for media services and improving its functioning. The Act should bring more legal certainty for media service providers and recipients of such services, in particular citizens, while safeguarding the editorial independence of providers of media services, protect journalists from undue interference and enhance the quality of media services. It will also enhance the protection of media content online. It should provide consumers with access to a more diverse range of quality media content, therefore contributing to the

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[53] The Media Pluralism Monitor (MPM) analyses the risks to media freedom and pluralism in all Member States, focusing on four areas – basic protection of media freedom, market plurality, political independence and the social inclusiveness of media.

[54] The European Media Ownership Monitor (EurOMo) monitors media ownership transparency in 15 European countries: Austria, Belgium, Czech Republic, Denmark, Finland, Germany, Greece, Hungary, Italy, Lithuania, Netherlands, Portugal, Slovenia, Spain, and Sweden. It provides a database with information on ownership and control of the most relevant news media in these countries, but also publishes country reports that assess the level of transparency of this information. The remaining Member States are being analysed in the second phase of the project, which started in October 2022 and will be completed in September 2023.

[55] Commission tackles abusive lawsuits against journalists and human rights defenders 'SLAPPs'

commitment of this Declaration to support effective access to **digital content reflecting the cultural and linguistic diversity** in the EU.

The EU and Member States committed in the Declaration to supporting the development and best use of **digital technologies to stimulate people's engagement and democratic participation**. As an illustration, reference can be made to the multilingual digital platform which empowered direct participation in the context of the Conference on the Future of Europe in 2021-2022, gathering over 17 000 citizen ideas. Note that, in November 2021, the Commission has proposed a Regulation on the transparency and targeting of political advertising, which aims to the proper functioning of the internal market for political advertising by laying down harmonised rules for a high level of transparency of political advertising and related services. Negotiations are ongoing. When in force, the rules will apply to providers of political advertising services.

As regards online harassment and violence, FRA 2021 survey showed that 13% of women and 15% of men in the EU-27 have experienced cyber harassment in 2019. This percentage was higher among people aged 16-29 (27%)[56].

Regarding the commitment to empower individuals to make free choices and limiting the exploitation of vulnerabilities and biases, namely through targeted advertising, the Fitness Check of EU consumer law on digital fairness (2022-2024) evaluates whether existing EU consumer laws are still adequate in the digital area. This includes an assessment of all business-to-consumer commercial practices that may distort the consumers' choices and decision-making, such as dark patterns.

Best practice

*With regards to media ownership, the first edition of the EurOMo's Risk Report, which ranks countries according to risks for transparency in media ownership and control, noted that out of the fifteen EU Member States analysed, **Austria** and **Sweden** present the most favourable conditions for transparency in media ownership and control, followed by **Denmark** and **Germany**. In **Lithuania**, as mentioned in the 2022 Rule of Law Report Country chapter[57], the system called 'VIRSIS' provides data on media owners and amounts of funds obtained from public bodies. The system is rolled out progressively, media service providers are currently submitting their ownership data.*

*When it comes to disinformation, **Finland** was one of the three European countries where the existing framework for countering disinformation was assessed as efficient by the Media Pluralism Monitor 2022 [58]. Finland's strategy mainly focuses on media literacy education and self-regulatory measures regarding the fact-checking in the media. The European Audio-visual Observatory's report on EU countries' media literacy initiatives found that 'the field of media literacy in Finland is wide and active, with many national institutes, as well as municipalities and regional and local actors involved'. EDMO reported that **Slovakia** has also a range of mostly ex-post measures in place to counter disinformation. The country experienced severe challenges facing the disinformation related to Covid-19 and its institutions responded in an efficient manner: the Ministry of Health led a successful and well-designed campaign on social media, and the Slovak Police effectively debunked numerous disinformation narratives.[59]*

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[56] Crime, safety, and victims' rights – Fundamental Rights Survey (europa.eu), page 56, figure 12.

[57] 2022 Rule of law report - Communication and country chapters (europa.eu)

[58] MPM2022 Results - Centre for Media Pluralism and Freedom (eui.eu)

[59] For both countries - Policies to tackle disinformation in EU member states – part 2, EDMO, 2022.

2.1.7 Chapter V: Safety, security and empowerment

A protected, safe and secure digital environment

According to the 2023 Eurobarometer survey, **a majority of Europeans (56%) consider that the principle of access to safe and privacy-friendly digital technologies is well protected** in their country, while about one third (32%) is of the opposite view. Furthermore, protecting users from cyberattacks is the first action that their country should prioritise according to 30% of respondents.

Among other things, and complementary to the objective of protection against cyberattacks included in the Digital decade objectives, the signatories of the Declaration committed to take (further) measures to promote traceable and safe products on the Digital Single Market, and to protect people, businesses and public institutions against cybersecurity risks and cybercrime, including via cybersecurity requirements for connected products placed on the single market.

In September 2022, the Commission proposed the Cyber Resilience Act (CRA), a horizontal regulation that would make the accessing of the European market by connectable products, hardware and software, conditional upon compliance with cybersecurity requirements. This Act also aims to contribute to further strengthening supply chain security. European harmonised standards based on the CRA shouldfacilitate its implementation. The CRA is expected to benefit business users and consumers by enhancing the transparency of the security properties and promoting trust in products with digital elements, as well as by ensuring a better protection of privacy and data protection. The CRA proposal is currently being discussed by the co-legislators, the European Parliament and Council.

More recently, in April 2023, the Commission also proposed a Cyber Solidarity Act. The proposed Regulation notably aims to deploy a pan-European infrastructure of National Security Operations Centres SOCs (European Cyber Shield) to enhance common detection and situational awareness capabilities, and to create a cyber emergency mechanism to support Member States in preparing and responding to large-scale cybersecurity incidents. Furthermore, the European Cybersecurity Competence Centre (ECCC), established by Regulation in May 2021, opened its doors in Bucharest in May 2023. The ECCC aims to support innovation and industrial policy in cybersecurity as well as develop and coordinate EU cybersecurity projects of e.g., the Digital Europe Programme and the Horizon Europe.

While these measures should undoubtedly increase Member States' capacity to address cybersecurity risks and incidents, action at national level remains essential, for instance via measures to implement the Directive on measures for a high common level of cybersecurity across the Union (NIS 2 Directive), which entered into force in early 2023 and notably expanded the scope of sectors, or via the continued implementation of the 2020 5G cybersecurity toolbox adopted by the NIS Cooperation Group and endorsed by the Commission.

Best practice

*By the time of the impact assessment that accompanied the proposal for a revised Network and Information Security Directive (NIS2), some Member States e.g., **Estonia, Denmark** and **Lithuania**, had already extended the list of essential services covered by network and information security regulations.*

Privacy and individual control over data

Data protection and privacy are key fundamental rights in the digital age. They are also enabling the protection of other fundamental rights that can be affected by unlawful surveillance, such as human dignity and freedom of expression.

According to the 2023 Eurobarometer survey, **a slight majority of Europeans (51%) consider that their privacy online, i.e., respect for the confidentiality of communications and information on**

devices, is well protected, especially in Finland (72%) and Luxembourg (70%). Over one third (36%) believe that it is not the case.

Getting control over one's own data, i.e., how it is used online and with whom it is shared, is not well protected according to four in ten (39%) of Europeans, and well protected according to less than half of citizens (49%). Only four out of ten (40%) Europeans believe that they are getting control of one's digital legacy, for instance deciding what happens with personal accounts and information after one's death.

The EU and Member States committed in the Declaration to effectively protect communications from unauthorised third-party access, prohibiting unlawful identification as well as unlawful retention of activity records.

The control over personal data in the Union is ensured by the General Data Protection Regulation (GDPR). The Regulation strengthens individuals' fundamental rights in the digital age and facilitates business by clarifying rules for companies and public bodies in the digital single market. It lays down clear requirements (e.g. data protection by design and by default) that must be respected whenever personal data are processed. It also lays down rights to allow control by individuals over the application of these rules, including the right to access personal data and the right to request erasure. In July 2023, the Commission proposed additional procedural rules for public authorities when applying the GDPR in cases which affect individuals located in more than one Member State, in order to provide quicker remedies.

The ePrivacy Directive already provides for some protection of the confidentiality of communications and related traffic as well as the user's terminal equipment (e.g. PC, smartphones). Concretely, it prohibits listening, tapping, storage or other kinds of interception or surveillance of communications and the related traffic data by persons other than users, without the consent of the users concerned, except when legally authorised to do so in accordance with the Directive. In addition, the ePrivacy Directive protects information stored in the terminal equipment. Moreover, traffic data must be erased or made anonymous when it is no longer needed for the transmission of a communication. The proposed ePrivacy Regulation aims to strengthen and clarify such protections.

According to the 2021 Annual Report on the Application of the EU Charter of Fundamental Rights 'Protecting Fundamental Rights in the Digital Age', this strong EU legal framework is often put to the test in practice by digital technologies development e.g. seeking use of biometric identification and seeking to reduce effect of privacy-preserving technologies such as encryption. However, the data protection authorities and national courts are seeking to ensure effective remedies wherever surveillance measures both by private and public actors constitute a breach of fundamental rights.

In the Declaration, the EU and Member States have also undertaken to ensure effective control of personal and non-personal data in line with EU data protection rules and relevant rules. The proposed European Digital Identity Framework aims to offer EU citizens and residents, on a voluntary basis, a trusted and secure digital wallet under full user control as a 'self-sovereign' enabler of access to digital public and privates services and to share a variety of attributes and credentials.

The EU and Member States also undertook to ensure effectively the possibility for individuals to easily move their personal and non-personal data between different digital services in line with portability rights. The 2022 Proposal for the Data Act gives users of connected devices the right to 'access and port' both personal and non-personal data collected or generated by such devices. In addition, the Data Governance Act has recently put in place rules on e.g., data intermediaries or data altruism organisations, to increase trust in data sharing and help individuals make use of their data.

Protection and empowerment of children and young people in the digital environment

Protection of children and young people online is a topic that Europeans are the most worried about, as shown by the Special Eurobarometer survey. **Only 45% of Europeans consider that their country is ensuring safe digital environment and content for children and young people**. Overall, **more than four out of ten (43%) are worried about the safety of children online**, mostly in Sweden (63%) and Greece (60%).

The Declaration provides that children and young people should be empowered to make safe and informed choices and express their creativity in the digital environment, have access to age-appropriate materials and services, **while being protected from crimes committed via or facilitated through digital technologies.** It includes several commitments in this respect, from providing education to navigating the digital environment, through protecting children and young people from harmful and illegal content, exploitation, manipulation and abuse online,, to involving them in the development or digital policies that concern them.

Children's use of digital technologies has changed dramatically with modern devices used to interact, play and share with others, often without parental supervision. Children aged 10-18 years old spend in average more than 6 hours on screen on typical weekday. Additionally, children are now more active and independent digital consumers, often using digital products and services designed for adults. They are exposed to or targeted by a range of online marketing techniques.

Consequently, harmful and illegal content, conduct, contacts and consumer risks are frequently present for children online. Digital services, from social media to interactive games, can expose children to risks such as unsuitable content, bullying, grooming, child sexual abuse or radicalisation.

One in three children surveyed across 19 European countries reported being exposed to sexual images both on and offline in 2019[60], and one in three girls surveyed across the EU reported experiencing disturbing content online once a month in 2020[61]. Data collected by the EU funded Safer Internet Centres (SIC) helplines shows significant increases in the number of people seeking help/advice between 2021 and 2022 on sextortion (+60%), online reputation[62] (+32%) and e-crime[63] (+30%). As of 2022, 60% of all contacts were made by children aged between 12 and 18,

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[60] EU Kids Online comparative report 2020 on countries: Switzerland, Czech Republic, Germany, Estonia, Spain, Finland, France, Croatia, Italy, Lithuania, Malta, Norway, Poland, Portugal, Romania, Servia, Russia, Slovakia, Flanders, age-range: 9-16 y/o;

[61] ChildFund Alliance, Eurochild, Save The Children, UNICEF, World Vision, report Our Europe, Our Rights, Our Future, on countries across Europe, age-range 11-17 y/o

[62] Including terrorism, online prostitution, drugs, eating disorders, self-harm, etc. Including calls related to sites promoting suicide and explaining ways to commit suicide.

[63] E.g., identity theft, fraud, data theft, copyright infringement, hacking, piracy, etc.

and almost 7.5% from children aged between 5 and 11, reflecting that children are going online and experiencing difficulties at an ever earlier age[64].

The 2022 Strategy for a better internet for kids (BIK+) promotes safe digital experiences, digital empowerment, and active participation, respecting children by giving them a say in the digital environment, with more child-led activities to foster innovative and creative safe digital experiences.

Through BIK+, the Commission proposes a series of ambitious and far-reaching actions to build on and reinforce the existing infrastructure. Ten years after the original BIK strategy and founded on extensive consultation with multiple stakeholders - including children and young people themselves - this new strategy frames the steps needed to ensure that no child is left behind in the digital transformation.

This flagship initiative of the European Year of Youth 2022, sets out commitments for the Commission and recommendations for Member States and industry around three pillars:

1. **Safe digital experiences** to protect children from harmful and illegal online content, conduct, contact and consumer risks;

2. **Digital empowerment** so all children acquire the necessary skills and competences to make sound choices and express themselves in the online environment safely and responsibly;

3. **Active participation**, respecting children by giving them a say in the digital environment, with more child-led activities to foster innovative and creative safe digital experiences.

The implementation of BIK+ requires cooperation and coordination at European and international level and involvement of Member States, industry, civil society and users themselves.

The Better internet for kids (BIK) platform and the EU funded network of national Safer internet centres (SICs) are crucial in implementing the BIK+ strategy[65]. Their actions help children and offer a wealth of resources and support for parents, teachers, and citizens in general. As an illustration, an online roundtable on child and youth consumer protection in digital markets was organised in 2022[66].

Throughout 2022, more than 31 million European citizens were reached, providing them with more than 1 300 new resources. Dedicated resources and activities were also organised for those directly affected by Russia's attack on Ukraine. On the way towards the target of 20 million ICT specialists and minimum 80% population with basic digital skills, the network organises media literacy campaigns and activities fostering digital skills complementing formal education at national, regional and local level.

Upcoming new features on BIK platform such as a BIK Parent corner, BIK+ Knowledge hub and BIK MOOC in the BIK Teacher corner will contribute to a vision of having a digitally skilled population and highly skilled digital professionals.

The Fitness Check of EU consumer law on digital fairness (2022-2024), which evaluates whether existing EU consumer laws are still adequate in the digital area, includes an assessment of

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[64] BIK Helpline Observatory: 31st Quarterly Report October - December 2022.
https://www.betterinternetforkids.eu/practice/helplines/article?id=7062577
[65] The Better Internet for Kids annual reports survey the activities and achievements of the EU funded network of Safer Internet Centres supporting child online protection and empowerment in Member States, provide relevant information on the various commitments included in the Declaration. The latest one is available is the Better Internet for Kids annual report 2022. The 2023 Report will be published in May. The implementation of the BIK strategy in the Member States is monitored in the BIK policy Map.
[66] This work continues under DIGITAL, including a number of new large-scale awareness-raising actions and campaigns with close collaboration between the SICs and the European Consumer Centres.)

commercial practices targeted at children, e.g. interface design and personalisation practices in video games and social media.

The 2022 Digital Services Act (DSA) includes specific provisions on protection of minors, including regarding targeted advertising. The platform providers concerned will have to redesign their systems to ensure a high level of privacy, security, and safety of minors; exclude targeted advertising based on profiling towards children is no longer permitted; provide for special risk assessments including for negative effects on mental health; and redesign their services, including their interfaces, recommender systems, terms and conditions, to mitigate these risks. The horizontal framework for online services set out in the DSA is complemented by the sector specific provisions of the Audio-visual Media Services Directive, which imposes an obligation on providers of video-sharing platforms to put in place appropriate measures to protect minors from illegal and harmful content.

Moreover, work on the Code of conduct on age-appropriate design which builds on the framework provided in the **DSA** will start in 2023. Strong engagement from industry will be necessary for the initiative to reinforce the protection of children when using digital products.

This complements specific requirements under the GDPR for processing of children's data that the data protection authorities are upholding[67], such as requiring parental consent for processing information of children under a certain age by information society services (e.g. social media, video-streaming or gaming platforms) or providing privacy notices in a child-friendly manner. The European Data Protection Board EDPB has made work on the guidelines for processing of children's data one of their key priorities in 2023 - 2024[68].

Regarding skills, the Commission adopted Guidelines to help teachers and educators promote digital literacy and address disinformation through education and training in October 2022. They are available in all EU languages and designed for primary and secondary teachers with or without specialist knowledge of digital education. In addition, the SELFIE for TEACHERS online tool, supports primary and secondary teachers in assessing their digital skills and in identifying ways to support student digital literacy.

Finally, youth participation in digital policies has long been a priority of EU youth programmes such as Erasmus+, as is digital transformation. Mainstreaming youth participation was also among the objectives of the 2022 European Year of Youth (EYY)[69], and digital was one of the nine policy areas of the European Year of Youth[70].

Best practice

When it comes to providing opportunities to children and young people to acquire the necessary digital skills and competences, in **Poland***, NASK and partners from* **Latvia and Romania** *(Latvian Internet Association and Save the Children Romania) launched a two-year project in 2022, Make it clear - educating young people against disinformation online, supported under the Creative Europe*

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[67] See for example Irish Data Protection decision to issue EUR 405 million fine against Instagram and upcoming decision against TikTok for processing of children data.

[68] EDPB work programme 2023-2024 .

[69] More than 470 events involved youth participation were organised throughout 2022 during the European Year of Youth. The Safer Internet Forum, a key annual international conference, was also youth-led in 2022 with on site and remote participation from more than 70 countries across and beyond the EU.

[70] Commission initiatives and opportunities for young people in this area were published on the European Youth Portal and its EYY page. The development of digital policies and opportunities was a topic of discussion in many Policy Dialogues with Commissioners, which took place in the framework of the European Year of Youth. Starting in 2022 and until February 2023, each member of the College of Commissioners invited 12-15 young people to take part in a policy dialogue.

2.1.8 Chapter VI: Sustainability

The Declaration promotes digital products and services with a minimum negative impact on the environment and on society, as well as **digital solutions with a positive impact on the environment**. This aligns with the perception of two thirds (66%) of Europeans, who think digital technologies will play a crucial role in fighting climate change (Special Eurobarometer survey). Moreover, the Declaration provides that access to accurate and easy-to-understand information on environmental impact and energy consumption should be available to everyone.

The 2023 Berlin Declaration Monitoring report[71] shows only slow progress on fostering sustainability, with significant potential for improvement on evaluating the environmental impacts of ICT and establishing a strategy aimed at expanding the lifespan of digital equipment, on which Member States score 54% compared to 49% in 2021. There is also room for improvement on assessing and making transparent the energy sources and consumption of digital tools and infrastructures as well as ways to improve their efficiency, with an EU average score of 65% in 2022. According to the Special Eurobarometer survey, a little **less than half of Europeans (48%) consider that they are getting access to digital products and services that minimise damage to the environment and society** (e.g., products and services that can be repaired or recycled, and which do not involve forced labour), with the exception of almost two thirds of citizens from Ireland (65%), Poland (65%) and Italy (64%). Over a third (34%) thinks the opposite.

Interestingly, a little more than half of Europeans (51%) believe that the principle of getting access to the right information on the environmental impact and energy consumption of digital technologies is well protected in their country, while a third considers it is not well protected, including half of citizens from Sweden (50%) and almost a half in the Netherlands (46%).

The March 2022 Proposal for a new Eco-design for Sustainable Products Regulation, currently in legislative negotiation, is an important part of the Commission's approach to more environmentally sustainable and circular products. The regulation introduces a Digital Product Passport which aims to support data capture and sharing to enhance product sustainability, transparency, and, to enable sustainable business models, e.g., Product-as-a-Service. This is an example of how digitalisation will support businesses and consumers in their green transition. A project funded by the Digital Europe Programme, the Digital Product Passport CIRPASS, aims to provide information about the environmental sustainability of products. It should help consumers and businesses make informed purchasing choices, facilitate repairs and recycling and improve transparency about product life cycle impacts on the environment. The product passport should also help public authorities to better perform checks and controls. A call for large scale pilot to be funded under by the Digital Europe programme has been published in May 2023.

The March 2023 Commission Proposal for a Directive on common rules promoting the repair of goods seeks to facilitate and promote e.g. the repair of digital products such as mobile phones and tablets.

The WBA's Digital Inclusion Benchmark 2023 also noted a challenge regarding the effective emission disclosure by some companies. In particular, certain companies appear to be only listing

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[71] Report on the monitoring of the Berlin Declaration, Directorate General for Informatics, European Commission, June 2023

the lower market-based figure and not their actual location-based emissions - while international standards call for both to be disclosed.

Besides Commission studies[72], a number of recent initiatives aim to contribute to achieve climate-neutral, highly energy-efficient and sustainable data centres: the Energy Efficiency Directive requires that, from May 2024 onwards, data centre operators report to the Commission a set of indicators on data centres' energy performance (which the Commission is finalising by way of a Delegated Act)[73].

The EU and MS committed in the Declaration to incentivising sustainable consumer choices and business models and fostering sustainable and responsible corporate behaviour throughout global value chains of digital products and services, including with a view to combating forced labour. Note in this respect the Corporate Sustainability Reporting Directive (CSRD), which entered into force in January 2023. This new Directive modernises and strengthens the rules concerning the social and environmental information that companies have to report.

Best practice

*Since 2022, **Denmark** has implemented standardised product data on environmental labels in e-procurement, which allows suppliers and procurers, both public and private, to inform each other about labelled products and services in a digitally structured manner. The aim is to increase the quality of data on labelled products and services in procurement and thereby support the ambition to measure and set goals for labelled procurement in the public and private sector. This is supposed to be a first step to ensure that the digital infrastructure contributes to a sustainable circular and climate-neutral economy and society while minimising administrative burdens on business facing various new green and sustainable data reporting requirements. **Latvia** has also developed a National Digital Strategy (Digital Transformation Guidelines 2021-2027) which includes provisions on resource and energy efficiency. The strategy notes that the use of digital technologies must be sustainable and energy-efficient and puts forward actions to promote the development of a sustainable digital infrastructure[74].*

2.2 Digital Decade objectives: sovereignty, resilience and competitiveness

The **digital transformation anchored in the Digital Decade Policy Programme** includes general objectives that seek to foster the development of infrastructures, to spur growth and foster the modernisation of the EU's economy, opening new business opportunities, enhancing the productivity of the EU industry, ensuring that competitiveness benefits are widely spread across society by reducing divides and consumer prices and helping gain a competitive advantage on the global markets.

Digital technologies, infrastructures, services, and skills are indeed an essential factor of competitiveness and resilience for the whole EU economy and society, ultimately reinforcing the

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[72] E.g., Study on Greening cloud computing and electronic communications services and networks: towards climate neutrality by 2050 (March 2022); Study on Greening cloud computing and electronic communications services and networks: towards climate neutrality by 2050 (March 2022).

[73] Note as well the 2021 Code of Conduct of the Joint Research Centre on energy efficient data centres, which sets the (maximum) electricity consumption for broadband equipment sold in the EU and manufactured or procured by participating companies.

[74] Latvian National Digital Strategy (Digital Transformation Guidelines 2021-2027), page 73, 4.4.4: "Digital transformation of geospatial, environmental management and development planning".

European sovereignty in the digital field[75]. **It is estimated that completing the Digital Decade could bring in EUR 2.8 trillion additional GDP for the EU by 2030**[76].

