European Commission

Report

2030 DIGITAL DECADE

REPORT ON THE STATE OF THE DIGITAL DECADE 2023

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1. Introduction: delivering the Digital Decade

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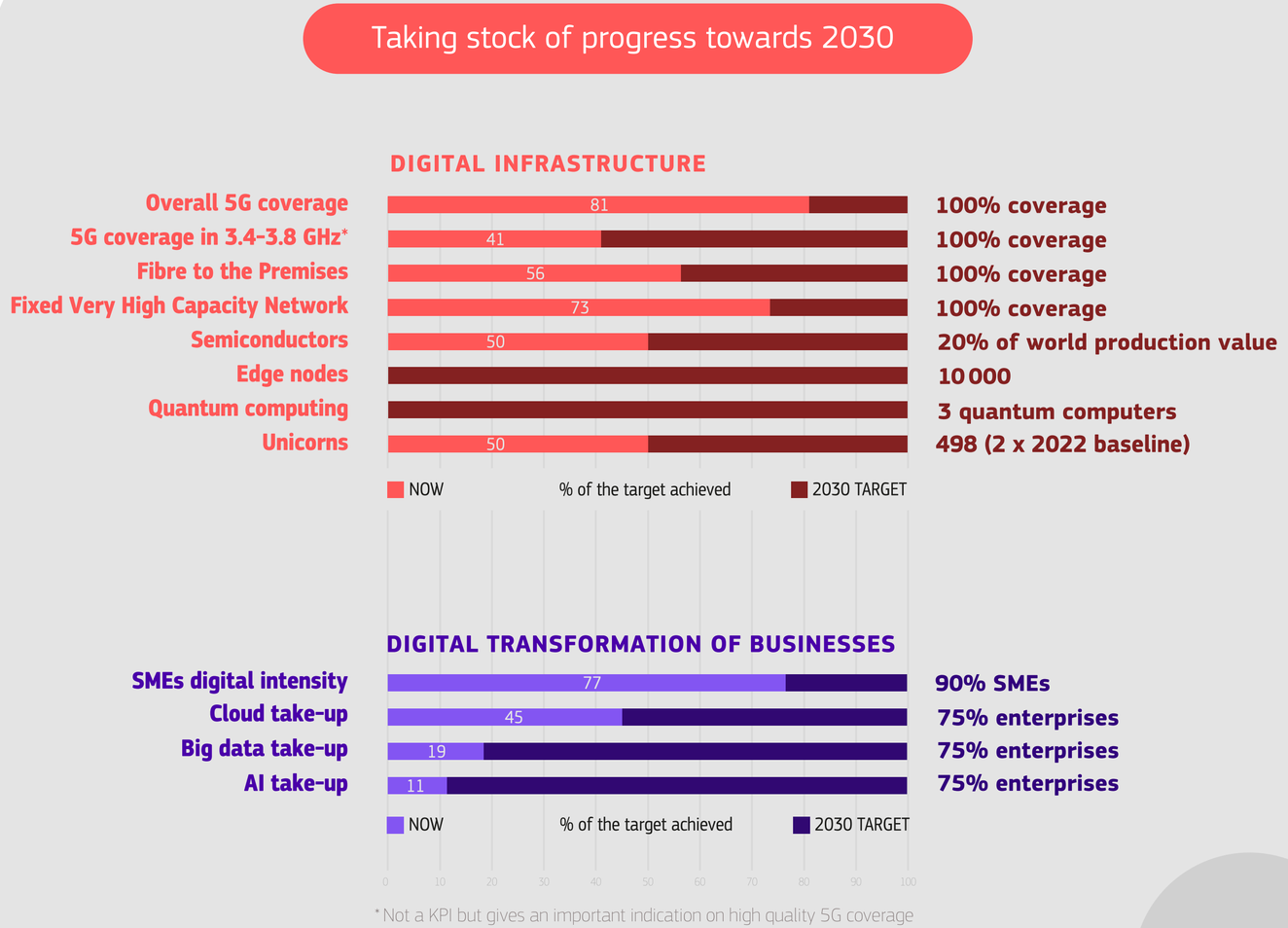
The **first State of the Digital Decade** report takes stock of the EU's progress towards a successful digital transformation for people, businesses, and the environment as set out in the Decision establishing the Digital Decade Policy Programme 2030 [1] ("the Digital Decade Decision"). It reviews digital policy developments and describes how the EU is advancing towards the agreed targets and objectives, thus outlining where the EU stands at the outset of the implementation of the Digital Decade Policy Programme.

The overall analysis of **the EU's progress against the Digital Decade objectives and targets** is shown in Figure 1 and the country reports presented in an annex to this report provide a more detailed picture.

1 *Decision (EU) 2022/2481 of the European Parliament and of the Council of 14 December 2022 establishing the Digital Decade Policy Programme 2030, OJ L 323, 19.12.2022, p. 4–26.*

2 *Source: Commission analysis SWD(2023) 571 'Digital Decade cardinal points: digital skills, digital infrastructures, digitalisation of businesses and digitalisation of public services'. See C(2023) 7500 'Communication from the Commission establishing the Union-level projected trajectories for the digital targets'.*

Figure 1: Taking stock of progress towards Digital Decade targets set for 2030 [2]



Introduction: delivering the Digital Decade

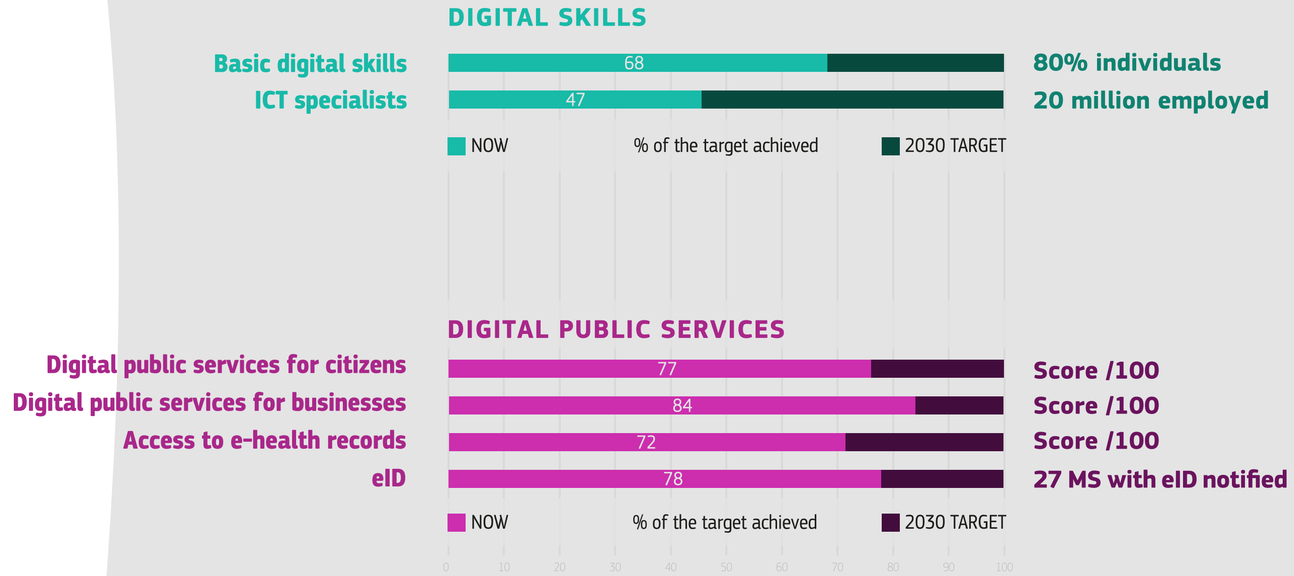
Figure 1 highlights **the need to accelerate and deepen the collective efforts, including through policy measures and investment [3] in digital technologies, skills and infrastructures,** which are critical geopolitical, societal, economic and environmental enablers. On this basis, this report includes concrete recommendations to Member States ahead of the adoption of their national strategic roadmaps and for their future adjustments. In its annex, the country specific recommendations are based on each Member State's performance and potential to contribute to collective efforts towards achieving the Digital Decade targets and objectives.