Box: Examples of benefits from the digitalisation of industrial ecosystems

*A highly digitalised **industry** of the future is enabling to produce more smartly, more efficiently, more quickly, safer, and cleaner. The productivity of companies already investing in data-driven innovation and data analytics grows approximately 5% - 10% faster than that of companies not investing[77]. In a not so far future, means of production will be able to self-regulate and self-monitor, consistently reducing the risk of random events and delays and enabling on-demand manufacturing, reducing the costs generated by unsold stock. Robots will increase the productivity of operators and improve their safety by taking up risky tasks. 3D printing will allow to maintain and repair all industrial goods locally and at a lower cost.*

*Digital technologies such as AI, IoT, cloud and edge computing or 5G networks are leading the digital transformation of the **mobility sector**. Autonomous vehicles, robotic taxis, connected lorries, driverless delivery systems, and new mobility services enabled by digital platforms are changing how we move. Connected and Automated Mobility (CAM) can make roads, railways, and waterways safer, enhance efficiency, reduce congestion, and lower gas emissions. Mobility as a Service (MaaS) can help to decarbonise transportation, allow seamless multimodal travel, and facilitate access to greener alternatives.*

*In **agriculture**, the Internet of Things (IoT) allows for the collection of real-time geo-spatial data on environmental and machine conditions, precision farming techniques and the remote monitoring of crops and livestock. Cloud and edge computing, AI, and IoT technologies optimise water usage, accurately spread seeds and fertilisers, and reduce the need for harmful pesticides.*

*Disruptive technologies promise to make transformative impacts in the **healthcare** and **pharma** sectors. The EU is a leader in healthcare, and **e-health** and the digitalisation of healthcare offer opportunities for our industry to consolidate their competitive positions and innovate into more efficient, reliable and cost-effective solutions that support healthy long living. Two of the largest current disruptors are artificial intelligence and, in the near future, quantum computing, which have seen applications from diagnostics to drug discovery and data management and processing.*

*In the **financial sector**, technologies such as quantum, blockchain and AI algorithms mitigate cyber risk and reduce fraud attempts, enable portfolio optimisation and reduce transaction delays.*

The Digital Decade objectives include notably the general objective to empower a more **digitally sovereign, resilient, and competitive Union**. Digital sovereignty refers to our ability to act independently in the digital world and therefore it constitutes a crucial means to safeguard our values. Digital sovereignty covers among others the following elements:

- The concrete means to ensure the **resilience of the Union's digital supply chains**;
- The **ability to innovate and develop digital technologies**, services and infrastructures without being bound by design choices made elsewhere and that do not reflect our European values;
- The capacity to **develop secure, sovereign and accessible digital infrastructures** that can efficiently store, transmit, and process vast amounts of data;.

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[75] Communication Long-term competitiveness_0.pdf (europa.eu)

[76] Publicfirst 2022, Unlocking Europe's digital potential.

[77] OECD (2015). *Data-driven innovation: big data for growth and well-being*, OECD Publishing, Paris.

- A **strong manufacturing digital sector** in the EU with strategic know-how and building synergies between the different stages of production, while responding to a political demand for more high-quality jobs and growth[78];
  - A policy and regulatory framework that supports the **competitiveness and sustainability** of the Union's industry and economy in the long term, and;
  - A broad **access to global markets**.

Achieving these objectives requires a strong coordination across policy and private and public investments. This chapter takes stock of progress made so far and presents an outlook of the policy measures taken at the EU level.

2.2.1 Technological leadership to support EU's future digital transformation

The success of EU's digital transformation will be notably **determined by the European ecosystem's capacity to foster the rise of global digital players** that will design tomorrow's business models and shape digital technologies and applications which embeds European values and contribute to EU's interests.

This is all the more important in a rapidly changing geopolitical context**, against the backdrop of a fragmentation of the global economy**[79] **and the war in Ukraine.** Digital technologies are at the centre of geostrategic tensions and of an intensifying **technological race**, where speed and scale play a critical role to gain and maintain leading positions in the future global economy. Systemic digital innovation such as generative AI which brings the potential for spill over effects on most economic sectors will give a further edge to established business leaders of the global digital ecosystem.

The EU is lagging behind in the ICT race, with most of the technologies needed for the digital transformation of Europe being designed and manufactured in third countries. Despite the essential nature of the ICT industry for our sovereignty and competitiveness, and to better respond to economic and societal challenges, the **global share of EU GDP in the ICT market has kept decreasing significantly** from 21.8% in 2013 to 11.3% in 2022.[80] Currently, the EU depends on foreign countries for over 80% of digital products, services, infrastructures, and intellectual property. This growing dependency is illustrated for example by the fact that the EU is dependent for 75-90% of semiconductor production on Asia[81].

Box EIB 2023 survey: deep tech innovation in smart connected technologies: EU-US comparison for SMEs

SMEs in the United States make a higher contribution to innovation in Fourth Industrial Revolution (4IR) technologies than SMEs in the EU, adding to the overall leadership of the US in advanced digital technologies. 4IR has massively accelerated the process of digital transformation. Technologies such as the internet of things (IoT), cloud computing, 5G and artificial intelligence (AI) are already altering the way we live, work and interact. There are twice as many SMEs with an international portfolio of 4IR patents in the US than in the EU. EU SMEs contributed 10% of international patent families (IPFs) in 4IR technologies invented in the EU, while US SMEs accounted for 16% of their country's contribution. Over 90% of th' EU's 4IR SMEs have already implemented their 4IR technologies in applications spanning the healthcare, transport and cleantech sectors, as

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[78] Foreign Affairs, *China's hidden Tech revolution*, volume 102, number 2, March 2023
[79] ECB – speech of Christine Lagarde, New York, 17 April 2023.
[80] ICT global market share by country 2022 | Statista
[81] Digital Industrial Policy for Europe - CERRE

well as data analytics. 4IR SMEs are more likely (44%) to be involved in manufacturing hardware products than other SMEs.

***More than every second 4IR SME in the EU sees its future primary market in Europe.** Although 32% of EU SMEs are still focused primarily on operations in their home country, the majority, 57%, sees its future primary market in Europe, as also reflected in the geographical scope of their patent portfolios. A quarter of European 4IR SMEs regard the US as their future primary market (24% of EU). This proportion rises to 38% among European 4IR SMEs that are dominant players in their market.*

Europe is still underinvesting in research and innovation as compared to its global competitors, despite being a scientific powerhouse and despite the increasing performance of the EU innovation system by 9.9 percentage points over between 2015 and 2022. The EU faces challenges in catching up with the US and China in the level of investments relative to their GDP. This correlates with a secondary position of the EU in the development of several critical technologies when compared to China or the US. The EU's current R&I expenditure as a percentage of GDP is 2.32% of GDP (2020)[82], at the risk of falling short of the 3% EU target by 2030 and lagging behind the US (3.45% of GDP in 2020) and China (2.4% of GDP)[83]. Overall, the US R&I spending are almost the double of EU's (EUR 620 bn against 330 bn) with a gap of 330 bn every year. In addition, when it comes to the capacity to innovate, as well as to digital capabilities and industries, there are still important and **growing disparities between EU Member States**[84] [85] [86]. The R&D 2022 scoreboard shows that **US private companies' investments are between three times and ten times larger than European ones**[87]. For instance, the US and China together account for over 80% of the EUR 25 billion of annual equity investments in AI and blockchain technologies, while the EU 27 only accounts for 7% of this global amount, investing around EUR 1.75 billion.

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[82] Research and development expenditure (% of GDP) | Data (worldbank.org)

[83] Top countries by R&D expenditure 2022 | Statista

[84] European innovation scoreboard (europa.eu)

[85] How to close Europe's digital divide? (brookings.edu)

[86] Europe 4.0: Addressing Europe's Digital Dilemma (worldbank.org)

[87] Among the 2500 companies investing in R&D in the world, R&D investment in ICT products and ICT services have seen their share diminishing sharply between 2012 and 2021 reaching only 30% of US investments for the former and 10% for the latter.

*Figure 2 - **EU-US comparison of R&D investment in 2012 and 2021**, by sector*
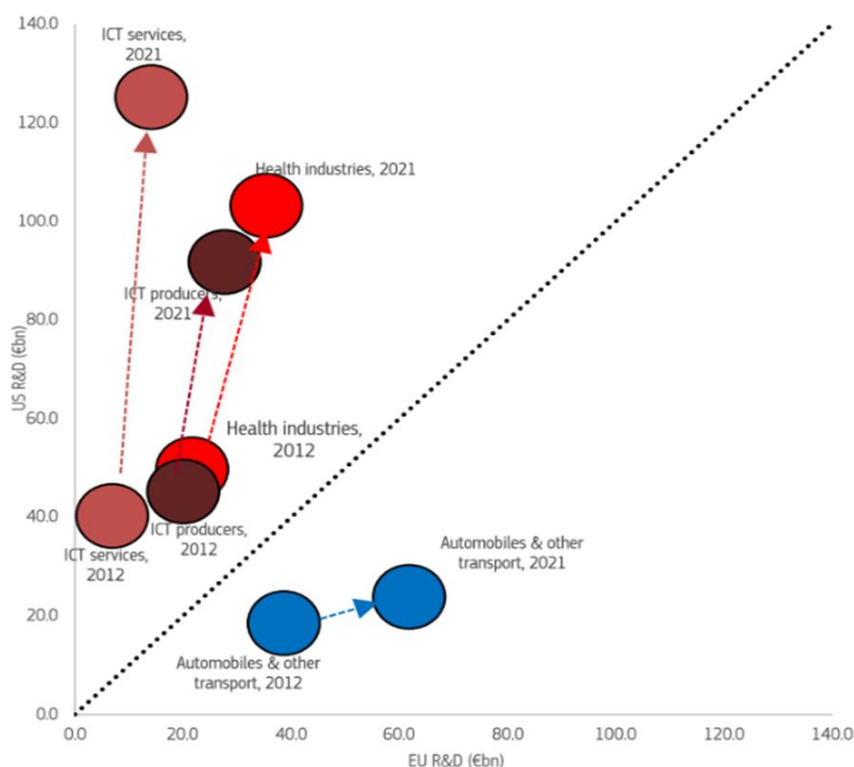
Note: data refers to 502 (EU:149, US:353) of the 834 companies (EU:174, US:660) in the 4 sector groups in the 2 regions considered for which R&D data are available for the entire 2012-2021 period, accounting for 89.6% of the R&D investment in 2021.
Source: The 2022 EU Industrial R&D Investment Scoreboard, European Commission, JRC/DG RTD.

EU venture capital investment is still far from the levels observed in the US and in China. Among the leading companies in software and internet, EU firms only represent 7% in global R&D expenditure, compared to 71% for the US, 15% for China and 3% for Japan and South Korea. The gap in financing disruptive innovation and start-ups is far from closing. EUR 41 billion was invested in Europe's start-up ecosystem in 2020, against EUR 141 billion in the US and EUR 74 billion in China. Europe features a substantially lower number of deep techs scale-ups, and scale-up financing lags behind financing for start-ups.[88] **Innovation made in Europe is not sufficiently brought to EU market, notably because of insufficient risk capital supporting the growth of European scale up proposing new services and contribute to the growth of the ICT sector.** Bridging the scale-up gap and supporting deep-tech innovation is essential to foster the EU global competitiveness, complete the green and digital transitions and ensure growth and well-being in Europe.[89]

Building a scale-up ecosystem require also on the successful nurturing, attraction, and retention of talented individuals with a diverse array of skills. **High-quality education** and **attractive working conditions** are key to ensuring a flow of highly skilled and talented individuals that can contribute to achieving the digital transformation, and a competitive edge in strategic value chains[90]. **It also requires to better coordinate policy measures dedicated to the European digital ecosystem development, notably strategic public procurement, deepening of single market and trade policy** so to ensure that market forces benefit the **scaling-up of European actors[91]**.

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[88] Nurturing deep-tech unicorns in the EU – CEPS

[89] EUR-Lex - 52022DC0332 - EN - EUR-Lex (europa.eu)

[90] EUR-Lex - 52022DC0332 - EN - EUR-Lex (europa.eu)

[91] Support measures that amount to State aid must comply with the applicable State aid rules. References in the present State of the digital decade report 2023 Decade to support measures that may amount to State aid do not in any way pre-judge a State aid assessment.

Against this background, the **New European Innovation Agenda**[92] adopted on 5 July 2022 aims to position the EU at the forefront of the new wave of deep tech innovation and up-ups. It will help the EU to develop new technologies to address the most pressing societal challenges, and to bring them on the market. It will do so by focusing on five areas for action:

- **Funding scale-ups**, mobilising institutional and other private investors in the EU to invest in, and benefit from the scaling of EU deep-tech start-ups;

- **Enabling innovation through experimentation spaces and public procurement**;

- **Accelerating and strengthening innovation in European Innovation Ecosystems across the EU and addressing the innovation divide**;

- **Fostering, attracting, and retaining talents** through a series of initiatives, including an innovation intern scheme for start-ups and scale-ups, an EU talent pool to help start-ups and innovative businesses find non-EU talent, a women entrepreneurship and leadership scheme, and a pioneer work on start-up employees' stock options;

- **Improving policy-making tools** to develop and use robust and comparable datasets and shared definitions (e.g., start-ups, scale-ups) that can inform policies at all levels across the EU and for ensuring better policy coordination and the EU level through the European Innovation Council Forum.

2.2.2 Strengthening EU's digital ecosystem resilience

One of the key lessons of the COVID-19 crisis is that there is a need for a **better analysis and monitoring of the strategic value and supply chains to address dependencies and build up resilience**. This involves to undertake a review of **critical materials** underlying the digital supply chain; to foster **manufacturing capabilities** or other essential capabilities that are necessary to producing goods in the digital supply chain; to identify **risk factors** that may impact the supply chain by disrupting it, compromising it, or eliminating it (e.g., defence, intelligence, cyber, security, health, climate, environmental, natural, market, economic, geopolitical, human rights, or forced-labour risks); to monitor the **dynamics of global key players** in the digital supply chain ecosystem; existing international partnerships; any executive, legislative, regulatory and policy changes, internal and external, which may impact the resilience of the digital supply chain.

2.2.2.1 Critical Raw Materials supply chain

Disruption in the supply of essential goods during the COVID-19 crisis and the energy crisis sparked by Russia's war of aggression against Ukraine have highlighted the **central importance of critical raw materials for the green and digital transitions, and for defence and space applications**. A disruption in their supply would have significant adverse effects for the EU industry, jeopardising the functioning of the Single Market and risking damaging the EU's competitiveness, while putting at stake jobs and job creation and affecting working conditions and wages. In addition, without a secure supply of critical raw materials, the Union will not be able to meet its objective for a green and digital future.

Since 2011, the Commission's Joint Research Centre (JRC) [93] [94] has been analysing the availability and importance of critical raw materials for various strategic technologies and sectors in the EU, assessing the related supply risks, considering the geopolitical context and market developments.

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[92] The New European Innovation Agenda (europa.eu)
[93] JRC assesses critical raw materials for Europe's green and digital future (europa.eu)
[94] CRMs_for_Strategic_Technologies_and_Sectors_in_the_EU_2020.pdf (europa.eu)

The findings of their analysis contribute to the **Commission's list of Critical Raw Materials (CRMs)**[95] which supports the EU in negotiating trade agreements, challenging trade distortions and in programming the research and innovation funding under Horizon Europe.

The latest report, "**Critical Raw Materials (CRMs) for Strategic Technologies and Sectors in the EU - 2023**"[96], investigates the supply chains of digital goods such as smartphones, tablets, laptops, data server and storage equipment and data transmission network equipment. Across those value chains, there are supply risks at all stages, from the poorly diversified production of certain critical raw materials (e.g., rare earths, platinum group metals and noble gases) to the EU's limited manufacturing capacity of highly strategic processed materials and components (e.g., advanced logic and memory semiconductor chips).

The EU relies almost exclusively on imports for most critical raw materials. Suppliers of those imports are often highly concentrated in a small number of third countries, both at the extraction and processing stage. For example, the EU sources 97% of its magnesium in China. Heavy rare earth elements, used in permanent magnets, are exclusively refined in China. 63% of the world's cobalt, used in batteries, is extracted in the Democratic Republic of Congo, while 60% is refined in China.

The exposure of the EU economy to geopolitical risks is high for many **critical raw materials**. Such risks derive from **trade distortions** (such as those enacted by countries like China, which accounts for the majority of the world's production of rare earths, gallium, germanium, aluminium, antimony, bismuth, indium, lithium, magnesium, phosphorus and silicon metal), from major social, health, and environmental problems arising from **unsustainable artisanal mining practices** (such as in the Democratic Republic of Congo, where most cobalt used in LCO batteries for powering smartphones, tablets and laptops is produced); from **labour market disputes** in South Africa regarding platinum-group metal (PGM) mines; or directly from **Russia's invasion of Ukraine** as in the case of noble gases, useful for the production of semiconductors[97].

This situation calls for a **comprehensive and coordinated strategy aimed at ensuring the availability and sustainable supply of CRMs in the EU**. This would have to include measures to stress-test the supply chains to assess their resilience, to diversify supply sources, promotes resource efficiency, encourages circular economy practices, and to incentivise EU research to develop alternatives to CRMs.

The **European Raw Materials Alliance (ERMA)**, set up as part of the Action Plan on Critical Raw Materials in 2020, is entirely dedicated to addressing the challenges affecting **specific raw materials value chains** (e.g., concentrated global markets, investment and innovation barriers and/or transparency and sustainability issues), ultimately securing EU's access to sustainable raw materials, advanced materials, and industrial processing know-how.

However, another important step towards a more strategic approach to critical raw materials at the EU level is represented by the Proposal for a **Critical Raw Materials (CRM) Act** which aims to ensure a secure and sustainable supply of CRMs to ultimately meet EU's twin transition and resilience needs. In particular, the CRMs Act will define strategic priorities and objectives for private and public actors; improve monitoring, risk prevention and coordination in the field of CRM; strengthen EU's CRM value chain (exploration, mining, refining, processing, recycling); and ensure a sustainable level playing field across the Single Market. To contribute towards security of supply of strategic raw materials in the Union, Member States may provide for support in **national**

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[95] The European Commission's Raw Materials Information System (RMIS) is developed by the JRC in collaboration with DG GROW and it is available at this link: Raw Materials Information System (europa.eu)
[96] CRMs_for_Strategic_Technologies_and_Sectors_in_the_EU_2023.pdf (europa.eu)
[97] CRMs_for_Strategic_Technologies_and_Sectors_in_the_EU_2023.pdf (europa.eu)

permit granting procedures to speed up **strategic projects**[98]. These projects would benefit from streamlined procedures and improved access to finance, so that the time from exploration to mine or refining facility opening is no longer a question of decades. In order to achieve the goals of the CRM Act, Europe will have to attract more **private investment** throughout the entire process from mining to refining, processing, and recycling.

2.2.2.2   Addressing dependencies for EU's digital transformation

The Commission has been working towards improving the **understanding and monitoring of the EU's strategic dependencies affecting the EU's core interests**. These notably relate to areas such as security and safety, health as well as the ability to access goods, services and technologies that are key for the digital and green transitions.

Work to identify and assess dependencies has been initiated since the March 2020 **Industry Strategy**. The Staff Working Document[99] accompanying the **update to the 2020 Industrial Strategy** represents another step of the EU towards a more structural, systematic and cross-sector **monitoring of the EU's strategic dependencies**. The document presents the **quantitative mapping** resulting from the analysis of external trade flows for more than 5 000 products in the most sensitive ecosystems, including digital, where the EU can be considered highly dependent on imports from third countries. Complementary to the analysis of trade flows, an **assessment of the EU's performance as regards the generation and uptake of certain key technologies** had shown both strengths and weaknesses.

The EU faces particular **challenges** in comparison with its global competitors for technologies that are at the core of the Digital Decade **such as cloud and semiconductors**. The **second in-depth analysis of Europe's strategic dependencies** presented by the Commission on 23 February 2022 has identified, in addition to cloud and semiconductors, also **cybersecurity** as an area where the EU faces major dependencies. The analysis also highlights that recent advancements in **edge computing** constitute a key opportunity for the European cloud market to overcome existing dependencies, calling for swift reaction and investment to capitalise on this chance.

Other relevant actions to identify and address strategic dependencies are being taken also in the context of the **Action Plan on synergies between civil, defence and space industries**, through the **Observatory of Critical Technologies**. The Observatory analyses technologies that are essential for capabilities of strategic importance in the domains of space, defence, security, safety, health and for the twin transitions and for which the EU is dependent from foreign actors, ultimately identifying relevant mitigation measures.

Instruments such as the **Important Projects of Common European Interest (IPCEIs),** including the two pre-notified IPCEIs on Next Generation Cloud and Edge Computing and Microelectronics and Communication Technologies as well as the **Industrial Alliances** continue to play an important role in addressing known strategic dependencies and enhancing the resilience of the value and supply chains underlying specific digital technologies.

Since 2021, the **European Alliance for Industrial Data, Edge and Cloud**[100] brings together European providers of highly innovative and secure edge and cloud technologies to cooperate on an investment roadmap and its deployment, with the involvement of Member State experts. The reliance of EU businesses on cloud services offered by non-EU entities means that the value of

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[98] Strategic projects are projects that are in the EU's public interest and that have a role in ensuring the Union's security of supply for strategic raw materials and contributing to the Union's open strategic autonomy and to the green and digital transition.

[99] EUR-Lex - 52021SC0352 - EN - EUR-Lex (europa.eu)

[100] European Alliance for Industrial Data, Edge, and Cloud (europa.eu)

industrial and public sector data is mostly extracted by foreign providers. This can bring risks in terms of cybersecurity, supply vulnerabilities, switching possibilities as well as unlawful access to data by third countries. By mobilising both industry and Member States, the Alliance contributes to **overcoming fragmentation in the European cloud market** and to forging a common approach to developing and deploying the next generation of cloud and edge capabilities for the benefit of EU businesses. In this view, the **shift towards edge computing**, as also highlighted in the **second in-depth analysis of Europe's strategic dependencies** presents important opportunities for Europe to meet the demand for next generation of sustainable and secure data processing infrastructures, unlocking an increased data processing capacity and, consequently, boosting Europe's technological sovereignty.

2.2.2.3 Monitoring and stress-testing the resilience of the digital ecosystem

Building on the above-mentioned action, a more **comprehensive approach** is made possible for **analysing and monitoring in real time all the risks that are undermining EU's digital ecosystem resilience**.

So far, **supply chain monitoring tools in the EU are still scarce and mainly targeted to specific products**. In addition, they do not allow for the tracking of the **real-time evolution of supply chains**. In the third issue of the Single Market Economic Papers series, the Commission has made a further step with an **indicator-based mechanism to monitor the evolution of supply chains in the EU and identify their distress**. It aims at contributing to a better risk assessment of supply chains, particularly in strategic areas, with the ultimate goal of detecting disruptions as early as possible and avoid potential adverse effects. The so-called **SCAN (Supply Chain Alert Notification) monitoring system** aims at identifying significant inflationary pressures and/or shortages resulting from imbalances between demand and supply. This tool can be applied at both product and sector level. The results of the SCAN on a list of commodities show that most of them are affected by the Russian invasion of Ukraine and almost all raw materials are likely to be affected by the conflict experience distress (i.e., import price increases and/or import quantity decreases). All raw materials with an important ex-ante risk of disruptions are subject to import price increases and import quantity decreases. Of these, **magnesium and cadmium are of great relevance for the digital ecosystem**[101]**.**

With the recently adopted **EU Economic Security Strategy**, the EU and its Member States are **better equipped to commonly identify and assess the risks to EU's economic security**, to use strategically the available tools for dealing with these risks and to develop new tools where needed. The objective is to maximise the benefits of its economic openness while minimising the risks of economic interdependencies, through setting up a common strategic framework for EU economic security. The strategy aims at promoting the EU's competitiveness by bolstering its Single Market, innovation, technological and industrial capacities; protecting the EU's economic security through a range of existing tools and new tools (some of which are discussed in the following sections); and partnering with likeminded countries to strengthen economic security and address shared security concerns through diversified and improved trade agreements, strengthening international rules and institutions, and investing in sustainable development. The EU Economic Security Strategy will contribute to tackling the risks to the resilience of our supply chains, risks related to the physical and cyber security of our critical infrastructure, risks related to technology security and technology leakage and finally the risks of weaponisation of economic dependencies including economic coercion.

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[101] 'SCAN' (Supply Chain Alert Notification) monitoring system (europa.eu)

2.2.3 Focus on 6 key digital sectors for EU's sovereignty and competitiveness

The EU has much progress to make to regain technological leadership. Three aspects are increasingly seen as needing to be addressed including the **lack of first-mover advantage**, the **absence of dominant EU technology players** and **strategic dependencies**.

The EU can rely on several levers to be a front runner in the current global digital race: a large internal EU market, global regulatory and standard-setting power. Six key enabling technology areas are set to define and shape the future of EU's capacity to act as a global technology leader: s**emiconductors, High-performance computing, quantum technologies, AI, Cloud, 5G and mobile equipment**[102].

2.2.3.1 Strengthening the EU's semiconductor ecosystem

Semiconductors are fundamental to all digital technologies and are the best illustration of the international nature of the market and supply chains. The lack of public investment to support the manufacture of advanced technologies within the EU has discouraged semiconductor industry development in the region. The COVID-19 pandemic triggered a global chip shortage in 2021, which originally affected the automotive industry but later spread to other sectors. The increasing competition for semiconductor leadership has led to substantial investments by highly industrialised countries like China, Taiwan, the US, Japan, South Korea, and the EU to develop domestic capacities[103].

The **global semiconductors crisis** has had detrimental impacts across several industries, with the automotive sector notably suffering the most in the EU[104]. The crisis has sparked from the increasing demand of chips accelerated by the digital transformation and a supply chain that has proved to be not resilient enough to the disruptions caused by the COVID-19 pandemic. In addition, the **high concentration of production of semiconductors in Asian countries** (Taiwan and South Korea) coupled with the **worsening of geopolitical tensions between China and Taiwan** and the **strengthening of US export control measures** have exacerbated the situation of the already fragile semiconductor supply chain.

As a consequence, global semiconductor companies are accelerating the development of their end-to-end design and manufacturing capabilities for leading-edge technology. Many governments are attempting to support their local semiconductor markets. However, while **no region or actor has end-to-end capabilities for semiconductor design and manufacturing**[105], there are clearly some winners and losers. In terms of revenues across the **semiconductors value chain**, the US is the market leader, followed by South Korea, Taiwan and Japan, while the market size of the EU semiconductor industry represents only around 10% of the global market. In addition, the EU is not equally strong in all segments of the value chain, showing strengths in R&D and manufacturing equipment but weaknesses in design, manufacturing and assembly, test and packaging.

Even before the EU Chips Act and since 2018, the **Important Project of Common European Interest on Processors and Semiconductor Technologies** has had the objective to endow the EU with capabilities in design and industrial deployment of the next generation of trusted processors and other electronic components needed to power the EU's critical digital infrastructures, AI-enabled systems, electric mobility, and communication networks. The first IPCEI will conclude in 2024/2025 and will be followed by a second **IPCEI, with an enlarged focus on Microelectronics and**

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[102] DGAP Policy Brief

[103] CRMs_for_Strategic_Technologies_and_Sectors_in_the_EU_2023.pdf (europa.eu)

[104] 11 million less cars were produced in 2021, equalling to EUR 190 billion in lost revenues and a 33% decrease in sales in the EU.

[105] Semiconductor design and manufacturing: Achieving leading-edge capabilities (mckinsey.com)

Communication Technologies. This will support investments in innovative industrial capacities on choke points of the supply chain such as compound materials, equipment, wafers, process technology, and designs, with the aim of enhancing the EU semiconductors market. The complementing vehicle for R&D and pilot lines in this sector is the **Key Digital Technologies (KDT) Joint Undertaking,** which, following the adoption of the Chips Act, will become **the Chips JU**.

Broadening the scope of the activities of the IPCEI, the proposed **EU Chips Act**[106] aims to give Europe leverage over key segments of the semiconductor value chain. The Act's three pillars aim at bolstering large-scale technological capacity building and innovation in the EU chips ecosystem while also improving the transition 'from lab to fab'; enhancing the EU's security of supply by attracting investment and strengthening production capacities in the EU; and, finally, setting up a monitoring and crisis response mechanism.

2.2.3.2   Consolidating EU's success on the High-performance computing

High-Performance Computing (HPC) is one of the most critical drivers for scientific excellence, industrial competitiveness in the global digital economy and for the digital transformation of our society. HPC is the engine that powers key technologies like AI, data analytics and cybersecurity to exploit the enormous potential of big data and support flagship initiatives like Destination Earth[107] (cf. 2.3).

Through EuroHPC, the Commission has developed a pan-European HPC strategy aimed at establishing **a full European HPC ecosystem**, supporting Europe's leading role in the data economy and with one of the most ambitious goals of the Union in the Digital Decade: **to become a world top supercomputing power in the exascale computing era**[108]. This strategy is deploying a fully-fledged innovative European HPC ecosystem including a world-class HPC infrastructure (from low-power processors to software, middleware, applications, and their integration into supercomputing systems) with high-speed connectivity and leading-edge data and software services **accessible to academia, industry and SMEs, and public actors from everywhere in the Union**, combined with an independent European supply of key HPC technologies and systems, actions for maintaining excellence and global leadership in key HPC applications, and building human capacities and skills in key HPC-related technologies.

As **no single Member State had the capacity to develop on its own a cutting edge HPC ecosystem** they united behind the EuroHPC declaration[2] in March 2017 at the Digital Day in Rome, in which Member States marked their commitment to coordinate together with the Union their supercomputing strategies and investments, followed by the establishment of the [EuroHPC Joint Undertaking (JU)](109) by the Council of the EU in September 2018.

The first phase of the EuroHPC JU (2018-2020) with a budget of around EUR 1 billion for the period 2018-2020 has successfully mobilised an **unprecedented level of national and EU co-investments** of **EUR 900 million in advanced digital infrastructures with concrete results:**

-   Since November 2017, the EU has **multiplied by 10-fold** its total computing power, placed **two EuroHPC systems among the top world supercomputers** (#3 and #4) - where no EU system was included in the top 10 in November 2017 - and **increased its share in the global supercomputing capacity** from 12% to **21% today;**

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[106] [European Chips Act (europa.eu)](#)
[107] [ESA - Destination Earth](#)
[108] Exascale computing refers to computing systems capable of calculating at least "10 18 IEEE 754 Double Precision (64-bit) operations (multiplications and/or additions) per second (exa FLOPS)
[109] [Home page (europa.eu)](#)

- EuroHPC systems makes available today **more than 1.6 exaflops** (**almost 50% of the total supercomputing capacity present in the EU**) **to a wide range of scientific, industrial and public users across the European Union**;

- The **pre-exascale supercomputers** illustrate the level of multi-country participation: LUMI in Finland with 10 countries and total investment exceeding EUR 200 million; Leonardo in Italy involves 6 countries and a total cost of EUR 240 million; and the Mare Nostrum 5 in Spain with 3 countries and a total cost of EUR 223 million.

The continuation of the EuroHPC JU with a budget of around EUR 7 billion for the period 2021-2027 represents a major step to achieve even more ambitious goals. For example, between 2024 and 205, **EuroHPC will establish a world-leading hyper-connected and federated HPC infrastructure, including the first two exascale supercomputers in the EU** and additional new mid-range systems, reaching an aggregated computing power beyond 3 exaflops - **about 20 times the total computing capacity available in the EU in 2017**.

EuroHPC will also contribute **to the Digital Decade's objective** of reinforcing the **EU's technology sovereignty** with an ambitious action to develop an HPC ecosystem based on open RISC-V processors, and their integration in exascale and post-exascale supercomputers, reducing the EU's dependency on foreign suppliers. It will also contribute to the first **European computer with quantum acceleration** by 2025, paving the way for cutting edge quantum capabilities in the Union by 2030. **EuroHPC has selected 6 sites across the Union to host the first EU quantum computers** in Czechia, Germany, Spain, France, Italy, and Poland, with a total co-investment of EUR 100 million, 50% of which to be pooled by 17 participating states. The **LUMI-Q Consortium** in Czechia is the largest, bringing together 14 partners from nine participating states. The EuroHPC federated infrastructure will integrate the quantum systems as high-end accelerators for specific applications in hybrid HPC/quantum configurations.

EuroHPC's success story shows that the EU can get back in the technological race. But such a success requires **strong long-term political and financial commitment from public and private partners towards a clear and ambitious pan-European strategy driven by the Union**, mobilising key European policies under one single governance and legal instrument that has the capacity to mobilise and pool the necessary critical mass of investments (on the whole spectrum of the ecosystem).

2.2.3.3   Strengthening EU's quantum ecosystem

Quantum technologies are a rapidly developing field with **significant potential for enhancing Europe's competitiveness and productivity in various industries**. Quantum technologies promise, for instance, exponential improvements in the way computers perform operations, in the security of communications, and in sensors' precision. Given their foundational role in future digital ecosystems and far-reaching economic and societal impact[110], including through security, defence and space applications, quantum technologies are strategic for the EU, and are at the intersection of our technological competitiveness and security concerns.

In 2018, the Commission launched the **Quantum Technologies Flagship**[111], a large-scale scientific leadership initiative pooling resources of research institutions, industry, and public funders with a budget of EUR 1 billion over ten years. The combined research strengths and funding efforts of the EU and EU Member States have made Europe a competitive actor in the current state of technological development. With nearly EUR 7 billion combined, the EU ranks only behind China in

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[110] Quantum | Shaping Europe's digital future (europa.eu)
[111] Quantum Technology | The future is Quantum (qt.eu)

public investment in quantum[112]. Since 2021, at least 8 Member States have launched **national quantum programmes** either in the form of consortia (e.g., Hungary and Portugal) or by direct R&D investment schemes only for quantum technologies (e.g., Austria), with at least four of them having published **national quantum strategies** (France, Germany, the Netherlands, and Slovakia). National initiatives aim to develop Europe's research excellence into fully-fledged quantum ecosystems, mobilising often significant funding in countries such as France (EUR 1.8 billion, 2021)[113], Germany (EUR 2 billion, 2021)[114], and the Netherlands (EUR 615 million, 2021)[115].

However, **despite the coordination efforts brought forward by the Quantum Flagship programme, most EU countries continue to work in silos**. Even at the national level, EU countries have generally not achieved the level of coordination between stakeholders and companies that countries like the US and China have managed to achieve[116]. In the future, the **enhancement of coordination between national quantum programmes** beyond the current efforts will be critical. In fact, in contrast to the US where several Big Tech actors (IBM, Google, Intel, Amazon) dominate the quantum field, the **EU's quantum strengths lie in a vibrant ecosystem of research organisations and start-ups**[117]. Though the US and Canada top the overall list of start-ups, the EU registered the most launches in 2021. In a situation of highly competitive and increasingly coercive economic environment, the **lack of joined-up efforts across EU Member States** means that building up Europe's quantum ecosystem represents a huge challenge for the EU. Several of EU's "quantum champions" are indeed currently reaching maturity, requiring so-called "series B" and "series C"-financing, typically in the range of EUR 100 million, to enable industrial development and scale-up. This financing is not readily available in the EU yet. New investment tools could aim to support strategic industrial projects and leverage private investment in this promising field.

2.2.3.4 Secure and resilient connectivity infrastructures

Communication infrastructures are fundamental to the digital transformation. It is therefore important that the EU is prepared to tackle potential vulnerabilities to ensure the resilience and security of EU communications.

In January 2020, the EU had published a **Toolbox on 5G cybersecurity** covering important aspects of non-interference of non-trusted suppliers via the supply chain. The Toolbox does not target any country or supplier but contains recommendations on the implementation of countries' risk assessments as well as measures to restrict or exclude high-risk suppliers from critical and sensitive assets. The **second progress report on Member States' progress in implementing the strategic and technical measures of the 5G Toolbox** published in mid-June 2023 shows that **24 EU Member States** have adopted or are preparing legislative measures giving national authorities the powers to perform this assessment and issue restrictions. However, some of the key measures listed in the Toolbox have not been fully implemented yet in all Member States. The importance of the connectivity infrastructure for the digital economy and dependence of many critical services on 5G networks means that Member States should achieve the implementation of the Toolbox without delay. A lack of swift action regarding high-risk suppliers could also affect over time the EU

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[112] Quantum computing talent not on pace with funding | McKinsey
[113] cp_-_plateforme_nationale_quantiquev04012022_finale.pdf (gouvernement.fr)
[114] Quantum technologies – from basic research to market (quantentechnologien.de)
[115] General overview and documents - Quantum Delta NL
[116] Can Europe Catch Up with the US (and China) in Quantum Computing? | BCG
[117] Quantum computing start-ups by country 2021 | Statista

consumers and companies' trust in the internal market and increase the risk of spill-over in case of cyber-attacks[118].

Following the unanimous agreement of Member States on the second progress report, the Commission has also published a **Communication on the Implementation of the 5G cybersecurity Toolbox**[119] where it underlines its strong concerns about the risks posed by certain suppliers of mobile network communication equipment to the security of the Union. DAs part of its corporate cybersecurity policy, and in application of the 5G cybersecurity toolbox, the Commission will take **measures to avoid exposure of its corporate communications to mobile networks using equipment that would have all necessary cybersecurity requirements.**

The 5G Toolbox represents a powerful instrument for safeguarding the security of communications in the Union. This complements defensive economic measures that have been put in place in the last few years, such as the **EU's framework for screening of foreign direct investment**[120] that aims to better safeguard key EU assets based on enhanced national screening capacities and improved coordination among Member States, and the overall **strengthening of export controls**[121].

It is important that the EU establishes itself at the forefront of the development of 6G technology. Leadership in the research and innovation of this technology allows the EU to capture the first-mover advantage and more in control over the resilience of future networks by shaping the design thereof.

Here too the EU needs to ensure that our communication pathways are secure and resilient. Two-thirds of the approximately 250 cable systems connecting the EU with the rest of the world's internet are submarine cables[122]. As a result, **ensuring the security of the seabed is now a key priority**[123] [124].

Until the mid-2010s, **submarine cables** were primarily owned by consortia of telecom providers. Since then, however, a significant trend can be noticed towards private investment by big tech companies in new submarine cable systems. Increased control over internet's cable infrastructure allows for the ability to shape global internet traffic flows with potential risks to the security and resilience of the EU's internet infrastructure[125].

Space connectivity is also critical for EU's sovereignty and technological leadership. Satellite broadband can help close the gaps concerning broadband services up to 100 Mbps download in very rural and remote areas, when no fixed or mobile Gigabit networks is available and can provide emergency service in disaster or crisis situation in the sense of resilience. Through the IRIS² [126] programme launched in November 2022, the **EU is reinforcing its action in this area**. With an EU budget seed of EUR 2.4 billion, IRIS² establishes space as a vector of our European autonomy, a

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[118] Second report on Member States' progress in implementing the EU Toolbox on 5G Cybersecurity | Shaping Europe's digital future (europa.eu), p. 22-23.

[119] Communication from the Commission: Implementation of the 5G cybersecurity Toolbox | Shaping Europe's digital future (europa.eu)

[120] Regulation (EU) 2019/452 of the European Parliament and of the Council of 19 March 2019 establishing a framework for the screening of foreign direct investments into the Union (OJ L 79 I, 21.3.2019, pp. 1–14).

[121] Regulation (EU) 2021/821 of the European Parliament and of the Council of 20 May 2021 setting up a Union regime for the control of exports, brokering, technical assistance, transit, and transfer of dual-use items (OJ L 206 I, 11.6.2021, pp. 1-461)

[122] Security threats to undersea communications cables and infrastructure – consequences for the EU | Think Tank | European Parliament (europa.eu) p. 16

[123] CRMs_for_Strategic_Technologies_and_Sectors_in_the_EU_2023.pdf (europa.eu)

[124] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023H0120%2801%29

[125] Security threats to undersea communications cables and infrastructure – consequences for the EU | Think Tank | European Parliament (europa.eu) p. 34

[126] Welcome IRIS²: Infrastructure for Resilience, Interconnectivity and Security by Satellite (europa.eu)

vector of connectivity and a vector of resilience and will provide a security network for the EU governments and military basis, integrating the European Quantum Communication Infrastructure (EuroQCI), which will contribute to protection against cyberattacks by using quantum key distribution to enable the secure transmission of cryptographic keys.

Secure and resilient connectivity is essential for the EU's competitiveness, leadership and autonomy. Given the current geopolitical and security situation, the EU must reinforce efforts to ensure the security and resilience of its telecommunications infrastructure as well as the digital services that are enabled by it.

2.2.3.5   EU data sovereignty

The estimated share of the data economy impacts on GDP in the EU27 has increased from 3.7% in 2021 to 3.9% in 2022. To implement the **European Strategy for Data**, which was published in February 2020, the Commission has focused on **combining fit-for-purpose legislation and governance with investments in standards, tools, cloud, edge and data infrastructures and services and competencies** to ensure the availability of data as well as in the set-up of **a High Impact Project on next generation federated cloud-to-edge infrastructure and services**. These actions aim to create a favourable context for innovative, secure and trustworthy data storage and processing advanced capabilities in the EU and the establishment of a **single European data space** that is open to data from around the world. This space will guarantee secure personal and non-personal data, providing businesses with easy access to high-quality industrial data, thereby boosting growth and creating value. This will in particular help innovative SMEs - which account for 98% of all data user companies in the EU - and start-ups whose business model is dependent on having access to high-quality data. In this single European data space, EU law will be enforced effectively, and **all data-driven products and services will comply with the relevant norms of the EU's Single Market**. This approach will ensure the **objective of European data sovereignty**, making it the safest and most attractive place for exchanging data.

The **Data Governance Act** (applicable from 24 September 2023) and the **proposal for a Data Act** (adopted in February 2022 and currently being negotiated) form the **foundation of the European model for data governance**. These regulations adhere to European fundamental rights and values, as well as the existing data and privacy protection laws. They follow a human-centric approach that aims to empower individuals and businesses, particularly start-ups and SMEs, which are involved in producing data.

In particular, the **Data Governance Act** includes measures that promote voluntary data sharing by improving trust in data exchanges, increasing data availability, and overcoming technical barriers to data reuse. Neutral data intermediaries will serve as trustworthy organisers of data sharing and pooling between data holders and users. Additionally, a **European framework for data altruism** will encourage citizens and businesses to share their data for general interest purposes. The **European Data Innovation Board** will help Member States to develop best practices for data sharing and address any gaps in data standards and technical requirements within the Union.

The proposed **Data Act** complements these rules by clarifying the legal access and use of data rights in various contexts, including business-to-business (B2B), business-to-consumer (B2C), and business-to-government (B2G). It aims to promote fairness in the data economy and provides control over data to individuals and businesses, particularly those involved in producing it. The new access right is expected to lead to efficiency and productivity gains of up to EUR 196.7 billion per year by 2028[127]. Entities will have the power to decide who can access their data, for what purposes, and under which conditions. SMEs will benefit from an unfairness test introduced in the

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[127] Study to support an Impact Assessment on enhancing the use of data in Europe

Data Act and which is–expected to bring benefits in the amount of EUR 7.4 billion per year. **The proposed Data Act is the first European legislative proposal that allows public sector bodies to access businesses' data in exceptional circumstances**, such as during public emergencies or natural disasters, to make the public sector more data-driven and efficient.

Finally, the **Implementing Regulation on High-Value Datasets**, adopted in December 2022, also contributes to the regulatory framework for data by outlining a list of datasets that must be made available for free, in a machine-readable format, and through application programming interface (APIs).

The data legislation is poised to enhance data sharing, pooling, and reuse in strategic economic sectors and domains of public interest, such as health, agriculture, energy, mobility, and environment. This will ensure that relevant, high-quality data fills the common European data spaces. The creation of these data spaces will establish an ecosystem of well-established companies, SMEs, start-ups, public sector bodies, civil society, and individuals, providing access to more data in a secure and trusted environment and giving rise to innovations.

The European data strategy initially introduced the development of ten common European data spaces. This list is not exhaustive, and work has already begun on **four additional data spaces**, namely tourism, cultural heritage, languages, and media. Since the same datasets can serve multiple purposes across various data spaces, the Commission's long-term goal is to ensure that these data spaces are interoperable, enabling data to flow across sectors and borders.

These investments will boost Europe's technological sovereignty in key enabling technologies, and infrastructures and services for the data economy. **Over the first three years of the Digital Europe programme, the EU invested roughly 450 million EUR to support the creation of sectoral data spaces and develop a technical infrastructure for sharing data in a trusted and secure manner**. This will be achieved through **Simpl**, an open-source smart middleware that enables cloud-to-edge federations and supports major data initiatives funded by the European Commission, including the common European data spaces.

Adding to these initiatives, a number of **EDIC proposals** aimed at reinforcing European data sovereignty have also been put forward. The **Mobility and Logistics Data EDIC** proposed by Member States should facilitate the establishment of a common European mobility data infrastructure ensuring safe access, sharing and reuse of data. The proposed long-term objective of the EDIC is to progressively become the core of the European Mobility and Logistics Data ecosystem. The **Genome EDIC** proposed by Member States is intended to establish a trust framework to enable the effective and secure cross-border access to repositories of personal genomic datasets among participating countries.

2.2.3.6   Artificial Intelligence

Strengthening Europe's AI capabilities is a key element of the wider strategy of making Europe fit for the digital age. The **rapid development of large artificial intelligence (AI) models in recent years** promises to have a profound impact on important segments of the European economy and society. Their advanced AI capabilities and their ability to adapt to diverse tasks and domains renders large AI models highly valuable for industry innovation and are expected to redefine sectors like healthcare, finance, education, among others.

However, these developments have been primarily driven outside of the EU by big technology companies with access to extensive computing resources, vast data repositories, and skilled engineers. In the EU, the development of these models has been **hindered by a fragmented approach, attributable to limited availability of computing power, data, coordination of talented communities, and financial resources**.

Faced with these rapid AI developments and a global policy context where more and more countries are investing heavily in AI, the EU must act jointly to harness the many opportunities and address challenges of AI in a future-proof manner. In this context the **2021 review of the Coordinated Plan on AI** put forward a concrete set of joint actions for the European Commission and Member States on how to **create EU global leadership on trustworthy AI**. Its proposed key actions reflected the vision that to succeed the European Commission together with Member States and private actors need to accelerate investments in AI technologies to drive resilient economic and social recovery facilitated by the uptake of 'new' digital solutions; act on AI strategies and programmes by fully and timely implementing them to ensure that the EU fully benefits from the first-mover adopter advantages; and align AI policy to remove fragmentation and address global challenges.

The Commission proposed that the Union invests in AI at least EUR 1 billion per year from Horizon Europe and the Digital Europe programmes under the programming period 2021-2027. This EU-level funding should attract and pool investment to foster collaboration among Member States and maximise impact in joining efforts, achieving much more together than the sum of individual uncoordinated efforts. The objective was set to gradually increase public and private investment in AI to a total of EUR 20 billion per year over the course of this decade.

Indeed, in 2021/2022 alone, the EU has invested more than EUR 4 billion from Horizon Europe and the Digital Europe Programme in the research, development and deployment of AI including the **AI Testing and Experimentation Facilities**, the **Networks of AI excellence centres** and **Data Spaces**. In addition, AI development benefits from the policy actions regarding the potential of data, critical computing capacity and strategic leadership in high-impact sectors set out in the Coordinated Plan[128].

Europe, with its long experience in research and innovation and a deep pool of skilled researchers, is uniquely positioned to contribute to and steer these advancements. However, to keep European institutions and businesses at the cutting edge of this technology, **it is important that Europe invests into the development of sovereign AI models**. That includes prioritising research into, and development of new foundation models developed by European firms and research labs, of similar competitive scale and performance to the world leading models.

To build large AI models such as **ChatGPT** requires access to large amounts of data, and enough computing power to process the data. So far only big companies like Microsoft, Meta and Google can afford to build such large models. They have a strong hold on AI and are keen on consolidating their power and dominate the market. Several countries like the US, DE, and UK proposed sovereignty plans to ensure that they can build their own AI models.

This focus of policy support for AI has had some success. In 2022, the EU was the only one of the major economies where AI venture capital investment continued to grow, while it fell considerably in the US and China. Still, with EUR 15.6 billion AI venture capital investment, **the EU continues to lag behind China and far behind the US**. Moreover, the success of ChatGPT has led to a renewed enthusiasm of AI venture capital investment in the US, so that the gap risks increasing again in 2023.

In March the UK government announced that it is going to invest GBP 900 million in a cutting-edge supercomputer as part of an AI strategy that includes ensuring the country can build its own "BritGPT". A dedicated taskforce in the US proposes to invest USD 2.6 billion in funding a widely accessible AI research cyberinfrastructure that brings together computational resources, data, testbeds, algorithms, software, services, networks, and expertise. This conveys a sense of urgency for the EU and the Member States to act now, joining forces to build jointly cutting-edge AI models

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[128] E.g., Data Act, Data Governance Act, EuroHPC Joint Undertaking, European Partnership on Key Digital Technologies

and **capitalise on existing strengths - research, engineering, HPC and data resources - to become independent from foreign models and maintain its competitiveness in the global economy and drive innovation and growth.**

2.2.4 Cybersecurity

Cybersecurity is an essential element for the security and resilience of our digital infrastructure[129]. As the EU has become a global political, economic and security actor, it has also growingly become a target for cyberattacks. The war in Ukraine has increased Member States' awareness on the need for more cooperation at the EU level to the point that cybersecurity is now recognised in the **EU Strategic Compass** - the plan of action for strengthening the EU's security and defence policy - as a way to increase the effectiveness and security of our efforts on land, in the air, at sea and in outer space. This represents a major paradigm shift in the Union's Common Security and Defence Policy (CSDP). In order to better manage cyber threats, the EU will need advanced technologies, secure infrastructure, common requirements, increased operational cooperation and effective sanctions[130].