This report also includes **the monitoring of the European Declaration on Digital Rights and Principles for the Digital Decade,** which translates the EU's vision of digital transformation into principles and commitments [4]. With the Declaration, the EU puts people at the centre of the digital transformation, supporting solidarity and inclusion through connectivity; restating the importance of freedom of choice and a fair digital environment; fostering participation in the digital public space; and increasing security and sustainability. The Declaration gives a clear reference point about the type of digital transformation that the EU wants, providing notably a guide for policy makers and companies when dealing with new technologies.

The Digital Decade Policy Programme relies on close cooperation with Member States to ensure collective progress and the involvement of all stakeholders at European, national, regional and local levels. It is complementary to the European Semester of economic and social policy coordination, as well as to the implementation of the Recovery and Resilience Facility (RRF), which includes a strong digital dimension: currently 26% of the Recovery and Resilience Plans' total allocation (EUR 130 billion of EUR 502 billion) is devoted to the digital transformation [5].

Figure 1: Taking stock of progress towards Digital Decade targets set for 2030[2]

Taking stock of progress towards 2030



3 *References in this Communication, its annex and accompanying Staff Working Documents that support measures that may amount to State aid are without prejudice to the State-aid assessment.*
4 *European Declaration on Digital Rights and Principles for the Digital Decade, OJ C 23, 23.1.2023, p. 1–7. The Declaration builds on primary EU law, in particular the Treaty on European Union, the Treaty on the Functioning of the European Union, the Charter of Fundamental Rights of the European Union, as well as on secondary law and the caselaw of the Court of Justice of the European Union.*
5 *Each Recovery and Resilience Plan has to dedicate at least 20% of the plan's total allocation to the digital transformation. To this end, the plans had to specify and justify the digital contribution of each measure, using the methodology set out in Annex VII of the RRF Regulation.*

2. Key drivers for the digital transformation of Europe in 2022

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Findings from the Eurobarometer 2023 [6] on the importance of digital technology and of common action:

Digital is becoming increasingly important, according to a large majority of Europeans. **4 out of 5 respondents consider that digital technologies will be important in their lives** by 2030.

To facilitate their daily use of digital technologies, 3 out of 4 Europeans stress the need for **stronger cybersecurity, better connectivity and better protection of data**.

In terms of future actions **in their countries**, the three top priorities according to respondents are: **protecting users from cyberattacks**, improving the availability of **high-speed internet for everyone and everywhere**, and protecting users from **disinformation and illegal content**.

2022 has witnessed **a further acceleration of the key trends affecting EU's digital transformation:** ever faster technological developments, such as those on generative Artificial Intelligence (AI), climate change and the associated societal and economic concerns, a growing demand for high-speed connectivity [7], the rise of internal and external risks to democracy and EU values, and the multi-polarisation of the global scene against an intensifying technological race [8]. The potential impact of technological change is significant and will require the EU to be agile and swift in its transformation.

2022 has magnified the **importance of geopolitics, against the backdrop of Russia's war of aggression against Ukraine, as well as of heightened economic fragmentation risks in some domains in light of competing strategic interests and values.** Geopolitics has entered resoundingly into people's and businesses' everyday activities with a rise in living costs, a steady and significant increase in the number of cyberattacks in Europe, and the disruption of products and services supply chains [9].

Digital technologies are at the centre of these geopolitical 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 [10]. Systemic digital innovations have the potential to create spill-over effects across economic sectors. This will give a further edge to established business leaders in the global digital ecosystem, resulting in significant effects on the EU's competitiveness, growth, and sovereignty.