Since 2020, the EU has significantly strengthened its policy landscape to prevent, detect, deter, and respond to cyberattacks on the Union, its Member States, critical infrastructure, businesses and citizens. The **NIS 2 Directive**, which entered into force in January 2023, raises the bar in terms of cybersecurity requirements, strengthens the EU crisis management framework and formally sets up **EU-CyCLONe** to support the coordinated management of large-scale cybersecurity incidents and crises at operational level and to ensure the regular exchange of relevant information among Member States and EU institutions, bodies and agencies.

To raise even more the level of resilience and security of our Single Market, the EU is adopting an ambitious **technological and regulatory approach**. On the technological front, the Commission is working on the deployment of a technological roadmap to identify cyber dependencies and to concentrate EU and national funding, whether civilian or military (through the European Defence Fund), to reducing these dependencies[131].

The **Cyber Resilience Act** proposal, presented in September 2022, aims to establish cybersecurity requirements, including **cybersecurity by design and by default**, **for hardware and software products accessing the Single Market, regardless of where they are produced**. According to the proposal, the vast majority of the products under the scope of the Act (estimated by the impact assessment to be approximately 90% of the total) would be subjected to self-assessment, while products considered as **critical** (estimated to be roughly 10%) will be subject to more stringent compliance assurance requirements, including third-party conformity assessment (e.g., industrial firewalls, routers or operating systems). The Commission continues to ensure the implementation of the **5G cybersecurity toolbox in the deployment of secure networks**.

Aiming to drastically reduce the time needed to detect a sophisticated cyber-attack, the Commission has proposed a **Cyber Solidarity Act**. This establishes a **European infrastructure of Security Operation Centres (SOCs)** that will scan the network using artificial intelligence technologies and detect weak signals of attacks. This common European advanced detection infrastructure will form a real European cyber shield. The **pilot project**[132], bringing together 17 countries in three large Security Operation Centres (SOCs), will be deployed this year. To further strengthen the security and resilience of our critical infrastructures the Commission, in partnership

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[129] Cf. notably to the EUCO Conclusions on ICT supply chain security (17 October 2022)
[130] A European Cyber Shield to step up our collective resilience (europa.eu)
[131] PQCRYPTO: an EU-funded project success story | Shaping Europe's digital future (europa.eu)
[132] Cybersecurity: EU launches first phase of deployment of the European infrastructure of cross-border security operations centres | Shaping Europe's digital future (europa.eu)

with the Member States, will simulate **attack scenarios and penetration tests** to strengthen the detection of any, including for undersea cables and space networks.

Better preparation in handling a significant attack is essential. This can be achieved by **increasing the exchange of information** between Member States, establishing an effective **operational capacity for joint crisis management**, and laying a foundation for true European solidarity and mutual assistance. In this respect, the **Cyber Solidarity Act** should include a **cyber emergency mechanism** providing civil protection for cyberattacks similar to that for natural disasters. This will involve the creation of a **European Cyber Reserve**, comprising of certified and trustworthy private service providers, which can be called upon by any Member State or entity requesting support during an attack. This will become the EU's cyber reactive arm, in addition to the technical cooperation already happening through the **CSIRT network** and the operational cooperation in the context of the **EU CYCLONE**.

As a way forward, the EU will have to establish a credible **global presence in the cyber field** by developing a strong doctrine on cyberattacks and defence. This is crucial to address the growing threat that Europe faces. The existing actions such as strengthening critical infrastructure, creating a common detection system, establishing a cyber reserve for European solidarity, and adopting active and direct sanctions have enabled Europe to already enhance its deterrent position in cyber matters. However, for this deterrent to become credible, it will have to be accompanied by an **offensive capability strategy**. Close cooperation with allies will also be crucial in this field. Hence, working closely with NATO and launching a cyber dialogue between the US and Europe with close cooperation and trust is a crucial step towards addressing the issue. Deeper engagements on security aspects related to emerging technologies such as adversarial artificial intelligence and quantum-resistant cryptography will be key to secure our critical infrastructure in the short to medium term future. As the lines between civilian and military blurs and cyberspace is used to carry out aggression below the threshold of armed conflict, EU-NATO cooperation on cyber resilience must be strengthened in particular in terms of joint situational awareness and crisis coordination. The launch of the EU NATO taskforce on critical infrastructure protection, as announced by President von der Leyen in January 2023, is an important step in this regard.

To **address the gap in cybersecurity professionals**, which is estimated to be ranging between 260 000 and 500 000, the Commission has put forward, on 18 April 2023, a **Communication on Closing the cybersecurity talent gap to boost the EU's competitiveness, growth and resilience**[133]. The **Cyber Security Skills Academy EDIC** is being set up in this context. This EDIC would develop the Cybersecurity Skills Academy as an umbrella organisation under which different Member States entities would integrate various activities related to cybersecurity education and training for SMEs, start-ups and the European public sector, as well as standardisation of procedures for cybersecurity competence recognition and professional certification. Addressing the cybersecurity skills needs requires first having accurate data on the state of the labour market to develop education and training curricula fit for the needs and direct funds towards those. Implementing the communication, and in coherence with the approach of the Digital Decade Policy Programme, indicators and key performance indicators (KPIs) for cybersecurity professionals are to be defined, and subsequently, data to be collected.

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[133] EUR-Lex - 52023DC0207 - EN - EUR-Lex (europa.eu)

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2.3   Twinning the digital and green transition

The digital transformation is **a vital ally in our efforts to reduce our environmental footprint and achieve the European Green Deal which sets the ambition for the Union to be climate-neutral by 2050**. The Digital Decade sets the objective of ensuring that digital infrastructures and technologies become more sustainable and resource efficient and **includes several references to the sustainability of infrastructures targets** notably edge nodes and semiconductors.

The Digital Decade's objectives[134], targets and the **European Declaration on Digital Rights and Principles** are all seeking to promotes sustainable digital technologies, products and services with a minimum negative impact on the environment and on society. Also, access to accurate and easy-to-understand information on environmental impact and energy consumption should be available to everyone.

> *According to the Eurobarometer on the Digital Decade 2023, the twinning of the digital and green transitions is considered to be a key factor in Europe's digitalisation. **2 out of 3 Europeans** consider that **digital technologies** will be **playing an important role for fighting climate change**.*

The December 2020 Council Conclusions[135] *(Digitalisation for the benefits of the environment)* recognised that "*digitalisation is an excellent lever to accelerate the transition to a climate neutral, circular and more resilient economy*" and called for a series of measures and initiatives, which sparked action by the European Commission as well as concrete commitments from Member States.

The **synergistic alignment of the green transition and the digital transformation is a political priority of the European Commission**, as announced by President Ursula von der Leyen as early as in her political guidelines[136]. An effective integration of digitalisation in the green transition policies and the support of digitalisation deployments with sustainable finance are key challenges ahead.

The EU has been actively working towards maximising the synergies of the green transition and digital transformation following the publication of the EU Digital Strategy[137]**,** where first ambitious goals have been set, for example, to work towards climate neutrality of data centres in the EU by 2030 (cf. section 1.3.2). Measures aiming to improve the circularity of digital devices and to reduce eWaste include the right to repair directive as well as the recently issued eco-design criteria for mobile phones and tablets[138]. Efforts are also ongoing in developing low energy chips under the European Processor Initiative, furthering sustainability in the digital sector.

Actions and commitments promoting the twin transition have also been set by EU Member States at ministerial level, such as the **Declaration on "A Green and Digital Transformation of the EU"**[139]

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[134] Article 3 of the Digital decade decision includes a commitment to "*ensuring that digital infrastructure and technologies, including their supply chains, become more sustainable, resilient, and energy- and resource-efficient, with a view to minimising their negative environmental and social impact, and contributing to a sustainable circular and climate-neutral economy and society in line with the European Green Deal, including by promoting research and innovation which contribute to that end and by developing methodologies for measuring the energy and resource efficiency of the digital space*"

[135] https://data.consilium.europa.eu/doc/document/ST-13957-2020-INIT/en/pdf

[136] political-guidelines-next-commission_en_0.pdf (europa.eu)

[137] https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age_en

[138] Commission Regulation (EU) …/… laying down ecodesign requirements for smartphones, mobile phones other than smartphones, cordless phones, and slate tablets (europa.eu)

[139] Declaration on A Green and Digital Transformation of the EU https://digital-strategy.ec.europa.eu/en/news/eu-countries-commit-leading-green-digital-transformation

(March 2021) and in the **Ministerial Declaration** Toulouse Call for a Green and Digital Transition in the EU[140] (June 2022), are also particularly important in the context of this report. For example, Member States committed in 2021 to make **green public procurement**[141] the default option and establish a sustainable baseline for public sector procurement of ICT products, data centres and cloud services, thereby stimulating a strong European market for green technologies. However, the EU is still underutilising this potential: a tripling of public procurement investments in innovative green, digital solutions is needed to achieve full speed green, digital transition.

The overall potential of emission reduction using digital solutions based on existing technologies is estimated at 15%-20% of total GHG emissions by 2030, provided they are properly used and governed[142]. To optimise the synergy between the digital transformation and the green transition we need to support innovation, deployment and financing in digital solutions that deliver significant net positive environmental impact.

As a first step, we need to develop and agree on standardised methods to measure the positive and negative impacts of digital solutions. This will allow us to make digital technologies more energy and material efficient, keep rebound effects under control[143], and support the development and deployment of '**green digital solution**' that deliver measurable environmental benefits.

- When implemented under the right conditions, **digital solutions**[144] have demonstrated significant reduction of GHG emissions, increased resource efficiency and improved environmental monitoring. For instance, by creating a digital twin of a building, energy usage can be reduced by up to 17% and costs slashed by 15-25%[145]. Many more examples can be found in the Strategic Foresight Report 2022[146];

- **At the same time, the ICT sector is also a significant source of energy consumption, emissions and waste.** Today, it accounts for approximately 7-9% of global electricity consumption, forecasted to rise to 13% by 2030[147], for 2-4% of the total GHG emissions, and, increasing amounts of eWaste[148]. More than five billion mobile phones are currently unused and could be recycled in the context of a circular mobile supply chain. It is estimated that a refurbished phone can have 87% lower climate impact than a newly manufactured phone and that if properly recycled, five billion mobile phones could recover EUR 8 billion worth of gold, palladium, silver, copper, rare earth elements, and other critical minerals, and cobalt for 10

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[140] Toulouse Call for a Green and Digital Transition in the EU June 2022
https://www.economie.gouv.fr/files/files/2022/Call_for_Green_Digital_Transition_EU.PDF
[141] https://digital-strategy.ec.europa.eu/en/library/results-eu-wide-benchmarking-innovation-procurement-investments-and-policy-frameworks-across-europe
[142] IPCCC Report 2022 (B.4.3)
https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_SPM.pdf
[143] See the Digital reset report https://digitalization-for-sustainability.com/digital-reset/
[144] such as IoT enabled smart grids, precision farming, connected mobility, teleworking, AI and robotics-based manufacturing or waste treatment, 3D printing, satellite earth observations services and others. Digital solutions are combination of digital technologies such as cloud services, fixed and mobile telecommunications, AI, IoT, blockchain, quantum.
[145] https://www.weforum.org/reports/shaping-the-future-of-construction-a-breakthrough-in-mindset-and-technology
[146] Strategic Foresight Report Twinning the green and digital transitions in the new geopolitical context, COM/2022/289 final.
[147] According to the Strategic Foresight Report 2022, the Action plan on Digitalisation of Energy Systems and eWaste Monitor,
[148] E-waste (electronic waste) is any electronic device or equipment that is obsolete, energy intensive, or has reached the end of its life, such as old computers, mobile phones, tablets, smart TVs, telecommunication equipment, and other electronic devices. GEM 2020 - E-Waste Monitor (ewastemonitor.info)

million electric car batteries[149]. The fast-evolving nature of digital technologies and the possible sharp increase of digitally enabled services is likely to reinforce further this situation. All analyses and studies agree that appropriate measures can limit or reduce the ICT sector footprint.

Investment is key to incentivise the move towards more resource-efficient digital technologies. The **EU Taxonomy Regulation** delegated act on climate mitigation and adaptation has set clear criteria notably for green datacentres and green digital solutions that will help steer investment towards greener data centres and proven green digital solutions as a sustainable economic activity. Over the summer, the Commission will publish an EU Cloud Rulebook as a single point of reference for relevant rules applicable to the cloud, including on sustainability.

The adoption of the **Temporary Crisis and Transition Framework** in March 2023 will support clean tech manufacturing, including their digital component. A the same time, the Commission endorsed amendments to the **General Block Exemption Regulation** ('GBER'), which have the potential to facilitate, simplify and speed up support for the EU's green and **digital transitions**, **massively facilitating investments in digital technologies and connectivity, notably:** new possibilities for **Digital Innovation Hubs** (relevant for SMEs), **Testing and Experimentation Facilities** (such as pilot lines foreseen in the Chips Act) and for the uptake of digital technologies such as artificial intelligence, cloud, edge and high-performance computing and cybersecurity, **ambitious connectivity projects** bringing significant new capabilities and investments in infrastructure for **remote areas** (including outermost regions) and, for the first time, the possibility to devote part of the **funding to active equipment**; Backhaul networks that do not have yet the performance of fibre; **Gigabit connectivity projects connecting socio-economic drivers** (e.g., schools) with less than 300 Mbps connectivity.

How to synergise digital transformation and green transition concretely: focus on energy system.

The EU Action Plan on the Digitalisation of the Energy System[150], adopted on 18 October 2022, sets out concrete actions to deliver on both the Green Deal and 'A Europe Fit for the Digital Age' priorities, hence at leveraging the digital transformation to foster the green transition, namely: Create an EU energy data space to ensure seamless exchange of interoperable data between different actors along the energy value chain; Increase coordinated investments in the electricity grid as the enabler for a smarter and more resilient energy system; Support consumers to benefit from innovative digital ways to engage with the energy transition and make more efficient use of energy; Ensure the energy system is cyber-secure through continuous effort and investment; Support the IT sector to be a driver of investments in renewables and energy efficiency along the value chain (from data centres to digital applications); Support research and innovation as well as structural and joint learning of all actors involved in the twin transition.

Since the adoption, the following actions have been successfully implemented:

*- To promote investments in digital electricity infrastructure, on 20 December 2022, the European association for the cooperation of transmission system operators for electricity (ENTSO-E) and the association of European distribution system operators (EU.DSO Entity), with the presence of Commissioner for Energy Kadri Simson, signed a **declaration of intent[151] towards the creation of a digital twin of the European electricity grid** that will help drive and coordinate investments in the digitalisation of the electricity infrastructure;*

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[149] https://www.gsma.com/newsroom/press-release/mobile-industry-eyes-five-billion-dormant-phones-sitting-in-desk-drawers-for-reuse-or-recycling/

[150] COM (2022) 552 final

*- To facilitate access to data (at the consumer's consent), the **Implementing Act on interoperability requirements and procedures for access to metering and consumption data** has been agreed with the Member States and goes towards adoption;*

*- To ensure the EU workforce has the skills to digitalise the energy system, progress has been made towards the **establishment of a large-scale Partnership on the digitalisation of the energy value chain** in the framework of the Pact for Skills, which will also contribute to the Green Deal Industrial Plan. To ensure digital solutions can help consumers save energy, a first key step was completed, namely the landscaping analysis for the development of a **Common European Reference Framework for energy-saving application**[152]. The report highlights the potential of digital technology in offering solutions to help consumers make informed choices.*

*To ensure synergies between green and digital investments and policies, the Commission Notice on the **Guidance to Member States for updated National Energy and Climate Plans (NECPs) 2021-2030**[153] - published on 15 December 2022 - encourages and assists Member States to make use of the existing tools and to build on their activities in the field of digital and energy to explore the full potential of the twin green and digital transition, while avoiding duplication. The Commission will follow-up on the guidance in discussions with Member States on the updated NECPs. Furthermore, many other actions are under way, for example the preparatory work to set up the Smart Energy Expert Group and its Data 4 Energy working group is progressing, and to ensure continuity the Smart Grid Task Force is continuing to work on key issues around demand response, cybersecurity and consumer engagement.*

*Digital innovations are also required to make the **energy system smarter** and more interactive so consumers can reap the benefits of increasing shares of cheap renewables, with Commission proposal for a targeted **Electricity Market Design Reform** from 14 March 2023.*

2.3.1   The pathfinder role of the cloud/edge computing sector

Compared to traditional on-premises data storage, the use of centralised computing capacities in the cloud has historically driven financial and efficiency benefits for companies. The enabling effects of cloud computing for the green transition are significant: the move from on-premises data storage and processing to centralised cloud capacities already allows companies to become more sustainable by tapping into the resource-saving potential of enhanced workload flexibility, improved server utilisation rates and more energy-efficient infrastructure. In fact, a private-sector study found that migration to the public cloud can reduce Co2 emissions by 59 million tons per year, a number equal to taking 22 million cars off the road[154].

Cloud and edge computing enables more than just file storage and agile emailing. It is a key enabler for emerging technologies like AI, big data and digital ledger technologies. As such, cloud computing underpins many of the technologies that unlock innovative use cases for the green transition. This dynamic is underscored by the move to edge computing which offers the potential to process data closer to the source.

In 2018, the energy consumption of data centres in the EU amounted to 76.8 TWh/a, which corresponded to 2.7% of total EU electricity demand. The growing reliance on cloud computing to enable the above-mentioned technologies has triggered a stark increase in data centre capacities.

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[151] https://energy.ec.europa.eu/news/commission-welcomes-cooperation-between-entso-e-and-eu-dso-entity-digital-electricity-grid-twin-2022-12-20_en
[152] https://digital-strategy.ec.europa.eu/en/library/empowering-consumers-leveraging-digital-technology-facilitate-voluntary-energy-reductions
[153] C(2022) 9264 final
[154] Accenture (2020), The Green Behind the Cloud.

This increase has more than off-set the significant efficiency gains achieved in recent years at the levels of hardware, software, and infrastructure. As a consequence, the total energy consumption of data centres in Europe is increasing, although at a rate that is modest in relation to the overall increase in data processing. By 2025, the energy consumption of data centres is expected to reach 92.6 TWh/a, a 21% increase compared to 2018. Targeted policy intervention has the potential to unlock significant savings: Studies suggest that by exploiting all policy potentials, it will be possible to reduce the energy consumption of data centres to the 2010 level[155].

In parallel, the contribution of edge data centres to the overall energy demand of the EU's data centres sector is also on the rise: **by 2025, edge data centres are expected to account for 12% of the total energy consumption of data centres in the EU 28**[156]. This reflects the fundamental change in the data processing paradigm leading to 80% of data processing at the edge of the network by 2025 as envisioned in the European Strategy for Data. However, the full diversity of edge infrastructures and devices is not entirely represented by edge data centres. The analysis of sustainability for edge computing must also take into account the analysis of the energy usage and sustainability of medium and low-end edge devices and analytics processes, as well as their connection with network transmission energy consumption.

Data centres also consume large volumes of water and produce significant amounts of electronic waste. And while the workload of data centres is growing rapidly, energy and water and other resources needed to produce electronic components are becoming scarcer. In recent years, this dynamic has given rise to public backlash against data centre investment projects. Under the Digitalisation of Energy Action Plan, the Commission is currently evaluating how to best integrate the excess heat and water used by data centres into the general energy systems. The aim of the ongoing study is to understand the drivers, obstacles and opportunities for data centre energy system integration from the technological, regulatory and economic perspectives, including rising public opposition to the establishment of new data centres[157].

Against the backdrop of these developments and as outlined in the Digital Strategy and the Digital Decade Policy Programme, the EU is taking the lead in making data centres climate-neutral, highly energy-efficient and sustainable by 2030. A mix of existing instruments, reviews of legislation, and new initiatives are paving the way towards attaining this goal. A first step will be creating full transparency on the resource intensity of data storage and processing. The revised Energy Efficiency Directive requires to consider the reuse of heat and water when planning new data centres or substantially refurbishing existing ones includes reporting and transparency requirements for the energy performance of data centres. By 15 May 2024 and annually thereafter, Member States will collect and make publicly available the sustainability performance from owners and operators of data centres in their territory with an installed IT power demand of at least 500kW. The Directive also stipulates that sustainability considerations must play a stronger role in the planning and operations of data centres.

The Regulation on Eco-design limits the environmental impact of servers and data storage products by setting requirements on their minimum efficiency and maximum consumption. Similarly, in fulfilling the Digital Decade Policy Programme's target for edge nodes, the resource efficiency of the to-be-deployed edge nodes should be considered by design with the purpose of achieving net-

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[155] Montevecchi, F., Stickler, T., Hintemann, R., Hinterholzer, S. (2020). Energy-efficient Cloud Computing Technologies and Policies for an Eco-friendly Cloud Market. Final Study Report. Vienna.

[156] Idem 124; EU 28: 26 Member States and Norway and Iceland

[157] Survey on synergies between data centres and energy systems | Shaping Europe's digital future (europa.eu)

zero carbon impact. Thus, edge nodes are built and operated in an energy-efficient way, with a focus on lowering their greenhouse gas emissions over their entire lifecycle and operation.

2.3.2 The net environmental effect of Artificial Intelligence

Artificial intelligence (AI) has the potential not just to promote economic growth and social well-being, **but also to help achieve global sustainability goals**. AI applications can have a beneficial environmental impact on different levels, such as optimising existing processing, enable new sustainable business models, support citizens in their green transition, and improve our understanding of environmental and climate risks and support mitigation and adaptation efforts.

For example, **AI can contribute to optimise existing processes to make them more efficient and environmentally friendly**. This includes examples such as optimising electric grid management, energy use of buildings, making mineral processing operations more efficient, or increasing use of public transport through planning routes based on passengers' needs. It also helps minimising waste and to reduce the use of pesticides in precision farming. Typically, in these sector-specific developments, environmental effect is coupled with efficiency improvements for financial gain.

At the same time, training and deploying AI systems requires massive amounts of computational resources with their own environmental impacts. While data centre energy use has remained flat at around 1% of (growing) global electricity demand despite large growth in workloads and data traffic, it is paramount to develop energy-efficient technologies that can minimise the environmental impact and cost of training and deploying emerging models such as GPT-3, which include a number of parameters several orders of magnitude larger than their predecessors' (175 billion parameters). The most promising technologies in this regard include: i) sparsification, which involves pruning unnecessary connections and using sparse matrix operations, ii) neuromorphic computing, which aims at adopting brain-inspired hardware for emulating the energy efficiency (~20 watts) and adaptability of the human brain, and iii) quantum computing, which leverages the principles of quantum mechanics to process information more efficiently than classical computers. It is worth mentioning that, recently, a European AI company, Aleph Alpha, has achieved a significant advance in AI compute efficiency, with the sparsification of a 13bn parameter AI model down to just 2.6 bn parameters[158].

The overall impact of AI on sustainability is determined by the balance of the positive and negative environmental impacts of specific solutions. In order to tilt the balance in favour of the environment, using AI for applications that reduce the carbon footprint of our economy is one of the priorities of the AI research funded under Horizon Europe. Numerous EU-funded projects and calls are dedicated to improving sustainability either in employing AI technologies to reduce the environmental impact on some application sectors or in reducing the energy usage of AI solutions, for example:

- **CLARUS** introduces an innovative solution connecting the sustainable paradigm of the food industry with AI and data technologies to reduce energy and water consumption;
- **ReconCycle** tackles the complex issue of electronic waste recycling via the development of an AI-driven, self-reconfigurable robotic solution;
- **SustainM**L develops an interactive design framework and models for developers to reduce emissions and energy usage throughout the life cycle of AI applications;
- The call HORIZON-CL4-2023-HUMAN-01-CNECT is targeting projects that yield unbiased, robust, trustworthy, model- and data-optimised AI solutions;

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[158] https://www.ecinews.fr/fr/graphcore-et-aleph-alpha-presentent-un-modele-dia-a-80-sparsifie/

- In September 2023 the EU funded research project ELIAS (**European Lighthouse of AI for Sustainability)** is planned to start with a funding of EUR 11 million with the aim to identify domains where AI can have a transformative impact on economic growth, as well as focus on devising new approaches for reducing the energy requirements of AI systems.

2.3.3 Linking digital and green through smart investments

As shown by the EIB 2023 survey, the EU is a global leader in the development of new technologies that combine digital and green innovations. While Europe appears to lag behind the US for digital innovation and patents, the survey highlights EU's strength in the development of new green technologies. A large share of EU patenting activities is concentrated in climate change technology and the EU leads on green innovation that incorporates digital technologies.

The survey also shows a clear link between business investments in digital and in green: Firms that make use of advanced digital technologies tend to invest more often in measures to build resilience and tackle challenges related to climate change. They are more likely to report that they have invested in adaptation strategies, strategies that involve changing procedures and/or operations to increase the organisation's resilience, and measures to reduce greenhouse gas emissions. If used in the right way, emerging digital technologies can be a competitive asset for business to tackle environmental challenges.

*Figure 3 - **Climate investment** (% of firms)*

a) Investments to mitigate the physical risk of climate change

b) Investments to reduce greenhouse gas emissions
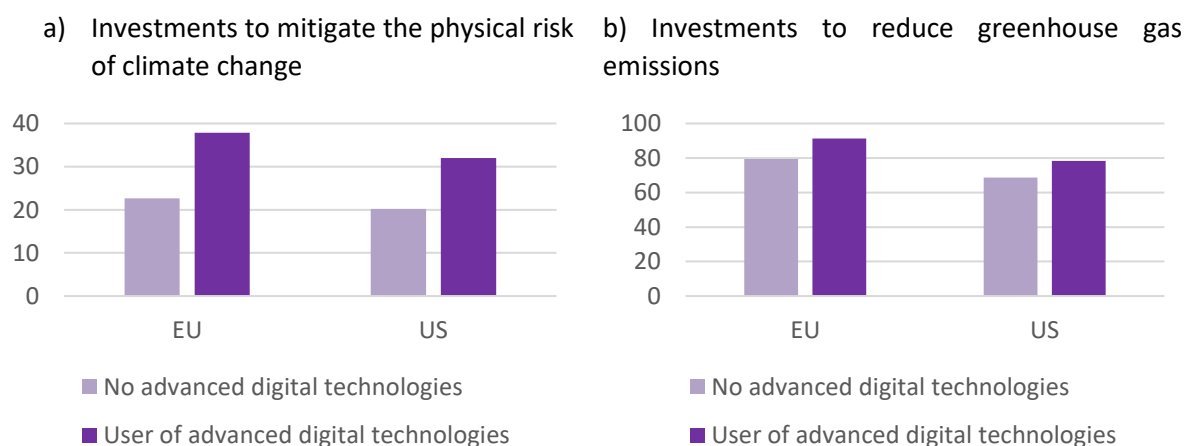
Source: EIBIS 2022.

Question: Has your company developed or invested in any of the following measures to build resilience to the physical risks to your company caused by climate change?

Source: EIBIS 2022.

Question: Is your company investing or implementing any of the following to reduce greenhouse gas emissions? Less polluting technologies, energy efficiency, renewable energy, waste minimisation, recycling, sustainable transport options.

*Figure 4 - **Investments to tackle climate change** (% of firms)*

a) Already invested

b) Plans to invest
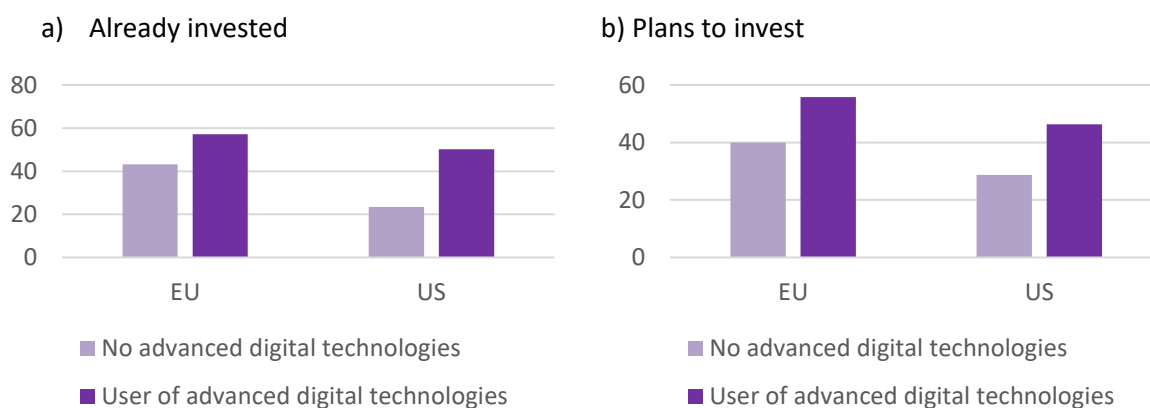
Source: EIBIS 2022.

Question: Which of the following applies to your company regarding investments to tackle the impacts of weather events and to help reduce carbon emissions? Company has already invested, company invested this year, company intends to invest over the next three years.

2.3.4 A digital project for the environment: Destination Earth (DestinE)

To boost the EU's ability to predict and manage environmental challenges and support sustainable development, the European Commission brings together under the Green Deal European scientific and industrial excellence to develop a very high precision digital model of the Earth, **Destination Earth (DestinE)**[159].

DestinE will leverage the EU's substantial investments and activities in high-performance computing (HPC), artificial intelligence (AI), cloud computing, high-speed connectivity networks, data from multiple sources (space, in-situ, socio-economic data). To ensure consistency of developments and sharing of best practices, DestinE is closely linked to Member State initiatives in the area and, representing an open digital infrastructure, ultimately aims to integrate other initiatives, best practice models and data resources. It will bring together European scientific and industrial excellence to provide the scale of effort and knowledge needed to manage the green transition.

Concretely, DestinE will bring unprecedented prediction and simulation capabilities, going beyond current sustainability policy decision support tool development initiatives on both EU and Member State levels (e.g., Copernicus) by significantly increasing the levels of precision (down to km scales at global level) as well as including impact sectors and user-defined scenario building capabilities. As a digital twin of the Earth, it will fully integrate observations with an Earth system model and human subsystems for water, food and energy resource management, to assess the impacts on, and influences from, these subsystems on Earth system trajectories. It will allow us to assess possible changes and their causes consistently across local and global spatial scales and over timescales stretching from days to decades.

Kicked off in December 2021, DestinE aims to develop in the first stage a series of different applications and services in relation to two key thematic areas such as **extreme weather monitoring** for a better identification of expected weather-induced harmful impacts and their location in time and space before they occur, or **predicting effects of climate change** and

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[159] https://digital-strategy.ec.europa.eu/en/policies/destination-earth

developing climate change adaptation strategies (as part of the EU's Mission on Adaptation to Climate Change[160]).

These developments are undertaken on behalf of the Commission by three implementing institutions - ESA, ECMWF, EUMETSAT - together with a huge number of scientific and business institutions in Member States. A first version of the DestinE platform, including the first two digital twins for climate change adaptation and extreme weather events, powered by the European High Performance Computing Joint Undertaking (EuroHPC JU)[161], is expected to go live in mid-2024. Subsequent phases of DestinE will refine models and data, identify new users, and address additional thematic areas.

2.3.5   Common European Green Deal Data Space

The Green Deal Data Space will facilitate access to interoperable data combined with digital infrastructure, analytics and artificial intelligence solutions. This is expected to boost evidence-based decisions and expand the capacity to understand and tackle environmental challenges.

The Green Deal Data space use-cases are driven by the needs from the following thematic areas and EU strategic targets: Biodiversity (including Forest related strategies), Zero-pollution targets, Climate change mitigation and adaptation targets and Circular economy.

Use-cases are currently (Q3 2023) being analysed and identified via several initiatives and ongoing Digital Europe and Horizon Europe projects[162].

For example in the case of the Circular Economy, the Green Deal Data Space is encompassing smart circular applications to make available the most relevant data for enabling circular value creation along supply chains such as the Digital Product Passport (DPP)[163].

2.3.6   Way forward

Focusing only on minimising the environmental footprint of ICT sector is not sufficient for it to deliver a positive contribution to EU Green Deal goals. Likewise, it is not possible to expect positive environmental impacts of increased digitalisation without keeping under control the footprint of digitalisation and the indirect rebound effects.

Beyond ongoing actions already mentioned above, a science-based assessment methodology on the "net environmental impact" of the digitalisation and facilitating the collection of evidence of the net environmental impacts of digital solutions across the EU will be an important focus. This aim is pursued currently by the European Green Digital Coalition (greendigitalcoaliton.eu).

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[160] https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/adaptation-climate-change_en

[161] https://eurohpc-ju.europa.eu/index_en

[162] GREAT , AD4GD , B3, FAIRiCUBE, USAGE

[163] CIRPASS – Digital Product Passport (cirpassproject.eu)

3 Linking the Digital Decade with EU cities, communities and regions

The success of EU's digital transformation will not be possible without the involvement of all actors at all levels. The multiple references to regions in the policy programme demonstrate the importance that co-legislators have placed on ensuring an inclusive approach that goes beyond EU and national level**.** Through co-creation with citizens, we aim to bring the economic and social benefits of this transformation to all local communities and implement an inclusive digital Europe, with powerful digital services, technologies, infrastructures and skills.

Regions and local communities have a key role to play in delivering digital Decade targets and can effectively contribute to the Digital Decade, via **contributions to national roadmaps**, involvement in **European Digital Infrastructure Consortia (EDICs)**, direct interaction through the FUTURIUM platform[164] set up by the Commission and by **taking ownership of the digital decade approach** while setting up and implementing their own digital strategies. There are thus ongoing discussions to set up an EDIC on Local Digital Twins for which five Member States have already pre-notified it to the Commission early June and more are interested to join this initiative.

In times when cities and communities are looking to digital solutions to tackle a growing range of interconnected challenges, **the Digital Decade can boost regional efforts by showing the 'European Way'**, notably with the guidance of the Declaration on Digital Rights and Principles, ensuring that digital solutions support the creation of places where people are fully respected and enjoy living and working. This includes approaches to smart urban mobility, energy efficiency, sustainable housing, digital public services, and civic-led governance. Large-scale uptake and upscale of these solutions are crucial to help our cities and communities meet their climate targets and reduce their environmental footprint, while fostering citizen participation and bringing prosperity to all types of business, including SMEs and start-ups. The **Digital Decade is also creating new opportunities for cities and regions to share views and learn from each other's experiences.**

Regions and municipalities also share many of the key challenges obstructing the digital transformation on national and European level. For example, a recent survey[165] undertaken by the EIB shows that **access to digital and technical skills represent major obstacles to the digital transformation of more than half (58%) of municipalities** in the European Union. Technical capabilities needed to access public or EU funds and increase investment as well the lack of environmental and climate assessment skills are also identified as major barriers.
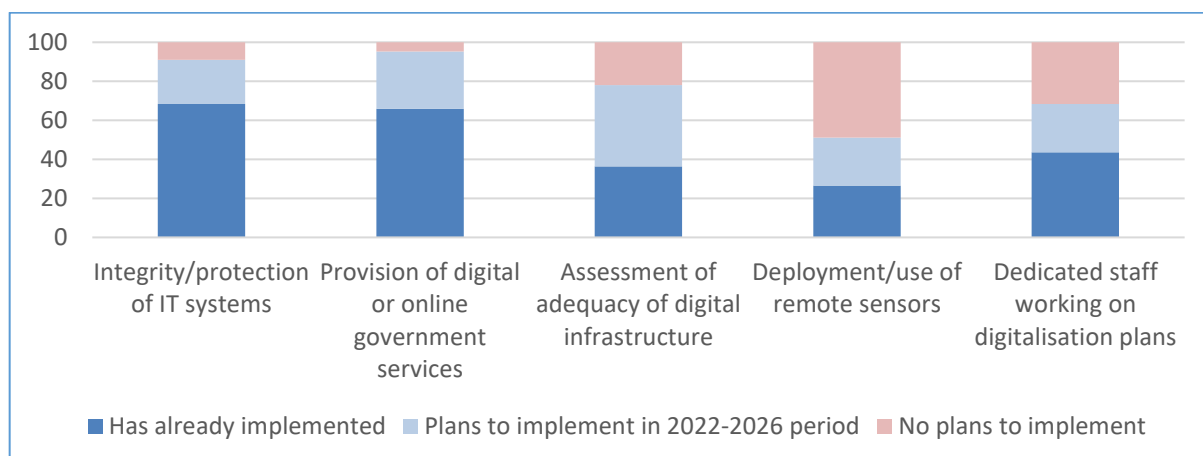
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[164] Digital Decade Report | Futurium (europa.eu)
[165] EIB, May 2023, Digitalisation in Europe 2022-2023
https://www.eib.org/attachments/lucalli/20230112_digitalisation_in_europe_2022_2023_en.pdf

Figure 5 - **Municipal administrative digital capability and sophistication** (% of municipalities)

Source: EIB Municipality Survey 2022.

Question: Thinking about digital technologies: for each of the following, please tell me whether your municipality has already implemented, has plans to implement in the 2022-2026 period or has no plans to implement in the 2022-2026 period.

Figure 6 - **Municipal skill constraints** (% of respondents)
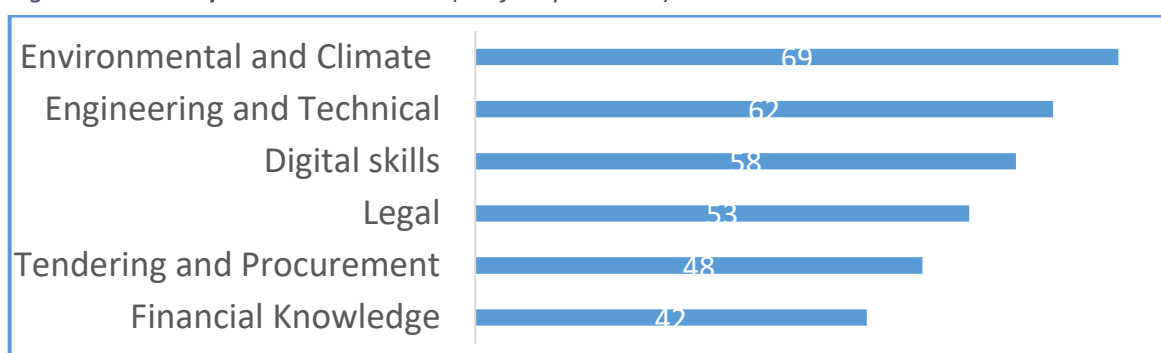
Source: EIB Municipality Survey 2022.

3.1   Contributing to the Digital Decade at local level: The Living-in.EU movement

At local level, the promising **Living-in.EU movement** embraces the Digital Decade as the **European way of digital transformation in cities and communities.** It is led by regions, cities and communities are themselves supported strongly by the Committee of the Regions and by the European Commission via the Digital Europe programme. Set up by cities in 2019, the movement is growing constantly and boasts more than 150 signatories and more than 130 institutional supporters, representing already 10% of EU population, today. It encourages cities and communities to scale up commonly agreed, interoperable digital solutions to provide more informed, innovative and high-quality services to the public and to businesses. It promotes EU digital sovereignty, especially on local data management and an inclusive approach so that the digital transformation will also benefit citizens living in small and medium size cities and rural areas.

Since October 2022, the **Digital Europe Program project** *The Governance of the Living-in.EU community* **(Go Li.EU)** manages the Living-in.EU community with the aim to structure and coordinate a broad range of activities for digital transformation at the local level. **The Mayors' Digital Assembly** acts as the political advisory body that provides strategic orientation to the Living-in.EU movement. The first Digital Mayors Assembly took place in June in the frame of the Brussels Urban Summit and has been the occasion for mayors to debate the political priorities of the

movement and to tackle a range of interconnected challenges - governance, digital divide, urban mobility, energy efficiency, and digital public services - while ensuring environmental sustainability in line with the European Green Deal. The Assembly is co-chaired by the mayor of **Oulu** (FI) and the mayor of **Sant Boi de Llobregat** (ES).

The approach that is pursued is to consider that digital transformation must be beneficial to all EU citizens to **avoid a digital divide** that could increase economic and social disparities, undermine the single market and delay the digital transformation. Therefore, local administrations are working to bridge this digital divide. This topic has gotten more interest even since the pandemic and is a crucial point of attention while public services are being moved online. Cities undertake many activities to support vulnerable groups, such as offering training courses, buddy systems, certifications programmes, device give-aways, free connectivity, preferred subscriptions, etc. In 2022, seven cities (Bordeaux Metropole, Barcelona, Amsterdam, Murcia, Rotterdam, Ghent, Genoa) endorsed by the Cities Coalition for Digital Rights have initiated work towards the development of local observatories for the digital divide to help define and measure it at the local level.

Besides building digital skills, local authorities need to build easier-to-use digital public services that provide clear functionalities responding to the needs of citizens. Several initiatives contribute to a better understanding how cities and regions are delivering effective digital services to their citizens. The UserCentriCities Benchmarking Dashboard[166] is based on a list of curated indicators and is useful to rank the performance of European cities and regions in designing and delivering digital services that focus on their citizens and their needs.

Another promising tool called LORDIMAS is developed by the Living-in.EU movement to measure the digital maturity at the local level. LORDIMAS stands for Local and Regional Digital Indicators Maturity Assessment. Since there is no methodology and instrument today to measure and monitor the digital transformation at local level such as the well-known national Digital Economy and Society Index (DESI), this tool **could** feed into the Digital Decade monitoring system in the future. It is an interactive real time assessment tool to help local municipalities understand where they stand in their digital journey, compare themselves with peers, access best practices and relevant material, as well as help national and EU-level policymakers provide better policy support and targeted funding.

LORDIMAS was announced at the first Mayors Digital Assembly in June 2023. It should reach in Autumn this year with about 85 000 EU municipalities via a strong and wide communication campaign to collect a critical mass of local data.

The **EU's cohesion policy and funding** provides a unique opportunity to support local and regional digital transformation efforts. By focusing in particular on areas where private investments are not able to deliver**,** it can help to ensure **a fair and inclusive** digital transformation, so that digital connectivity is available to **all regions.** For example, the **European Urban Initiative**, set up in September last year, is testing new solutions to foster digital governance and improve public services, making interactions with public authorities faster and simpler with a budget of EUR 450 million.

The **H2020 project AURORAL** focuses on increasing connectivity and delivering a digital environment of smart objects interoperable services platforms able to trigger dynamic rural ecosystems of innovation chains, applications and services. In this way, the projects contribute to

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[166] Important findings from the first UserCentriCities benchmarking dashboard exercise (Apr-Oct 2022) on how European cities and regions are performing in designing and delivering user-centric digital public services can be found here. It includes data from 13 cities and regions (Barcelona, the Catalonia region, the Emilia Romagna region, Espoo, Gothenburg, Helsinki, Kyiv, the Kronoberg region, Madrid, Milan, Murcia, Rotterdam, and Tallinn).

creating a cross-domain applications through large-scale pilots **in seven European regions**. Its main impact is to bridge the interoperability gap at the local level and create markets for services in rural areas.

Similarly, the **H2020 project dRural** aims at injecting new chances for the development of European rural areas and communities. The project is co-developing and rolling up a digital marketplace of innovative services and business models to improve quality of life and prosperity. An important aspect of the dRural project lies in the ambition **to overcome the digital divide between rural and urban areas** by exploiting the potential offered by connectivity and digitalisation in rural areas.

Finally, the **European Parliament Preparatory Action DT4REGIONS is another example of regional collaboration on the digital transformation**. It aims at creating a European Platform for Regions to enable AI and big data collective solutions and to enhance public administration efficiency and effectiveness in user-centric services. **By bringing together 14 partners from across Europe into a community of practice, the project showed how to put the everyday needs of a network of regions at its heart.** It established partnerships with related initiatives (e.g., Living-in.EU and projects Go Li.EU and AURORAL), and provide recommendations to extend AI platforms with AI functionalities for regions.

3.2   Local Digital twins/CitiVerse/New European Bauhaus

There are many established and new technology solutions available to support local communities in their efforts. Some of these are particularly suited to integrate transdisciplinary efforts and include citizens and decision makers in the decision-making process. The European Commission is striving to help EU communities to build local digital ecosystems that enable innovative solutions and applications to emerge. **A local digital twin** is an example of such innovative tool that builds on cross-sector data. It helps understand the data that is available by virtualising the physical environment and developing modelling scenarios linked to specific use cases. It also spurs the development of applications increasingly building on real-time data, including simulation and forecasts. Finally, these developments will eventually permit the adoption of virtual reality and immersive technology that not only supports architects, artists and environmentalist in co-creating and re-designing beautiful and greener environments but also enhance citizen engagement in many ways.

As part of the Commission's New European Bauhaus[167] initiative, the project in the **DIGITAL programme ("digiNEB.EU")** supports the green transition by increasing the adoption of digital solutions. It bridges the digital and NEB communities and raises awareness around EU digital solutions for all NEB stakeholders, establishing a pan-European digital ecosystem. Involving participants from Italy, the Netherlands, Sweden and Belgium. The central element of the digiNEB.eu ecosystem is the platform, which supports delivery to the various stakeholders of value-added information, services, engagement and discussion opportunities, bringing together research, industry and business actors, including start-ups/SMEs, as well as policymakers, experts and NGOs. The platform will host a series of assets, which will help ignite the necessary engagement and fuel the dialogue to sustain the ecosystem. The project will contribute to the transformation of the enabling environment for innovation by mapping exercise designed to help policy makers monitor progress and alignment of the financial instruments and deploy effective strategies too.

In the context of the planned **Commission initiative on virtual worlds**, the Commission has proposed to support the development of the so-called **CitiVerse** ("Citi" for citizen) in the Digital Europe work programme for 2023 to 2024. This initiative will bring the EU industry, including SMEs,

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and cities together in developing the different layers of virtual reality worlds that may be useful for cities. CitiVerse could eventually be used by citizens to navigate a city and discover its cultural, historical or touristic assets, with businesses offering innovative services related to tourism, entertainment, shopping and urban planning, and cities to manage their infrastructure and sustainable mobility.

3.3   Smart communities ecosystem interoperability and AI

Local and regional administrations face interlinked and often unique challenges when it comes to digital transformation. A **lack of interoperability** leads to **fragmented delivery** of digital services, which means **higher costs** for citizens, businesses as well as for the administration.

At the same time, local and regional administrations are **often more agile** than their national counterparts when it comes to experimenting with emerging technologies, innovation procurement practices or technology start-ups.

The European Commission is drawing on several initiatives to increase interoperability at the local level, especially to support the public sector. The **Interoperable Europe Act**[168] is to make digital public services truly work across borders, sectors and different levels of government, especially through the **European Interoperability Framework for Smart Cities and Communities** (EIF4SCC)[169]

Involving cities and regions is indispensable if we want to make interoperable digital services a reality. Not only because they constitute the 'first and last mile' of public service delivery, but also to tap into their considerable innovation capacity. A representative of the Committee of the Regions will have a seat at the future **Interoperable Europe Board** so that cities, communities and regions can be part of setting out the Interoperable Europe Agenda and be fully involved in discussing interoperability issues. Additionally, cities, communities and regions are by far the first source of public procurement and can significantly shape the demand market for open and inclusive IT solutions.

Furthermore, it is worth noting that the responsible use of artificial intelligence (AI) is a topic of great interest to local authorities. For example, the city of Amsterdam has published contractual terms for the procurement of AI and the city of Helsinki has implemented an AI register. Building on these good practices, European municipalities[170] have jointly developed a free-to-use, open-source algorithm transparency standard to support the responsible use of AI in cities. The standard sets common guidelines on the information to be collected on algorithms and their use by a city, offering a safeguard for people whose data may be used by algorithms. It creates a validated model that other municipalities can use straight away, without investing further resources. This is how the digital transformation is taking place at the local level.