6 *Special Eurobarometer 532 "The Digital Decade", March 2023, hereafter referred to as Eurobarometer 2023.*
7 *According to Eurostat 2023 data (online data code: ISOC_CI_IFP_FU), in 2022, 84% of individuals in the EU accessed the internet daily, with a further 5% using it at least once a week.*
8 *Strategic Foresight report 2021 (COM (2021) 750 final) and 2022 (COM(2022) 289 final).*

9 *McKinsey, Taking the pulse of shifting supply chains, 2022.*
10 *SWD(2023)570 'Implementing Digital Decade objectives and the Digital rights and Principles'.*

Key drivers for the digital transformation of Europe in 2022

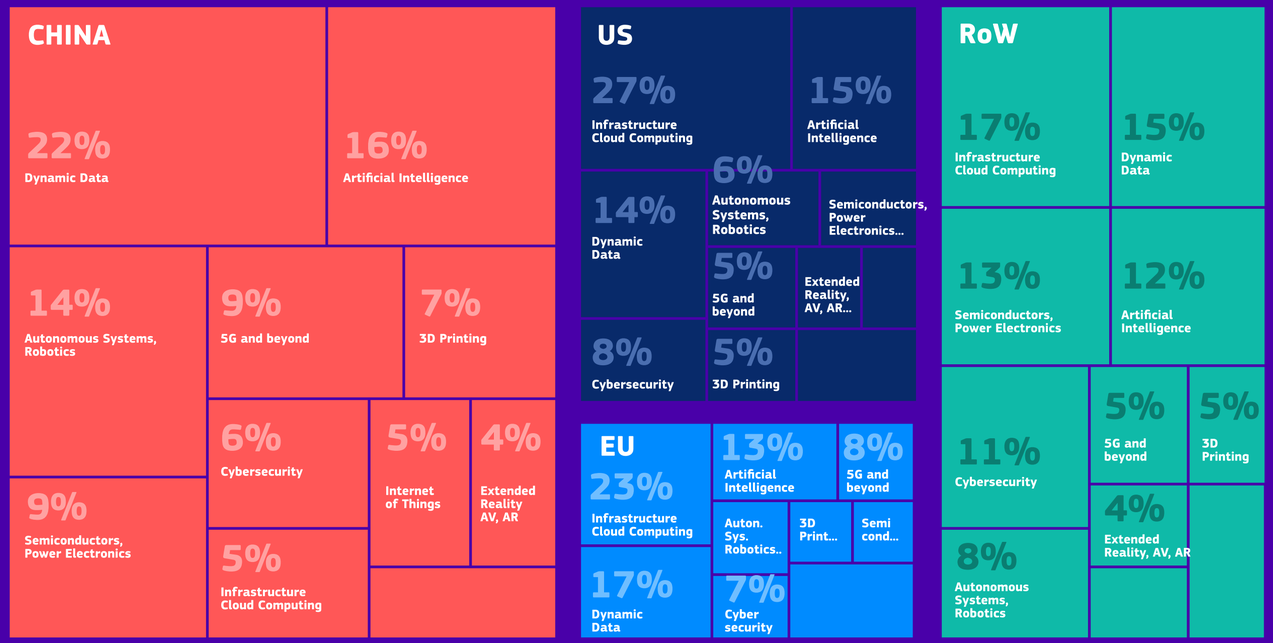


Figure 2: *Composition of activities by digital area in selected geographical areas (2009-2022)*
Source: Calza et al., "Analytical insights into the global digital ecosystem (DGTES)", 2023 [11].

Ranking as one of the largest industries, the global ICT market is forecast to reach a size of EUR 6 trillion in 2023. However, the EU's position in the global ecosystem, illustrated in the Figure 2, could be substantially improved. Even more importantly, the EU's share of global revenue in the ICT market has drastically fallen in the last decade, from 21.8% in 2013 to 11.3% in 2022, while US's share increased from 26.8% to 36%. [12] Currently, the EU relies on foreign countries for over 80% of digital products, as well as for services, infrastructures, and intellectual property. For example, the US and the EU are up to 75-90% production-dependent on Asia for semiconductors [13] [14].

In this context, over the last year, **the EU has stepped up action to re-assert its technological leadership and facilitate digital transformation while fostering its resilience** [15]. Building on the world's largest integrated market area [16], the EU has boosted action to address strategic dependencies, notably on critical raw materials, semiconductors, IT software (cloud and edge software), and cybersecurity technologies and capabilities [17].

11 *Calza, E., Dalla Benetta, A., Kostić, U., Mitton, I., Moraschini, M., Vazquez-Prada Baillet, M., Cardona, M., Papazoglou, M., Righi, R., Torrecillas Jodar, J., Lopez Cobo, M., Cira, P. and De Prato, G., Analytical insights into the global digital ecosystem (DGTES), EUR 31538 EN, Publications Office of the European Union, Luxembourg, 2023, ISBN 978-92-68-04045-4, doi:10.2760/811932, JRC132991. See https://publications.jrc.ec.europa.eu/repository/handle/JRC132991*
12 *ICT global market share by country 2022 | Statista.*
13 *Center on Regulation in Europe (CERRE), Digital Industrial Policy for Europe, December 2022.*
14 *In the context of the 2021 Industrial Policy package, the Commission has proposed a methodology to map EU strategic dependent products across sensitive ecosystems. Within the digital ecosystems, the latest analysis points to dependencies for laptops, cell phones, and radio broadcast receivers, among others, which are also subject to single points of failure. For more details see SWD (2021) 352 and Single Market Economics Papers (Working Paper 14, 2023): "An enhanced methodology to monitor the EU's strategic dependencies and vulnerabilities".*
15 *See the Declaration of leaders, meeting of the Head of State and government, Versailles 10/11 March 2022.*
16 *Communication from the Commission 'The Single Market at 30', (COM(2023) 162 final); measured in purchasing power parity, IMF World Economic Outlook.*
17 *EU strategic dependencies and capacities: second stage of in-depth reviews (SWD (2022) 41 final).*

Key drivers for the digital transformation of Europe in 2022

Both reforms and investments have been put in place to this effect, thus contributing to the achievement of the Digital Decade. For example, since its presentation in February last year, the EU Chips Act has given the market the right signals and already EUR 100 billion in planned public and private investments have been announced [18]. The EU has also invested in high-performance computers, of which the EU now holds two of the top five in the world [19]. Finally, targeted research and innovation (R&I) efforts, such as those under Horizon Europe and the European Defence Fund, are also crucial to boost EU's R&I positioning compared with its global competitors, and thereby further contribute to EU's long-term competitiveness and resilience and to the reduction of strategic dependencies [20].

In more detail, with EUR 165 billion in EU funding expected to directly contribute to the Digital Decade targets, **the EU is already supporting the Digital Decade through several programmes, notably with the Recovery and Resilience Facility** [21]. However, as shown in Figure 1 above ("Taking stock of progress toward 2030"), **a successful achievement of the EU's digital transformation is far from assured** and will require additional policy measures, actions and investments, highlighting **the importance of joining forces notably through multi-country projects (MCPs)**. This is made even more necessary by the challenging geopolitical context and global technological race.

Accelerating the delivery of new common industrial digital projects will be a critical element of the Digital Decade. The establishment and implementation of MCPs, pooling EU, Member States' and private resources, will be more agile and flexible thanks to the European Digital Infrastructure Consortia (EDIC), the new implementing mechanism introduced by the Digital Decade Decision. This is highlighted by the significant number of projects which have already been proposed by Member States to be implemented through EDICs [22].