3.4   A common project at EU level for local communities

At least 14 Member States expressed their interest in the common European project "setting up a **European Digital Infrastructure Consortium (EDIC)**[171] around the establishment of a **Network of Local Digital Twins** in Europe" that operate between them by joining existing and future digital infrastructures (EU, national, regional and local), **manage data across borders** and **mutualise costs**

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[168] Interoperable Europe Act Proposal (europa.eu)
[169] Proposal for a European Interoperability Framework for Smart Cities and Communities (EIF4SCC) | Shaping Europe's digital future (europa.eu)
[170] The scheme was implemented by Barcelona, Bologna, Brussels, Eindhoven, Mannheim, Rotterdam, and Sofia.
[171] This new instrument was created under the EUR-Lex - 52021PC0574 - EN - EUR-Lex (europa.eu) Regulation.

of investments (EU, national, regional and local as well as from private companies) and **building on Digital Europe Programme enablers**.

The envisaged EDIC of a Network of Local Digital Twins relates to the digitalisation of public services, and it aims **to make cities and communities fit for the digital age and furthermore to become more sustainable, more resilient and a better place for citizens to live and work**. Beyond developing a toolbox for digital twins, this EDIC proposal would seek to establish the **foundations of a European "CitiVerse"**.

Building on **existing developments**, this EDIC proposes to develop a common and open digital infrastructure enabled by interoperability and mutual agreements to avoid further fragmentation of the European digital ecosystem and enable cities (especially cross border) to tackle joint challenges more effectively.

This project can also consolidate the **building blocks for Local Digital Twins** and propose new ones. It can **build and extend DEP building blocks**: EU Smart Cities and Communities dataspace ecosystem; the Testing and Experimentation Facility on SCC; AI solutions; AR/VR/XR visualisation and modelling tools; Digital Innovation Hubs; HPC services; cloud and edge computing usage. It can also extend interoperable software solutions co-created with industry using citizen-friendly and immersive technologies. This EDIC can potentially further extend the capabilities of the European data space for smart communities and generate synergies and resources efficiency enabled by re-using solutions. The public sector would be able to tap into available solutions to support interoperability at all levels.

The EDIC could also serve as **the long-term sustainability mechanism for the EU Toolbox for Local Digital Twins of components, reference architectures, building blocks and models that will be made available to all communities in Europe**. It could host new applications that bring benefit and wealth at the local level. Lastly, the EDIC would facilitate the planned linkage of Local Digital Twins with **DestinE**[6] to address better climate change action. This EDIC could also take on board other digital infrastructures or solutions for the benefits of cities and communities.

4 The external dimension of the Digital Decade

Through EU's international engagement (bilateral, multilateral, multi-stakeholder, standardisation), the EU is proactively projecting our human-centric model, legislative solutions and norms globally, seeking to inspire global partners to align their digital policies with the EU and promote EU interests. By cooperating with advanced partners, we are seeking to enhance our strategic autonomy in the field of emerging technologies such as semiconductors and quantum.

The EU is drawing on a combination of regulatory cooperation, capacity building and skills, investment in international cooperation and research partnerships to provide a competitive offer to our global partners. International cooperation activities are performed across the four cardinal points of the Digital Compass: infrastructures, digital transformation of business, digital transformation of public services and digital skills.

This approach relies on **leveraging international digital partnerships**, building on our strong ties with like-minded partners. It is structured across **three levels:**

1. **Trade and Technology Councils and Digital Partnerships**
2. **Regional Alliances**
3. **Digital Dialogues**

The mobilisation of funding as part of the **Global Gateway** strategy underpins EU action in all these areas , while coherence of our action is ensured in line with the [conclusions of the Foreign Affairs Council of July 2022](#).

Furthermore, engagement in **multilateral fora** and cooperation with **the EU Neighbourhood is prioritised** with a focus on candidate and pre-candidate countries to enhance their alignment to the EU's policy and regulatory agenda.

4.1 Trade and Technology Councils and Digital Partnerships with like-minded countries

Through the **EU-United States Trade and Technology Council (EU-US TTC),** the EU has advanced cooperation in key areas such as emerging technologies, secure and resilient connectivity, protection of human rights and values online and facilitation of trade.

In this framework, a joint Task Force to address open questions on science and technology cooperation in quantum technologies has been established with the aim of seeking to advance a trust-based R&I collaboration based on reciprocal access to respective R&D programs. Cooperation is ongoing on the implementation of the Joint Roadmap on Evaluation and Measurement Tools for Trustworthy AI and Risk Management and on AI for public good, which will seek to make the results of joint R&I cooperation available to third countries to address key societal challenges. Next to this, a joint early warning mechanism for semiconductor supply chain disruptions was established. are also advancing on joint technical specifications on key areas for standardisation work on critical and emerging technologies and will accelerate cooperation to develop a common vision and roadmap on research and development for 6G wireless communication systems.

The first **[EU-India Trade and Technology Council](#)** launched cooperation on microelectronics, Digital Public Infrastructure (DPI), digital skills and talents, high performance computing (HPC) and quantum, AI, and ICT standardisation. This will enable EU companies to gain access to new markets and leverage India's technological expertise.

Over the course of 2022, three **Digital Partnerships** with key East Asian countries: **Japan, the Republic of Korea and Singapore, have been secured.** These Partnerships showcase the EU's strategic engagement in the digital field with a pivotal region of the world. They aim at providing an overall framework for bilateral cooperation on digital policy and regulatory matters such as DFFT, platforms and AI, on our positions on digital matters in international fora and on research and

investment opportunities in cutting-edge technologies such as HPC, semiconductors and 5G/6G. The Partnerships include agreed Digital Trade Principles as key deliverables . Over the next two years, the EU will launch and deliver new joint projects with its partners to reinforce mutual economic resilience, increase the EU's excellence in R&I and boost competitiveness. A key project is to deploy a secure and direct submarine cable between the EU and Japan and the rest of the region through the Arctic. The Council's authorisation in 2023 to open negotiations on binding digital trade agreements with South Korea and with Singapore will also present an opportunity to build on and complement the EU's existing trade relationship with these countries.

With the successful start of the Partnerships in East Asia, our intention is to gradually engage with other like-minded countries. We are currently exploring the possibilities for a digital partnership with **Canada** to be announced at this year at the EU-Canada Summit.

4.2   Regional alliances

An EU-Africa Investment Package was agreed at the EU-Africa Summit in February 2022, including a number of flagships for the digital transition.

An EU-Latin America and Caribbean Digital Alliance was launched in March 2023, providing a forum for regular high-level bi-regional dialogue and cooperation on priority topics, supported by a number of Global Gateway flagship initiatives.

4.3   Digital Dialogues

The EU's international digital partnerships are underpinned by a growing programme of bilateral digital dialogues with key partners around the world.

In the **Latin America and Caribbean** region, bilateral digital policy dialogues have been set up with **Brazil, Argentina and Mexico**, to be complemented with a bi-regional dialogue established under the EU-LAC Digital Alliance. The dialogues aim at promoting the EU's human-centric approach to digital transformation in these countries, covering themes like regulatory convergence with the EU especially on key areas such as digital markets and services as well as artificial intelligence, alignment with EU technical norms and cybersecurity standards, deployment of secure and resilient digital infrastructure (including 5G), stimulation of EU-led value chains for the digital transformation of the economy, the development of digital government, addressing social inclusion through digital, and fostering global secure connectivity.

In **Asia**, the EU has committed to holding a second High Level Dialogue on Digital with **China** in line with the conclusions of the last EU-China Summit of 1 April 2022. The Dialogue could address market access issues in the digital field and both sides' approaches to cutting-edge technologies (e.g., semiconductors, artificial intelligence, 5G/6G), as well as legislation in the fields of cybersecurity and data protection.

In line with the "One China" policy, the EU maintains a Digital Economy Dialogue with **Taiwan** which promotes research cooperation in areas such as semiconductors and 5G/6G, regulatory cooperation in the fields of data, online platforms and AI, and coordination related to Internet Governance.

This programme of policy dialogues is accompanied by a growing offer of digital cooperation initiatives supported by instruments such as NDICI-Global Europe, the Connecting Europe Facility or Horizon Europe, in addition to Team Europe Initiatives gathering the contributions of EU Member States. The release of the Global Gateway Communication in end 2021 marked an important milestone for advancing the Commission's global approach on digital connectivity, leveraging more funds to this end. To foster a Team Europe approach, the Commission and EU Member States joined forces to establish a coordination platform aimed at strengthening the EU global role in

support of a human centric model of digital transformation: the <u>D4D Hub.</u> The results of these efforts are already visible on several flagship initiatives delivered on the ground, including:

- An EU-Africa Global Gateway Investment Package with <u>digital flagships for the digital transition</u>
- An <u>EU-Latin America and Caribbean Digital Alliance</u>
- Digital Economy Packages (DEPs) are to start as of 2024 with a number of developing countries, the first being Nigeria with a robust package. The list of other countries DEPs is subject to decisions during the Mid-Term Review of the NDICI-Global Europe Instrument in 2023 and 2024.

4.4 EU candidate and pre candidate countries

Since the start of Russia's war of aggression against Ukraine, we have substantially stepped up our support for the digital transformation of **Ukraine**, focusing both on emergency and long-term measures:

Emergency measures include:

- Supporting Ukraine's immediate needs for ICT equipment;
- Securing affordable or free roaming and international calls for Ukrainian refugees in Europe;
- Facilitating the recognition of the refugees' electronic credentials in EU Member States;
- Coordinating EU Member States' efforts aimed to enhance Ukraine's cyber resilience;
- Fighting war-related disinformation.

Long-term cooperation focuses on:

- A long-term roaming arrangement with Ukraine;
- Bilateral recognition of electronic trust services and electronic identities between the EU and Ukraine;
- Ukraine's participation in BEREC (completed in June 2022);
- Ukraine's association to the Digital Europe Programme (completed in September 2022);
- Ukraine's association in the Connecting Europe Facility (CEF) - Digital programme (ongoing).

Moreover, the EU has been facilitating a voluntary roaming agreement (a Joint Statement) between EU and Ukrainian operators. Thanks to this agreement, around 4.5 million Ukrainians enjoy roaming in Europe since the start of the war and can call back home at affordable rates or by using free mobile internet. In parallel, the EU has been working towards a long-term roaming arrangement with Ukraine through the EU-Ukraine Association Agreement. A similar approach for roaming is being followed with Moldova, where efforts towards a long-term arrangement through the EU-Moldova Association Agreement are to be complemented by short-to-medium term voluntary agreements between operators on both sides.

In the **Western Balkans, the EU** agenda of approximation to the EU policy framework and 'acquis' for Albania, Bosnia and Herzegovina, Kosovo*, Montenegro, North Macedonia and Serbia remains valid, supporting the yearly negotiations of Chapter 10 (Information Society and Media) of the Stabilisation and Association Agreements. While the transposition of EU 'acquis' into national laws is advancing, albeit unevenly, the economies in the region face several challenges for which EU support should continue. This includes support to the development of reliable and high-speed digital infrastructure, digital skills, and alignment with EU digital legislation.

In June 2022, the Commission held its first Regulatory Dialogue with the Western Balkans. The Dialogue touched upon a broad range of regulatory reforms and policy developments, including the European Electronic Communications Code, Broadband Cost Reduction Directive, developments in 5G, the EU Cybersecurity Act, the NIS Directive and the 5G toolbox, DSA and DMA, the Data Governance Act and Data Act and the European Digital Identity. As stated in the 5th WB Digital Summit in October 2022, Pristina: "(The Western Balkans) appreciate the launch of the Regulatory Dialogue between the EU and Western Balkans, agree to work on efficient enforcement of the relevant EU acquis and priority legislative reforms, and reiterate the importance of the European Commission's support to transformative policies and green transition goals". The 2nd edition of the Dialogue has taken place on 30 June 2023, with discussions on free flow of data, interoperability and cybersecurity.

On roaming, a Joint Declaration on the Reduction of Roaming charges for a first reduction in data consumption was signed by 38 major EU and Western Balkans operators at the EU-Western Balkans Summit on 6 December 2022 in Tirana. Through their voluntary agreement, the operators committed to significantly reducing the gap between roaming and domestic fees for data usage in both directions between the EU and the Western Balkans. Maximum retail price levels ('price caps') for 1 gigabyte will decrease from October 2023 to 2028 as follows: EUR 18 from 1 October 2023, EUR 14 from 2026, and EUR 9 from 2028. Yearly reviews are foreseen to assess impacts and next steps.

In terms of financing, the project **EU4Digital - An accelerated digital transition for the Western Balkans (WB)**, currently in preparation under the Instrument of Pre-Accession (IPA) III Programming Framework, is structured in line with cardinal points of the Digital Decade: (1) Secure and sustainable digital and telecom infrastructure in across the region, (2) Enhancing interoperability of public services on the national and/or regional levels, and between the Western Balkans and the EU, (3) Digitalisation of businesses in the Western Balkans, (4) Development of digital skills. The proposed activities provide a framework for the development of regional and/or bilateral pilots, which can be scaled up at a later stage. Activities and pilots will respond to the needs, interests and the state of play/progress of different partners in the region, building on already existing EU/WB best practices. In addition, the Digital Europe legal act allows for third countries' participation in the programme through association. To date, Ukraine, Albania, North Macedonia, Serbia, Montenegro and Türkiye have signed agreements associating them to the programme.

4.5 Multilateral cooperation

In 2022, the EU made significant progress on the promotion of the EU digital agenda at the **Düsseldorf G7** and at the **G20 Bali Digital Ministers meetings**. For example, on the Data Free Flows with Trust agenda, the G7 agreed on an action plan (with a specific focus on EU legal instruments used to transfer data with protection). G7 also started the Hiroshima process on AI recommendations. In the G20, countries recognised that regulations around the world are converging to protect data around common principles. The G20 Indian presidency on 2023 put an important emphasis on Data for Development and referencing AI for development too.
G7 also started the Hiroshima process on AI recommendations. In the G20, countries recognised that regulations around the world are converging to protect data around common principles. The G20 Indian presidency on 2023 put a huge emphasis on Data for Development and referencing AI for development too.

In the **OECD,** the EU brought to conclusion the discussions on the first-ever international instrument setting out principles in the area of surveillance, the Declaration on Government Access to Personal Data held by Private Sector Entities. OECD also adopted the 'OECD AI principles' and 28 OECD countrie OECD's Global Partnership on AI (GPAI).

In the **UN context**, the EU submitted a contribution to the **Global Digital Compact** in an EU single adopted document in line with the European Declaration on Digital Rights and Principles and the human rights conventions, covenants and treaties. From January to June 2023, the UN GDC has undergone a series of Member States and Stakeholders consultations in which the EU has actively participated. The consultations ("deep dives") touched upon all the thematic areas of the Global Digital Compact. The UN GDC is to be delivered by September 2024.

On **Internet Governance**, the EU is committed to promote its human-centric vision and interests in global multi-stakeholder institutions, including standardisation bodies. This encompasses concrete policies related to internet openness and security, as well as setting the global internet policy agenda. For example, we held a high-level event on the international impact of EU digital regulations in the 2022 UN's Internet Governance Forum in Ethiopia. Moreover, the EU promoted the open Internet and its multi-stakeholder model through different actions, including by putting forward, together with like-minded partners, the [Declaration for the Future of the Internet.](#)

4.6   Global Gateway

The [Global Gateway](#) strategy includes digital connectivity as one of five priority sectors for action.

To foster a Team Europe approach, the Commission and EU Member States joined forces to establish a coordination platform aimed at strengthening the EU global role in support of a human centric model of digital transformation: the [D4D Hub.](#) The results of these efforts are already visible on several flagship initiatives delivered on the ground.

To structure and prioritise future investments under the Global Gateway strategy, the Commission is developing a Digital Connectivity Masterplan.

At global level, the Commission is working to reinforce the European backbone infrastructure and connectivity of EU territories notably with likeminded third countries, using a global and secure network of submarine cables to support the EU's digital resilience and reduce dependencies by means of promoting international route diversification.

4.7   Digital Diplomacy

As tech and digital policy becomes an increasing factor in the common foreign & security policy, the Foreign Affairs Council tasked the HRVP, the Commission & the EU Member States to ensure that **digital diplomacy becomes a core component and an integral part of the EU external action** and is closely coordinated with other EU external policies on cyber and countering hybrid threats, including foreign information manipulation and interference.

The Foreign Affairs Council adopted Conclusions on Digital Diplomacy in July 2023 that focus on a number of priority actions that aim to leverage our role in global digital affairs and take EU digital diplomacy to the next level. The EU will therefore develop further its influence in global digital governance. The EU's objective is to safeguard and improve the current multistakeholder model of internet governance and avoid a fragmented Internet - with a human-centric model on one side and a competing model with a state-controlled architecture of the Internet on the other. They will build a more convincing digital offer towards partner countries through Global Gateway and by supplying trusted digital connectivity. Thirdly, the EU will work to strengthen its role as a shaper of the global digital rulebook. This can happen via strengthening cooperation in relevant multilateral and multistakeholder fora, including the WTO, and specific bilateral partnerships and working with likeminded partners on the emerging technologies. It can also happen more generally through the EU's measures- Digital Services Act, Digital Markets Act, Data Act or the Artificial Intelligence Act- that strengthen the Union's position in global discussions on digital issues and can pave the way to converging rules globally.

5   Delivering the Digital Decade with EU investments

5.1   EU funding programmes contributing to the Digital Decade

While the Digital Decade Policy Programme has only entered into force recently, several EU funding programmes are expected to support, to various extents, the Digital Decade. The largest investments supporting are undertaken in the framework of the Recovery and Resilience Facility, with an estimated contribution of EUR 117 billion[172], and Cohesion Policy 2021-2028, with an estimated contribution of EUR 26 billion to the Digital Decade targets. In addition, Horizon Europe (HE) provides a EUR 6 billion estimated support for some of the Digital Decade targets, in particular promoting innovation and technological advancement across various sectors. Furthermore, the Connecting Europe Facility (CEF2) - Digital and the Digital Europe Programme (DEP), are estimated to contribute with EUR 1.3 billion and EUR 1.6 billion respectively.

The graph and table below[173] also take into account the estimated contributions of two programmes from the previous programming period, for which several projects are for the moment still ongoing: the European Structural and Investment Funds 2014-2020 with an estimated contribution of EUR 10 billion and the H2020 programme, with an estimated contribution of EUR 3 billion.

*Figure 7 - **DD relevant budget** (in billion EUR) by funding instrument*
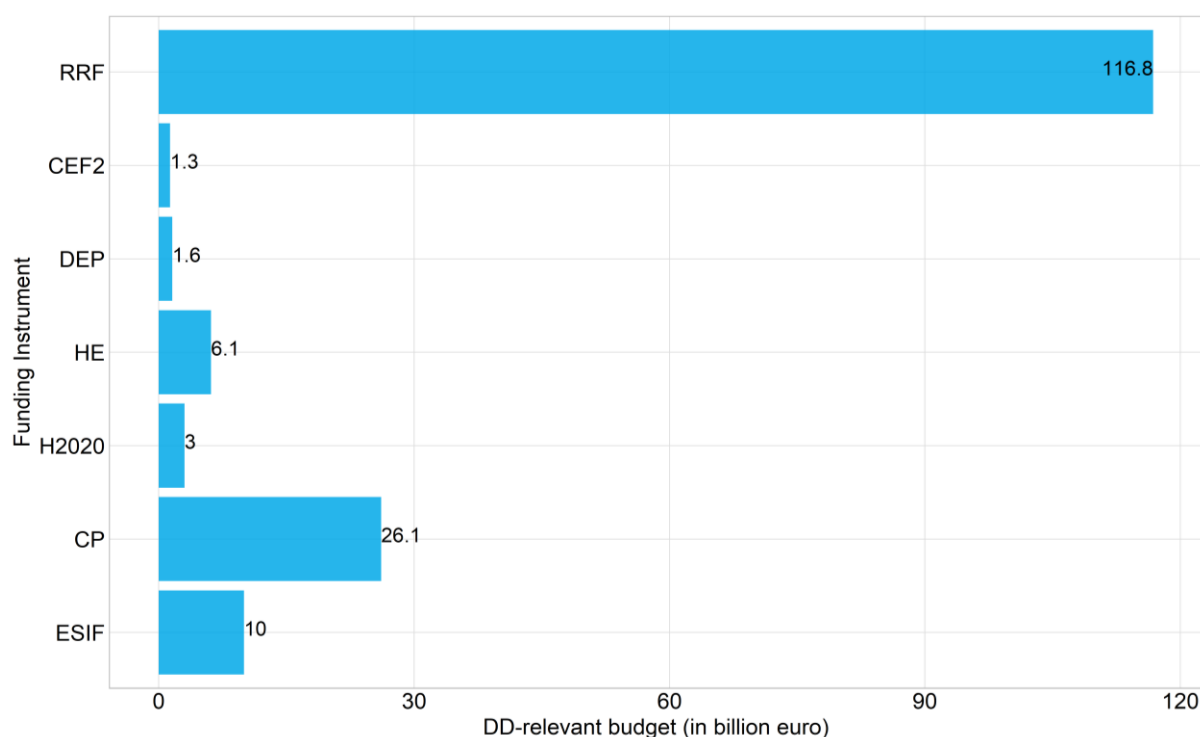
Source : JRC report (Papazoglou et al., 2023)

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[172] This figure represents an estimate based on the mapping of the measures of the Recovery and Resilience Plans expected to contribute directly to the Digital Decade targets (JRC report, Papazoglou M., Torrecillas J., Cardona M., Calza E., Vázquez-Prada Baillet M., Righi R., *Mapping EU level funding instruments to Digital Decade targets. Application to main digital instruments in 2014-2027*, López Cobo, M. and De Prato, G. editors, Publications Office of the European Union, Luxembourg, 2023, doi:10.2760/986930, JRC134647, https://publications.jrc.ec.europa.eu/repository/handle/JRC134647). Therefore, this figure is based on, but not identical to the amount that Member States have dedicated to the digital transformation in accordance with Annex VII of the Recovery and Resilience Regulation (reported in the next chapter).

[173] As above.

*Figure 8 - **DD relevant budget** (percentage %) **by cardinal point***
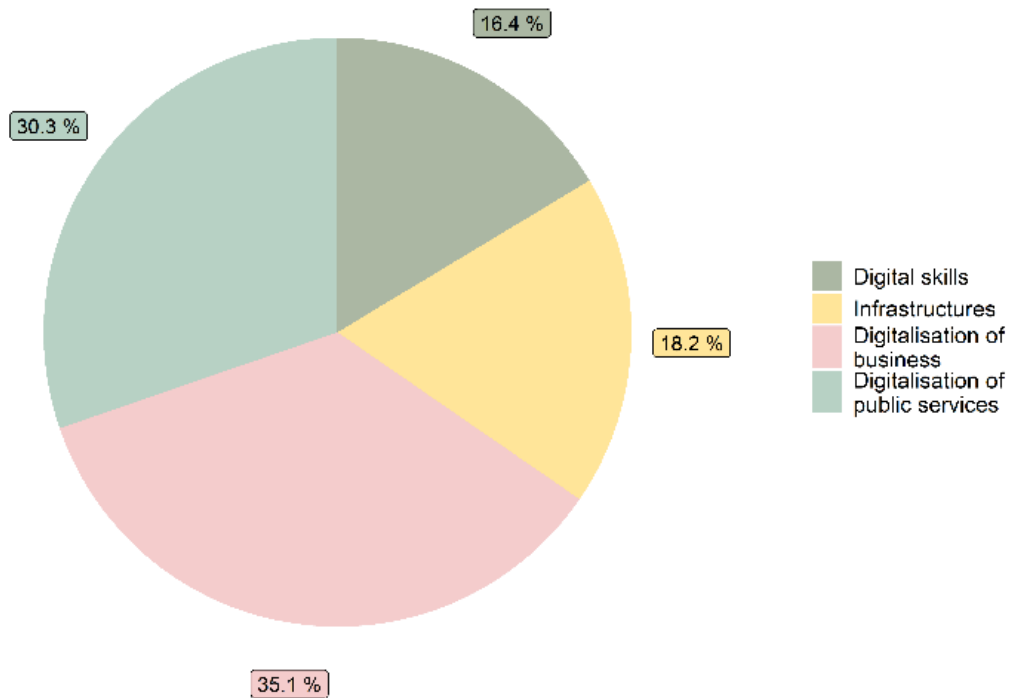
Source: JRC calculations

As shown in figure 8, the allocation to each cardinal point varies in percentage. The digital transformation of businesses and the digitalisation of public services are estimated to receive the highest amounts of this funding, with 35% and 30% of the budget respectively. Secure and sustainable digital infrastructures follow with 18% of the budget, while digital skills account for 16%.

Going into more detail, table 1 presents the estimated split of this funding per Digital Decade target. It shows that the Digital Public Services target potentially receives the highest allocation of funding among all Digital Decade targets, with a budget of EUR 34 billion. Gigabit network coverage also benefits from an important allocation of EUR 17 billion, out of the total budget of EUR 30 billion dedicated to digital infrastructure. Regarding the Digital transformation of businesses, EUR 18 billion are dedicated to the digital late adopters' target. Furthermore, EUR 17 billion is estimated to be allocated to the unicorns' target. Finally, investments in digital skills development are also important, estimated at EUR 16 billion for basic skills and EUR 11 billion for ICT specialists.

Table 1 - **Summary table of investment funds by DD target** *(in EUR million)*

		Funding instrument						
		RRF	**CEF2 Digital**	**DEP**	**H2020**	**HE**	**CP**	**ESIF**
TOTAL DD-relevant budget	**165 011.04**	**116 797.29**	**1 323.20**	**1 585.55**	**3 034.38**	**6 146.46**	**26 112.63**	**10 011.54**
Basic digital skills	**15 931.67**	13 797.82	0.00	40.07	94.09	44.75	864.17	1 090.76
ICT Specialists	**11 107.81**	9 171.58	0.00	224.65	72.55	223.05	576.12	839.86
Gigabit network coverage	**17 114.97**	12 963.94	160.16	0.80	0.00	0.11	2 164.23	1 825.73
5G coverage	**5 998.16**	3 470.86	969.70	0.80	780.16	396.13	114.83	265.68
Semiconductors	**3 919.91**	2 950.00	0.00	10.51	172.15	688.41	0.00	98.83
Edge	**654.88**	0.00	43.16	134.41	46.51	331.98	0.00	98.83
Quantum computing	**2 355.56**	846.08	90.00	176.23	517.29	627.14	0.00	98.83
Cloud computing services	**7 685.03**	5 077.61	60.18	118.15	166.78	434.73	1 549.98	277.60
Big data	**6 921.32**	3 866.61	0.00	32.85	179.12	1 015.15	1 549.98	277.60
Artificial intelligence	**8 451.99**	4 376.00	0.00	243.80	346.03	1 658.58	1 549.98	277.60
Digital late adopters	**17 866.22**	11 599.84	0.00	197.64	250.29	341.39	4 649.94	827.12
Innovative businesses/ scale-ups	**17 029.58**	11 603.65	0.00	59.52	290.45	183.37	4 649.94	242.65
Digital public services	**33 534.04**	23 446.73	0.00	180.72	90.68	6.33	7 214.61	2 594.97
Electronic health records	**15 495.50**	13 110.35	0.00	87.13	28.28	185.86	1 228.84	855.04
eID	**944.40**	516.21	0.00	78.27	0.00	9.46	0.00	340.45

Source: JRC report (Papazoglou et al., 2023).

Notes:

- CP's data extraction date: 27 March 2023.

- DEP budget includes Main WP 21-22, Cybersecurity WP 21-22, EDIHs WP 21-23.

- HE budget includes WP21-22, WP23-24, Joint Undertakings, and European Innovation Council. It does not include European Research Council.

- RRF's data extraction date: 1 September 2023.

- H2020's data update: 2 June 2023.- Funds not included in the table: Joint Undertakings (work in progress), EIC (work in progress), ERC (to be mapped for a future update).

Table 1 depicts the funding distribution across various instruments and Digital Decade targets. The Recovery and Resilience Facility (RRF) emerges as the primary contributor to the majority of the Digital Decades targets, expected to provide substantial support. For example, it accounts for 87% of the allocation for Basic Digital Skills, 83% of the allocation or ICT Specialists, and 70% of the allocation for Digital Public Services.

*Figure 9 - **DD relevant budget by DD target***

(a) In billion €
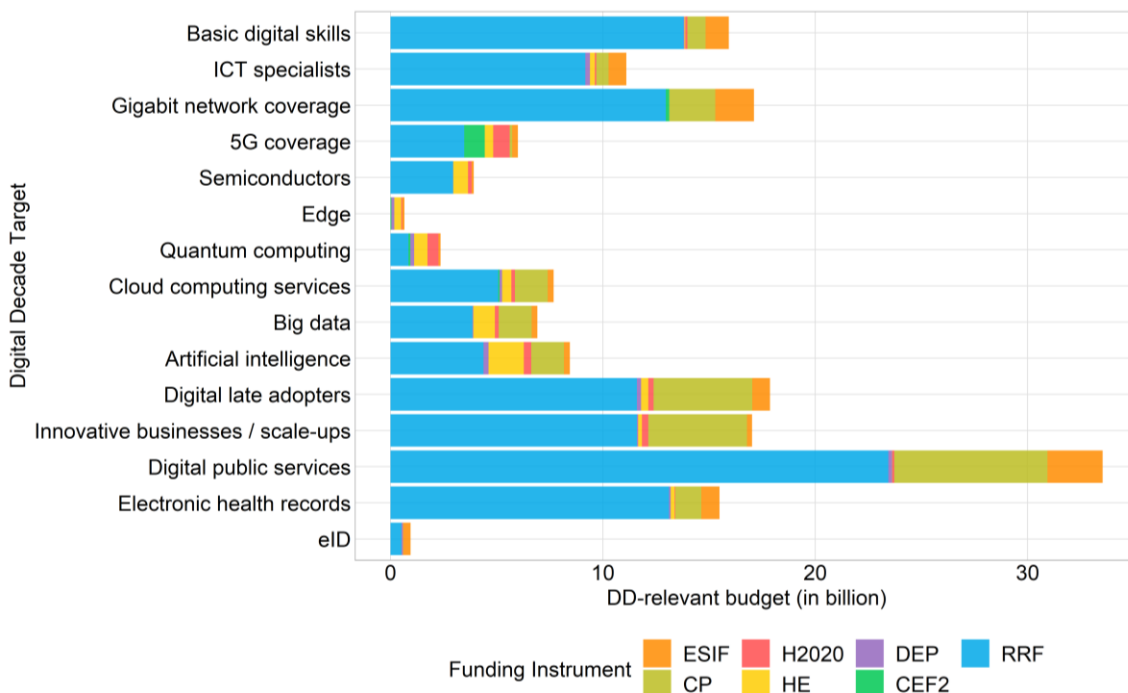
(b) In percentage
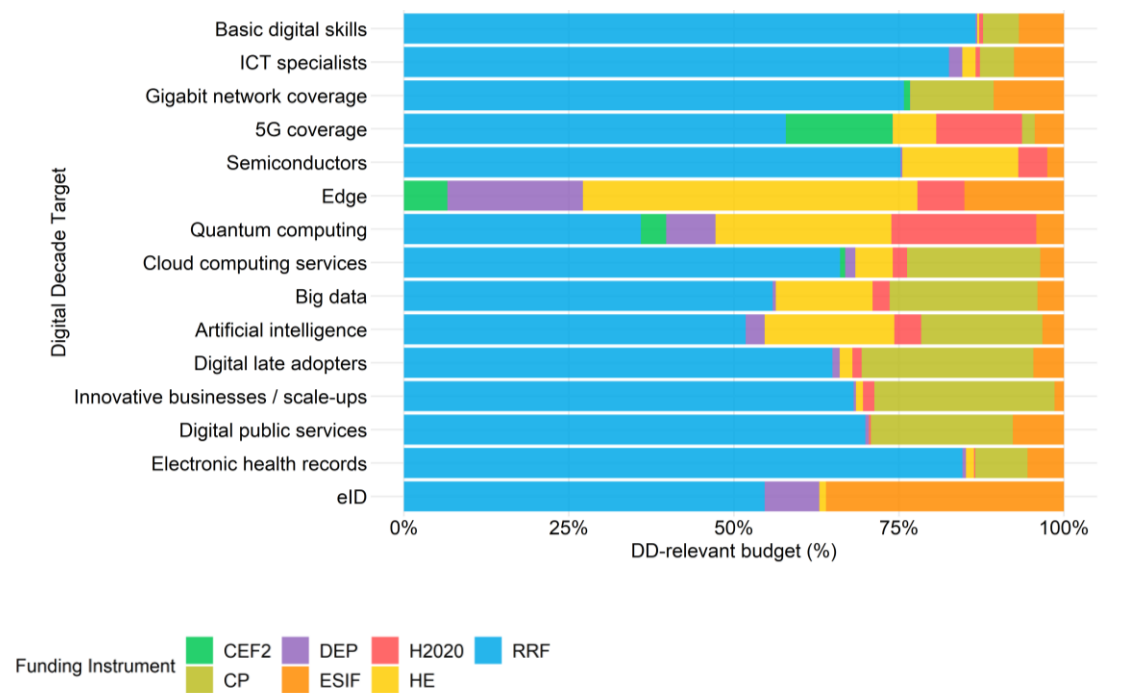
Source : JRC report (Papazoglou et al., 2023)

As figure 9 (b) shows, other programmes besides the RRF have a high relevance for more innovative, cutting-edge targets. For example, by contributing a substantial share (16%) to the 5G target, Connecting Europe Facility 2 (CEF2) plays a significant role in advancing Europe's digital infrastructure. The Digital Europe Programme (DEP) makes important contributions to the edge computing target (21% of the total budget). Horizon 2020 (H2020) and Horizon Europe (HE) make significant contributions to research and innovation-focused Digital Decade targets, such as the quantum target (49%).

However, figure 9 (a) shows that the funding dedicated to more innovative, cutting-edge technologies, such as 5G, AI, semi-conductors, edge, quantum, and big data is rather modest in absolute terms, in particular when compared to the other headings, and when put in the perspective of the ambition of the respective 2030 targets. Joint investment in the form of multi-country projects for these targets is therefore critical.

5.2   Focus: the RRF contribution to the Digital Decade

As illustrated above, the RRF is the largest contributor to the Digital Decade targets. In accordance with the legal framework, each Member State was required to dedicate at least 20% of its recovery and resilience plan's total allocation to measures contributing to the digital transition or to addressing the challenges resulting from it. Member States have so far committed about EUR 130 billion for digital expenditure, amounting to 26% of the RRF as a whole, well over the 20% target established by the RRF Regulation, with some Member States such as Germany having dedicated over 50% of their plans to digital transformation.

The figure below represents the split of the digital budgets of the RRF plans in accordance with the digital tagging methodology established in Annex VII of the RRF Regulation. This categorisation of measures allowed for a more refined analysis of the contribution of the RRF to the Digital Decade targets, as compared to that undertaken for the other EU instruments.

*Figure 10 - **Split of the RRF digital budget per priority area**, in accordance with Annex VII of the RRF Regulation*
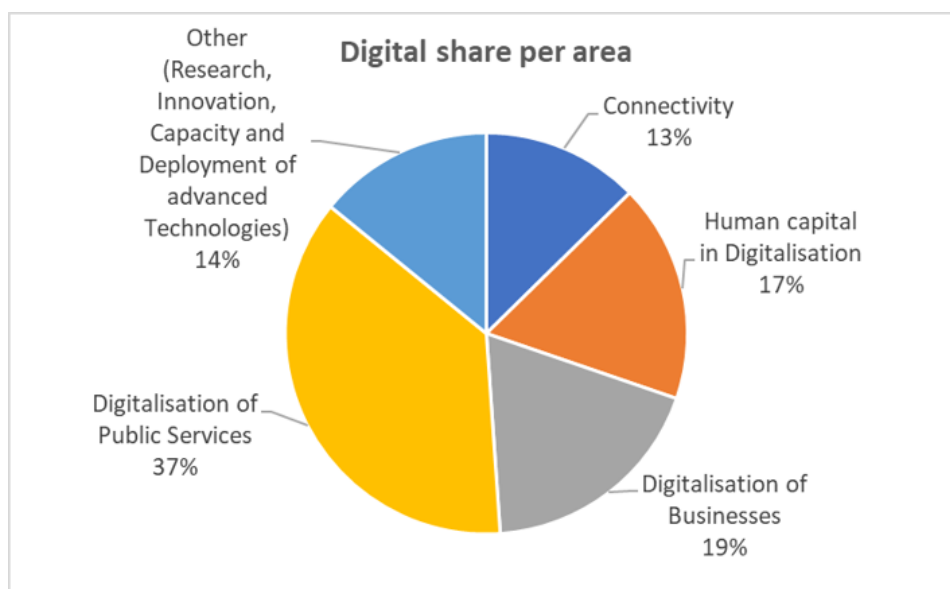
Figure 11 depicts the absolute figures (EUR million) of the Digital Decade relevant RRF budget allocation to each Member State. It is evident that certain Member States receiving a larger share of the overall RRF funding will also make the highest contributions to digital (e.g., Italy EUR 42 billion, Spain EUR 19 billion, and France EUR 8 billion). However, as noted before, certain Member

States chose to dedicate important parts of their RRPs to digital, beyond the legal requirement, e.g. Germany (51%), Hungary, Lithuania and Ireland each above 30%.

*Figure 11 - 2**DD relevant RRF budget** (in million €) **by cardinal point***
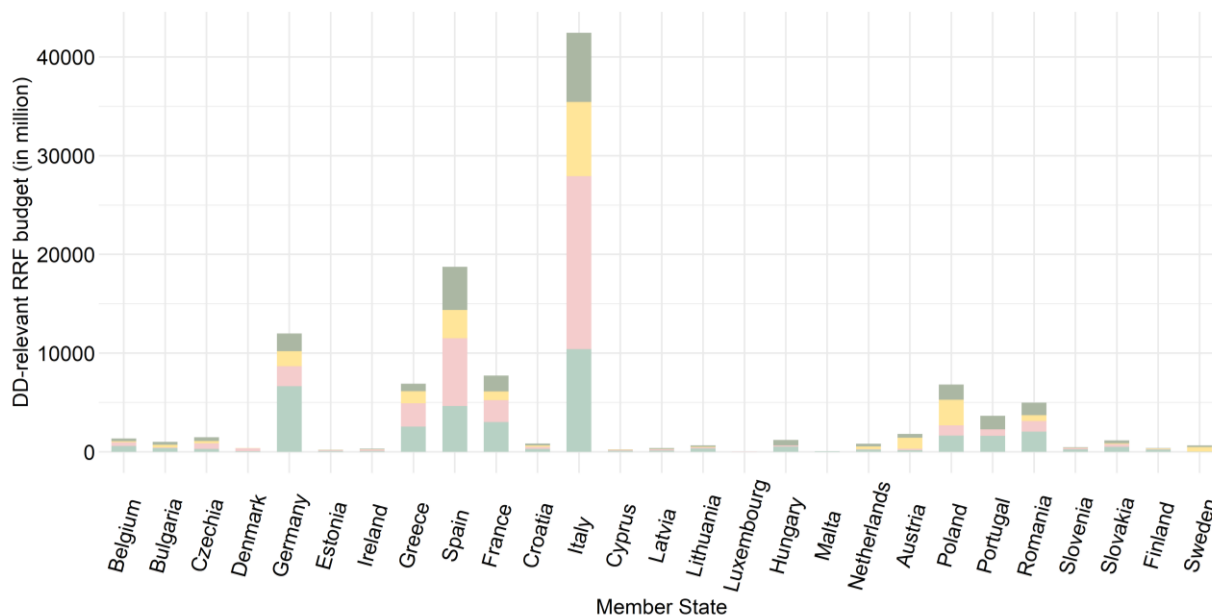
Source : JRC report (Papazoglou et al., 2023)

Comparing these shares of funding with the GDP (PPP) of each MS, it further underlines the importance of the Recovery and Resilience Facility (RRF) in supporting digital transformation and the achievement of the Digital Decade targets across the EU, particularly in countries with smaller economies. Notably, Greece (4.09%), Italy (3.48%) and Spain (2.22%) will receive a significant proportion of their GDP (PPP) towards investments relevant for the Digital Decade targets, indicating a strong support of the RRF to achieving the Digital Decade targets.

*Figure 12 -3 **DD relevant RRF budget** (as share of GDP) **by cardinal point***
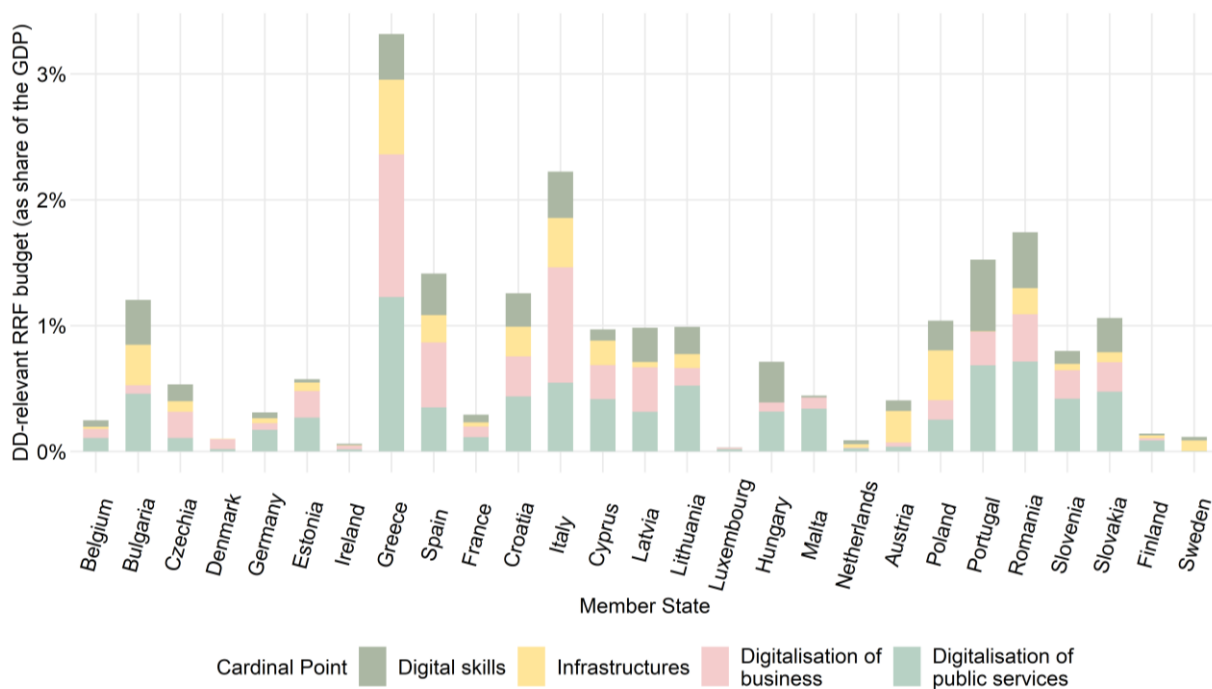
Source : JRC report (Papazoglou et al., 2023)

5.3 Investments needed to achieve Digital Decade targets

Increasing public and private investment in digital technologies, including innovative ICTs, will be an important part of the solution for the EU to reach targets. The **Recovery and Resilience Facility** and the **Digital Europe Programme** provide an important step-up by providing funding for investments in digital technologies. Targeted research and innovation efforts such as those under **Horizon Europe** and the **European Defence Fund** are also key in addressing the EU's R&I gap in comparison with its global competitors and thereby reducing strategic dependencies. However, the assessment of progress under the Digital Decade shows that there are still serious investment gaps that will have to be addressed.

A forthcoming **international benchmarking of private investments in Digital Decade thematic areas**[174] reports that **the EU presents lower levels of investments than the US and China in various digital sectors**, particularly in fixed broadband coverage, 5G, and semiconductors. The EU faces investment shortages in the adoption of cloud computing, big data, and AI, with Chinese firms showing substantial investments and revenues in these areas. These results suggest that **increased investments and support to enhance the EU's digital competitiveness are needed** in order to achieve the objectives of the Digital Decade Policy Programme.

The number of ICT specialists employed in the EU has been growing in the last few years and so has the number of companies operating in the ICT sector. In 2022, 62.8% of companies looking for ICT specialists reported difficulties in recruiting them[175], with SMEs struggling more often in filling ICT vacancies. New technologies require an increasingly experienced workforce in the ICT sector. **Without a firm command of advanced digital skills, there is no way to propel innovation and remain competitive**[176]. For this reason, **ICT specialists should be considered as an essential element of the supply chain underlying not only the digital ecosystem but the EU evermore digitalised economy as a whole**. The shortage of ICT specialists will require massive investment by the public and private sectors that should occur in parallel to the necessary reforms in Member States to promote specialisation and employment in this field. while the number of ICT specialists employed in the EU has been growing in the last few years, so has the number of companies operating in the ICT sector.

By 2030 all European households should be served by a Gigabit network, and all populated areas covered by next generation wireless high-speed networks offering performance at least equivalent to that of 5G. Achieving these goal **will require substantial investments** from the private sector, as well as support from public funding including from EU programmes such as CEF Digital and the RRF. The study, based on the WIK-Consult's cost and viability model, estimates that around **EUR 114 billion** in investment will be required to achieve the fixed Gigabit coverage goal using Fibre-to-the-Premise (FTTP). **EUR 33.5 billion** is estimated to be needed for the provision of "**full 5G service**" (with additional base stations and small cells, mostly for the mid or high 5G bands). The resulting total investment needs to reach the current Digital Decade targets is about **EUR 148 billion** in investment, with an addition of between **EUR 26 billion and EUR 79 billion** depending on the deployment mode, for the main transport paths. This makes the **overall investment gap reach at least EUR 174 billion,** including the public funds that may be required, but more likely beyond EUR 200 billion depending on the options considered**.** It is important to note that, as 2030 approaches,

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[174] Torrecillas, J., Papazoglou, M., Calza, E., Cardona, M., Vázquez Prada-Baillet, M International benchmarking of private investments in Digital Decade thematic areas, López Cobo, M. and De Prato, G. editors, Publications Office of the European Union, Luxembourg, 2023, doi:10.2760/359158, JRC134743 (https://publications.jrc.ec.europa.eu/repository/handle/JRC134743).

[175] ICT specialists - statistics on hard-to-fill vacancies in enterprises - Statistics Explained (europa.eu)

[176] OECD (2019): OECD Economic Outlook, Digitalisation, and productivity: A story of complementarities, OECD Economic Outlook, Volume 2019 Issue 1 | OECD iLibrary (oecd-ilibrary.org).

the more intense, industrial use of connectivity for internet 4.0 scenarios, and the increasing security requirements, are likely to push the investment needs much higher[177]. Strengthening Europe's global partnerships and boosting strategic investment in international connectivity networks is among the objectives of the Digital Decade. Reinforcing connections between Europe and its global partners will promote European norms and standards and help shape global solutions. Across the world, the **Global Gateway** aims to mobilise up to EUR 300 billion in investments between 2021 and 2027 with a mix of grants, concessional loans and guarantees to de-risk private sector investments.

Semiconductors are at the centre of strong geostrategic interests, and of the global technological race. For this reason, the Commission proposed the **European Chips Act**, which strengthens European competitiveness and resilience in this strategic sector. To respond to critical dependencies, the European Chips Act will strengthen manufacturing activities in the Union, stimulate the European design ecosystem, and support scale-up and innovation across the whole value chain. Through the European Chips Act, the European Union aims to reach its target to **double its current global market share to 20% in 2030**. The **Chips for Europe Initiative** will combine investments from the Union, Member States and the private sector, through a strategic reorientation of the Key Digital Technologies Joint Undertaking (renamed 'Chips Joint Undertaking'). The Initiative will be supported by EUR 6.2 billion of public funds, of which EUR 3.3 billion from the EU budget agreed for the period until 2027. This support will come in addition to EUR 2.6 billion public funding already foreseen for semiconductor technologies. The EUR 6.2 billion will support activities, such as the development of a design platform and setting up of pilot lines to accelerate innovation and production. The Initiative will also help the establishment of competence centres, located across Europe, which will provide access to technical expertise and experimentation, helping companies, SMEs in particular, to improve design capabilities and developing skills. Together with design centres of excellence, they will become poles of attraction for innovation and for new talent. Moreover, to support start-ups and SMEs, access to finance will be ensured through a **Chips Fund** and a dedicated **semiconductor equity investment facility established under InvestEU**. In addition to the Chips for Europe Initiative, the second pillar of the European Chips Act will incentivise public and private investments in manufacturing facilities for chipmakers and their suppliers. This will contribute to the **overall public investments in the sector estimated at EUR 43 billion**. Since the proposal for a European Chips Act, together with the second **Important Project of Common European Interest in microelectronics** currently under assessment, which involves 20 Member States and dozens of participants, investment plans towards industrial deployment have reached EUR 90 - 100 billion. The adoption of the European Chips Act will allow a faster realisation of those projects and further progress in attracting investment to secure Europe's supply chain in semiconductors.