At the same time, **the Commission has updated its State-aid toolbox** and in particular endorsed amendments to the General Block Exemption Regulation (GBER) [23], which have the potential to facilitate, simplify and speed up public support for the EU's digital transitions, facilitating investments in digital technologies and connectivity. This includes new possibilities for testing digital innovation hubs and experimentation facilities, ambitious connectivity projects for the deployment of fixed broadband networks, mobile networks such as 5G networks, as well as backhaul networks, to bring high quality infrastructure to areas suffering from insufficient broadband coverage, in particular in rural and remote areas. The revised GBER also fosters aid for certain projects of common interest, financed under CEF2 or awarded a Seal of Excellence under CEF2, particularly relevant for cross-border 5G corridors and certain backbone networks and submarine cables. The revised GBER also exempts from notification certain aid measures in the form of a vouchers for consumers to facilitate teleworking, online education, training services or for SMEs, provided that certain conditions are fulfilled.

18 *Commission welcomes political agreement on the European Chips Act (europa.eu)*
19 *SWD(2023)570 'Implementation of the Digital Decade objectives and the Digital Rights and Principles'.*
20 *The R&D 2022 scoreboard shows that US private companies' investments are between three times and ten times larger than European ones. 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.*

21 *Around 70% of the contribution is expected to come from the RRF. For a comprehensive overview cf. SWD(2023)570 'Implementation of Digital Decade objectives and Declaration on Digital rights and Principles' Chapter 5 "Delivering the Digital Decade with EU investments".*
22 *SWD(2023)573 'Implementation of multi-country projects', Section 1.1. A new implementation mechanism for multi-country projects.*
23 *Commission Regulation (EU) No 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty, OJ L 187, 26.6.2014, p. 1–78, and its updates, last brought about by Commission Regulation (EU) 2023/1315 of 23 June 2023, OJ L 167, 30.6.2023, p. 1–90.*

Recommended policies, measures & actions

Member States should take the opportunity of the Digital Decade to adopt a whole-of-government approach to digitalisation efforts, involving stakeholders and reducing administrative burden. This should be done, in particular, through their national roadmaps, to consolidate, streamline and coordinate policy action at all levels of governance, steer investment to accelerate progress towards general objectives and targets, as well as to strengthen their involvement in MCPs and in the preparatory works for setting up EDICs to accelerate delivering new common digital projects.

Member States are encouraged to describe in the upcoming national roadmaps and subsequent adjustments – integrating, where appropriate, regional roadmaps – how the general objectives of the Digital Decade Policy Programme are addressed and how the process to achieve them is monitored and assessed at national level.

To regain technological leadership and reduce strategic dependencies, Member States are encouraged to effectively increase investment in digital R&I across sectors. In particular, they should seek to achieve the public and private expenditure target of 3% of GDP [24] and invest in critical infrastructures and technologies as well as in projects of strategic interest for the EU's digital sovereignty.

Member States should contribute to planning and coordinating investment and reforms to deepen the single market, which is essential factor for accelerating an EU-based digital transformation.

24 *Council Recommendation (EU) 2021/2122 of 26 November 2021 on a Pact for Research and Innovation in Europe, OJ L 431, 2.12.2021, p. 1–9.*

3. Digital transformation for a sovereign and competitive Europe

3. Digital transformation for a sovereign and competitive Europe

The EU's Digital Decade is being shaped around the ambition of empowering a more digitally sovereign, resilient, and competitive EU. In this context, digital infrastructures, in particular connectivity, are the backbone of the EU's digital transformation, and the digitalisation of businesses is essential to nurture strong digital European systems and increase the EU's digital capacity and know-how. Progress in these cardinal points [25] is essential to foster the rise of European global digital players, who will design tomorrow's business models and shape digital technologies and applications that embed European values and contribute to the EU's interests.

The following sections monitor progress in relation to these two cardinal points. The analysis is completed by a monitoring of progress also in relation to the Digital Decade objectives related to cybersecurity and resilience, taking into account their importance and relevance with regards to the current context.

3.1 CARDINAL POINT: DIGITAL INFRASTRUCTURES

The Digital Decade Decision sets four targets with regard to digital infrastructures. First, gigabit coverage should be available for everyone and 5G performant networks in all populated areas. Second, the EU should produce at least 20% of the world's cutting-edge semiconductors. Third, the EU should deploy at least 10 000 climate-neutral, highly secure edge nodes. Fourth, the EU should equip itself of the first computer with quantum acceleration by 2025.