The European Alliance for Industrial Data, Edge, and Cloud[178] has projected the **required investment until 2025 to reach EUR 6.4 billion**, which breaks down to EUR 2.9 billion for cloud infrastructures, EUR 2.1 billion for near edge installations, and EUR 1.4 billion for far edge devices. For a thorough understanding of the costs associated with the deployment of Edge nodes by 2030, it is also required to incorporate the costs connected with on-premises Edge computing installations, expenses related to management software platforms and climate neutrality and sustainability features as well as the extrapolation of overall expenditures to 2030.

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[177] Investment and funding needs for the Digital Decade connectivity targets | Shaping Europe's digital future (europa.eu)

[178] European industrial technology roadmap for the next generation cloud-edge offering (May 2021), https://ec.europa.eu/newsroom/repository/document/2021-18/European_CloudEdge_Technology_Investment_Roadmap_for_publication_pMdz85DSw6nqPppq8hE9S9RbB8_76223.pdf

Quantum is one of the most promising industries of the future, with a huge strategic value. The quantum technology industry has a projected market size of USD 106 billion in 2040 and a potential economic value from quantum computing only of between USD 620 billion and USD 1,270 billion across four industries by 2035: chemicals, life sciences, finance and automotive[179]. The EU has already secured the budget for the EU to have its **first computer with quantum acceleration** by 2024, together with the **EUR 0.6 billion for a number of R&D calls**[180]. The EU is currently standing at the leading edge of the quantum industry, yet its position is under threat. In the quantum technology, the US leads in venture capital investments, followed by the UK and the EU in third place. Asian countries show very low venture capital funding, which may indicate an underestimate due to Crunchbase's delay in capturing Asian firms active in very new technologies.[181] The EU's quantum strengths lie in a vibrant ecosystem of research organisations and start-ups that are likely to become EU's future quantum technology giants. However, the success of the EU start-ups and scale-ups developing these assets relies heavily upon their access to capital. Adequate financial resources will therefore be needed for the EU to surpass competitors and become the leader in quantum technologies.

Europe wide benchmarking[182] also points to serious investment gaps in the adoption of innovative digital solutions across all public services (e.g., AI, big data, robotics, etc). While the roll-out of basic digital public services is progressing steadily (e.g., access to online forms, online appointment booking, etc.), the availability of more advanced public services that make use of innovative digital technologies still requires significant procurement investments. Overcoming this gap in innovation procurement of ICT-based solutions requires dedicating an additional **EUR 177 billion** of public procurement budgets across the EU to innovative digital solutions[183].

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[179] Quantum technology encompasses the three subfields of computing, communication and sensing.
[180] This includes the following calls:
- Integration of quantum computing and classical computing (HPC, Cloud) - EUR 40 million
- Error correction and fault tolerant quantum computing & simulation - EUR 25 million
- Quantum computing and simulation applications addressing practical problems - EUR 15 million
- Benchmarking, certification, and standardisation on quantum technologies - EUR 10 million
- Development quantum computing technology-agnostic software stack - EUR 25 million
- Projects for developing quantum computing hardware - EUR 150 million (FPAs x 4 and launch calls for alternative quantum computing and simulation).

[181] Torrecillas, J., Papazoglou, M., Calza, E., Cardona, M., Vázquez Prada-Baillet, M International benchmarking of private investments in Digital Decade thematic areas, López Cobo, M. and De Prato, G. editors, Publications Office of the European Union, Luxembourg, 2023, doi:10.2760/359158, JRC134743 (https://publications.jrc.ec.europa.eu/repository/handle/JRC134743)

[182] Benchmarking of innovation procurement investments and policy frameworks across Europe | Shaping Europe's digital future (europa.eu)

[183] Benchmarking of innovation procurement investments and policy frameworks across Europe | Shaping Europe's digital future (europa.eu). The benchmarking went through all published public procurements in the EU and measured how much public procurement budget is spent in each country on buying innovative digital solutions across all the key sectors in which the public sector is active (e.g., public administration, health, transport, education, culture, energy, environment, security, defence, construction, water). Innovative solution and ICT are based on the OECD definition and the corresponding definitions in the EU public procurement directives. Innovative solutions include both product innovation (i.e. introduction of a new good/service, also including works such as building and construction works), process innovation (i.e. implementation of new or significantly improved production or delivery method), marketing innovation (i.e. a new method to introduce an innovation into the market) and organisational innovation (i.e. an innovation in workplace organisation, business practices or external relations) ICT covers all types of ICT sectors (both in the areas of telecoms, IT hardware and software and digital content) for all types of digital solutions (including all the key innovative ICT technologies that the Digital Decade seeks to deploy such as AI, robotics, smart cloud, HPC, blockchain, virtual worlds).

6 Delivering the Digital Decade through policies

The table below provides an overview of actions taken since 2020 to implement the EU's digital strategy. It summarises key achievements contributing to the three overarching areas covered by the Digital Decade targets and objectives: (i) fostering a sovereign and competitive Europe, (ii) empowering people and society, and (iii) contributing to the green transition. The fourth column further specifies the contribution of a given action to the Digital Decade, distinguishing between contributions to general objectives, cardinal points and targets, as well as Multi-Country Projects (MCPs).

Action item	Short description & next steps	DDPP relevance General objective /Cardinal points -target - MCPs
Fostering a sovereign and competitive Europe		
Cutting-edge digital capacities		
Building and deploying **cutting-edge joint digital capacities** in the following areas:	The following rows refer to the categories listed in the 2020 Communication. In addition to the areas where cutting-edge digital capacities are being built and deployed. The work on **semiconductors** is ongoing: • In **February 2022**, the **European Chips Act** proposal was adopted; a political agreement was reached on 18 April 2023, adoption of the final text is expected to take place in Q3 2023.	• Objective: Sovereignty, resilience • Infrastructure, Target on Semi-processors
• AI	• In **January 2023**, **Testing and Experimentation Facilities** (*TEF*) in AI and robotics were launched for the healthcare, agri-food, smart cities, and communities and manufacturing sectors (total cost of EUR 220 million). • Networks of **excellence centres** and **European Digital Innovation Hubs** (DIHs) in AI and robotics are being created. • An **AI-on-demand platform** is supported by several projects (under Horizon 2020, Horizon Europe, and the Digital Europe Programme) that create a single access point to trustworthy AI resources, supporting the development and deployment of AI.	• Target on Digitalisation of business and public services • MCPs
• Cyber	• European **network of Security Operations Centres (*SOCs*)** is being set up both via a call for expression of interest for Member States to join cross border SOCs and calls for grants	• Objective: Cyber, resilience

	to support the capacity building of SOCs, as well as via the upcoming Cyber Solidarity Act.	
• Super- and quantum computing	• Two EuroHPC supercomputers were inaugurated in 2022 and are in the top five supercomputers worldwide. In June 2023, the EuroHPC JU signed hosting agreements for another six quantum computers. • Significant progress in **quantum technologies flagship projects**. A report summarising the main project results from the ramp-up phase of the Quantum Flagship (2018-2021) is available [here]().	• Infrastructure/Target on quantum • MCP
• Quantum communicatio n	• Deployment of the national **EUROQCI networks** started (secure quantum communication infrastructure spanning the whole EU, including its overseas territories). 26 projects were selected by the end of 2022 to foster the growth of a European quantum communication ecosystem and to develop the national quantum communication networks.	• Infrastructure/Target on quantum • MCPs
• Blockchain	• The **European Blockchain Service Infrastructure** (*EBSI*) is piloting several use cases and mobilises an increasing number of actors. • Digital Europe funded projects were launched in May 2023.	• Digitalisation of public services • MCPs/EDICs
European Strategies on Quantum and blockchain (Q2 2020)	European **Blockchain Strategy [published]()** in **January 2021** (potentially to be updated in 2023/24).	• Digitalisation of public services • Infrastructure/Target on quantum • MCPs/EDICs
Revised EuroHPC Regulation on **supercomputing**	The revised EuroHPC Regulation was **[adopted]()** in **July 2021**.	• Infrastructure
Connectivity		
Accelerating investments in Europe's Gigabit connectivity, through:	In **February 2023**, the Commission presented a set of actions aimed at making Gigabit connectivity available to all citizens and businesses across the EU by 2030, including: • A **[proposal]()** for a **Gigabit Infrastructure Act** (negotiations ongoing),	• Infrastructure, target Connectivity

	- A **draft** **Gigabit Recommendation**, which seeks to provide guidance to National Regulatory Authorities, - An **exploratory consultation** on the **future of the connectivity sector** and its infrastructure (until May 2023).	
- **Revision of the Broadband Cost Reduction Directive**	**Proposal** for a **Gigabit Infrastructure Act** adopted in **February 2023** (see above), reducing cost of deploying gigabit electronic communications networks and repealing the Broadband Cost Reduction Directive.	- Infrastructure, target Connectivity
- **Updated Action Plan on 5G and 6G**	- Clear **5G and 6G deployment targets** were defined for 2030 and the trajectory to '5G everywhere' is agreed with the Council and Parliament. - Relevant **policy aspects** are addressed in the accompanying staff working document. Deployment frameworks are proposed in the (proposed) **Gigabit Infrastructure Act** (see above). Spectrum actions are being developed in the context of the Radio Spectrum Policy Programme. - **Smart Networks and Services Joint Undertaking** (*SNS JU*) **launched** in **November 2021** to support the development of Europe's technological capacities in 6G.	- Infrastructure, target Connectivity
- **New Radio Spectrum Policy Programme (2021)**	The Radio Spectrum Policy Programme ongoing (is currently being drafted.	- Infrastructure, target Connectivity
- Roll-out of **5G corridors** for **connected and automated mobility**, including railway corridors (2021-2030) (2021-2023)	Corresponding to one of the areas of activity for the **multi-country projects**, identified in the **Digital Decade Policy Programme** and facilitated by the newly established Smart Networks and Services Joint Undertaking. Initial funding under the first CEF Digital call of EUR 42 million, with the possibility of additional funding of around EUR 200 million under calls 2 and 3.	- Infrastructure, target Connectivity
- **Cybersecurity**		
A **European cybersecurity strategy**, including	- In **December 2020**, the European Commission and the High Representative of the Union for	- Objective: resilience, cyber

the establishment of a **joint Cybersecurity Unit** A **Review of the Security of Network and Information Systems (NIS) Directive** and giving a push to the single market for cybersecurity	Foreign Affairs and Security Policy presented a new EU Cybersecurity Strategy (Joint Communication: The EU's Cybersecurity Strategy for the Digital Decade), followed by a Commission recommendation on building the Joint Cyber Unit dated **June 2021**. • In **January 2023**, the new **NIS2 Directive** on measures for a high common level of cybersecurity across the Union **entered into force**.	
Online Platforms		
Initiative to **improve labour conditions of platform workers** (2021)	Package presented in **December 2021**, including: • Commission **Communication** on better working conditions for a stronger social Europe: harnessing the full benefits of digitalisation; for the future of work, • **Proposed Directive** on improving working conditions in platform work; • **Draft Guidelines** clarifying the application of EU competition law to collective agreements of solo self-employed- people seeking to improve their working conditions, including those working through digital labour platforms.	• Human centred digital transformation
Explore **ex ante rules** to ensure that **markets characterised by large platforms** with significant network effects acting as gatekeepers, remain **fair and contestable** for innovators, businesses, and new market entrants (Q4 2020)	The **Digital Markets Act** entered **into force** on **1 November 2022.**	• Objective: efficient data infrastructure, Competitiveness and sustainability • Targets: Digitalisation of business and public services
New and revised rules to deepen the **Internal Market for Digital**	**Digital Services Act** entered **into force** on **16 November 2022**.	• Objective: human centred digital transformation • Declaration on digital rights and principles

Services, by increasing and harmonising the **responsibilities of online platforms** and **information service providers** and reinforce the **oversight over platforms' content policies** in the EU. (Q4 2020, as part of the Digital Services Act package)		
Public sector		
A reinforced **EU governments interoperability strategy** to ensure coordination and common standards for secure and borderless **public sector data flows and services** (2021)	In line with the Commission work programme 2022, updated **strategy package adopted** in **November 2022,** including the **Interoperable Europe Act** proposal and an accompanying Communication. The proposed Act (which is currently under negotiation) provides for a new monitoring mechanism according to which the Commission shall monitor the progress of the development of cross border interoperable public services delivered or managed electronically and report regularly on the progress made. The Commission is working with the JRC to support the transition.	• Objective on interoperability • Digitalisation of public services, target on key public services
Data		
A **European Data Strategy** to make Europe a global leader in the data-agile economy (February 2020)	Commission **Communication** on a **European strategy for data** dated **February 2020**.	• Objective: efficient data infrastructure, competitiveness and sustainability of EU's industry • Targets: Digitalisation of businesses and public services
Announcing a **legislative framework for data governance** (Q4 2020)	The **Data Governance Act** entered **into force** in **June 2022**.	• Objective: efficient data infrastructure,competitiveness and sustainability of EU's industry • Targets: Digitalisation of businesses and public services

Announcing a possible **Data Act** (2021)	**Data Act [proposed](#)** in **February 2022** (agreement found between co-legislators in June 2023).	• Objective: efficient data infrastructure, competitiveness and sustainability of EU's industry • Targets: Digitalisation of businesses and public services
Competition law		
Ongoing **evaluation and review** of the fitness of **EU competition rules for the digital age** (2020-2023)	**State aid** - measures include the following: • **General Block Exemption Regulation [amended](#)** in **March 2023** to support the twin transition to a green and digital economy. • **Revised Broadband Guidelines** adopted in **December 2022** setting out rules under which the Commission will assess state aid measures notified by Member States to support the deployment and take-up of broadband networks in the EU. • Evaluation of the **Technology Transfer** block exemption regulation ongoing.	• Objective: efficient data infrastructure, Competitiveness and sustainability of EU's industry
Launch of a **sector inquiry** (2020).	**Consumer IoT sector inquiry** launched in **July 2020**. **[Final report](#)** published in **January 2022**, together with an accompanying **[staff working document](#)**.	• Objective: efficient data infrastructure, Competitiveness and sustainability of EU's industry • Targets: Digitalisation of business and public services
Single Market		
Propose an **Industrial Strategy Package** putting forward a range of actions to facilitate the transformation towards clean, circular, digital and globally competitive EU industries, including SMEs and the reinforcement of single market rules	New **European Industrial Strategy Package adopted** in **March 2020**, including: • [a new Industrial Strategy for Europe](#), • [SME strategy for a sustainable and digital Europe](#) (referring also to the network of **European Digital Innovation Hubs**, set up to support companies in their digital transformation, specifically in the areas of AI, blockchain, quantum, HPC or cybersecurity), • an accompanying staff working document [identifying and addressing barriers to the Single Market](#), and • a [long-term action plan for better](#)	• Objective: efficient data infrastructure, Competitiveness and sustainability of EU's industry • Sustainable ecosystem of digital infrastructures, notably energy and resource efficient, • Minimising their negative environmental impact, sustainable circular and climate neutral

	implementation and enforcement of single market rules.	
Digital Finance		
Create a **framework** to enable convenient, competitive and secure **Digital Finance** (Q3 2020), including: • **Legislative proposals** on **crypto assets** • **Legislative proposals** on **digital operational** and **cyber resilience** in the financial sector • **Strategy** towards an **integrated EU payments market** that supports pan-European digital payment services and solutions	New **Digital Finance Package**, including Digital Finance and Retail Payments Strategies and legislative proposals on crypto assets and digital resilience, proposals **adopted** in **September 2020**.	• Objective: efficient data infrastructure, Competitiveness and sustainability of EU's industry • Sustainable ecosystem of digital infrastructures
Digital Identity		
Revision of eIDAS Regulation to improve its effectiveness, extend its benefits to the private sector and promote trusted digital identities for all Europeans (Q4 2020)	• Commission **proposal** for a **European Digital Identity Framework presented** in **June 2021;** negotiations at the final stages "political agreement was reached between the co-legislators in June 2023 • A first draft **Architecture and Reference Framework** for the European Digital Identity wallet published in **February 2023**	• Digitalisation of public services, eID
Media & Audiovisual		
Media and Audiovisual **Action Plan** to support	**Presented** in **December 2020**. **European Media Freedom Act** proposed	• Online participation in democratic life for all, fair and non-discriminatory

digital transformation and competitiveness of the audiovisual and media sector, to stimulate access to quality content and media pluralism (Q4 2020)	16 September 2022	conditions
Health		
Promotion of **electronic health records** based on a common European exchange format to give European citizens secure access to and exchange of health data across the EU	• **Recommendation** on a European electronic health record exchange format to facilitate the cross border interoperability of electronic health records (EHRs) in the EU **presented** in **February 2019**. • Exchange format structure specifications for two mainstream standards for the three Electronic Health Record EHR data categories delivered at the end of 2022. • eHealth Network guidelines for laboratory results and reports were published.	• Human centred digital transformation • Digitalisation of public services, e-health target
European health data space to improve safe and secure accessibility of health data allowing for targeted and faster research, diagnosis and treatment (from 2022).	• **Launched** in **May** 2022, with a **proposed regulation** to set up the European Health Data Space in order to unleash the full potential of health data (proposal currently under discussion among the co-legislators).	• Human centred digital transformation • Digitalisation of public services, e-health target
The international dimension - Europe as a global player		
A **Global Digital Cooperation Strategy** (2021)	TTC with USA and India, Digital partnerships with Japan, Korea and Singapore launched. Digital transformation is one of the main pillars in the Global Gateway.	
A **Digital for Development Hub** that will build and consolidate a whole-of-EU approach promoting EU	**D4D Hub** launched in December 2020. It serves as a strategic multi-stakeholder platform that fosters digital cooperation between the Team Europe and its global partners.	

values and mobilising EU member states and EU industry, Civil Society Organisations (CSOs), financial institutions, expertise and technologies in digitisation		
A **strategy for standardisation**, which will allow for the deployment of interoperable technologies respecting Europe's rules, and promote Europe's approach and interests on the global stage (Q3 2020)	Commission **presented** a new [Standardisation Strategy](#) **in February 2022** aimed at strengthening the EU's global competitiveness, enabling a resilient, green and digital economy, and enshrining democratic values in technology applications. DG CNECT supports the implementation of the strategy across all its five pillars (e.g. identification of ICT standardisation needs with the ICT Standardisation Rolling Plan; support in modernising ETSI's governance; integration of standardisation activities in Digital partnerships and participation of EU experts in international ICT standardisation via [StandICT.eu](#); promotion of EU's standards and standardisation system globally through Horizon Europe; support to research, development and innovation through Horizon Europe, DEPI, CEF; strengthening of skills through [StandICT.eu EUOS academy](#)).	- Sovereignty, resilience - Objective: Human centred digital transformation - Competitiveness and sustainability of EU's industry - Cardinal point on skills, target basic skills - Supporting international partnerships
Mapping of **opportunities and action plan** to **promote the European approach** in bilateral relations and multilateral fora (Q2 2020)	**Digital Partnerships** with three key Indo-Pacific countries launched: **Japan** (May 2022), **Republic of Korea** (November 2022) and **Singapore** (February 2023). **EU-India Trade and Technology Council** launched in February 2023 - Fourth (May 2023) and fifth **EU-US Trade and Technology Council** focusing on a selected number of priority areas. **Other fora** include the OECD ministerial meeting held in December 2022, the G7 Digital Ministers' meeting held in Japan in April 2023, and the G20 Digital Economy Ministerial meeting to be held in India in August 2023.	

Empowering people and society		
Artificial Intelligence		
White Paper on AI setting out options for a legislative framework for trustworthy AI	**February 2020**: White Paper on AI **adopted**.	• Objective: Human centred digital transformation • Digitalisation of business and public services
Follow-up to White Paper on AI **on safety, liability, fundamental rights and data** (**Q4 2020**)	In **April 2021**, as a follow-up to the White Paper on AI, the AI package was presented, including: • a proposed **AI Act**, currently under negotiation (trilogues ongoing). • an accompanying Communication on Fostering a European approach to Artificial Intelligence, and • a revised Coordinated Action Plan on AI. In **September 2022**, the Commission issued a proposal for an Artificial Intelligence Liability Directive.	• Objective: Human centred digital transformation • Digitalisation of business and public services
Skills		
A **Digital Education Action Plan** to boost digital literacy and competences at all levels of education (Q2 2020)	**Digital Education Action Plan** (2021-2027) **adopted** in **September 2020**. **Cybersecurity Skills Academy** proposed on 18 April 2023	• Objective: skills, divides • Cardinal point on skills, target basic skills
A reinforced **Skills Agenda** to strengthen digital skills throughout society and a reinforced **Youth Guarantee** to put a strong focus on digital skills in early career transitions (Q2 2020)	• **New Skills Agenda presented** in **July 2020**. • **Youth Guarantee reinforced** by Council **Recommendation** dated **October 2020**.	• Cardinal point on skills, target basic skills
Consumers		
Deliver a new **Consumer Agenda**, which will empower consumers to make informed	**Launched** in **November 2020**.	• Objective: human centred digital transformation

choices and play an active role in the digital transformation (Q4 2020)		
Democratic system		
European Democracy Action Plan to improve the resilience of our democratic systems, support media pluralism and address the threats of external intervention in European elections (Q4 2020)	**Presented** in **December 2020** Subsequently, several measures were adopted, including a Recommendation on the safety of journalists (September 2021) and an initiative to protect journalists and civil society against strategic lawsuits against public participation (SLAPPs) (April 2022). Projects with a focus on legal and practical assistance to journalists and media councils are ongoing.	• Online participation in democratic life for all, fair and non-discriminatory conditions
Contributing to the green transition		
Green		
Destination Earth, an initiative to develop a high precision digital model of Earth (a "**Digital Twin of the Earth**") that would improve Europe's environmental prediction and crisis management capabilities (Timing: from 2021)	Work on the **Destination Earth platform** (including the first two digital twins for climate change adaptation and extreme weather events) **ongoing** (phase 1). During phase 1, the three main components (core platform, data lake and digital twins) will be delivered.	• Sustainable ecosystem of digital infrastructures,
Circular electronics initiative, mobilising existing and new instruments in line with the policy framework for **sustainable products** of the forthcoming circular economy action plan, to ensure that devices are designed for	The **new Circular Economy Action Plan** (**adopted** in March 2020) sets out further details on the actions under the Circular Electronics Initiative (within the responsibilities of several **DGs**), including: • **Measures** for **mobile phones**, **tablets and laptops** for durability, reparability, energy efficiency, • **Common charger proposed** in September 2021, • **Legislative proposal on the Right to Repair announced** in September 2021 and adopted on 22 March 2023.	• Sustainable ecosystem of digital infrastructures,

durability, maintenance, dismantling, reuse and recycling and including a right to repair or upgrade **to extend the lifecycle of electronic devices and to avoid premature obsolescence** (2021)		
Initiatives to achieve **climate-neutral, highly energy-efficient and sustainable data centres** by no later than 2030 and transparency measures for telecoms operators on their environmental footprint	Mix of existing instruments, reviews of existing legislation and new initiatives, including: • the revision of the **Energy Efficiency Directive** (reporting and transparency requirement for the energy performance of datacentres), currently at the final stages of the trilogues, • JRC's European **Code of Conduct for Energy Efficiency in Datacentres**, updated every year, • **Action Plan on Digitalising the Energy System** (October 2022); CNECT commissioned a **study with JRC** to explore possibilities to develop common indicators for measuring the environmental footprint of electronic communications services, • Delegated Act of the **Taxonomy Regulation** (classifying investments in data centres adhering to the best practices of the JRC's European Code of Conduct for Energy Efficiency in Data Centres as "green"), • **Ecodesign Regulation** on servers and data storage products; revision being prepared based on study commissioned by GROW, • **EU Green Public Procurement criteria** for data centres, server and cloud services.	• Sustainable ecosystem of digital infrastructures