25 *The Digital Decade Decision sets out digital targets grouped into four cardinal points, which were first identified in the Digital Compass Communication (COM/2021/118 final) as key areas for the digital transformation of the Union: digital skills, digital infrastructures, the digitalisation of businesses, and the digitalisation of public services.*
26 *McKinsey Global Institute, Connected world: An evolution in connectivity beyond the 5G revolution, 2020.*
27 *See https://5gobservatory.eu/observatory-overview/interactive-5g-scoreboard/*

3.1.1 Target: gigabit and wireless high-speed networks for all

Eurobarometer 2023: to facilitate their daily use of digital technologies, **3 out of 4** Europeans stress the need for **better connectivity**, specifically better availability of a high-speed internet connection (76%) and greater affordability of these connections (75%).

Fixed and mobile connectivity are a prerequisite and an essential enabler for digital transformation and inclusion, as reflected in the Declaration on Digital Rights and Principles. The EU is approaching a defining moment where new connectivity services will rapidly emerge from technological developments and synergies between terrestrial, space and sea infrastructures. The stakes are high as 5G and 6G-enabled activity are estimated to generate EUR 3 trillion in growth by 2030 globally [26]. Making this a reality will require a significant effort within a policy mix associating regulatory incentives, cooperation in MCPs and funding.

At the outset of the Digital Decade, the EU is still far from achieving the Digital Decade connectivity targets. Fibre networks, which are critical for delivering gigabit connectivity, only reach 56% of households. While 5G population coverage stands at 81% [27], the deployment of 5G stand-alone networks is lagging behind. 5G is still falling short in quality with regards to end-users' expectations and industry needs, as well as in addressing the divide between rural and urban areas [28]. The EU is lagging behind in terms of coverage compared to the US, where 96% of the population is covered by 5G [29].

28 *The current KPI for the 5G target does not take into account the quality of service provided under peak-time conditions. A key challenge is to ensure that the deployed networks respond to future needs, notably supporting key industry sectors and critical applications that will benefit consumers and businesses in all sectors. To measure Member States readiness to overcome this challenge, further examination is required to strengthen and broaden the 5G measurement framework. See C(2023) 7500 'Communication from the Commission establishing the Union-level projected trajectories for the digital targets'*
29 *ETNO, State of Digital Communications 2023. "5G coverage is approaching 96% in the USA, 95% in South Korea, 90% in Japan and 86% in China."*

There is also less investment in the EU compared to its key trading partners. Public investment in the US has recently reached USD 90 billion only in the context of the Infrastructure Investment and Jobs Act and American Rescue Plan [30]. To compare, in the EU, whilst unprecedented funds have been made available to support progress towards the 2030 connectivity targets, these amount to just over EUR 23 billion in grants available, under EU Programmes for the 2021-2027 programming period, including around EUR 16 billion under the RRF [31]. Moreover, between 2014 and 2021 EUR 53.71 billion of state aid for broadband had already been approved by or communicated to the Commission. In terms of total fixed capital investment in fibre and 5G per capita adjusted to GDP, only EUR 104 were invested in the EU against EUR 260 in Japan, EUR 150 in the US and 110 in China [32]. A JRC study on international benchmarking of digital investments presents a similar picture, finding that private investments (gross fixed capital formation) on telecommunication equipment by the US's ICT sector reached EUR 590 bn between 2014 and 2020, representing the double the amount invested by the EU's ICT sector (EUR 277 bn), and 1.8 times the amount invested by the EU after GDP correction [33].

This situation needs to be analysed also considering the different scale achieved by operators active in the EU compared with those in the US. While a few European operators are active across multiple Member States, none of these operators compare to the scale achieved by operators on the US market, where five operators offer fixed or mobile networks across the entire country.

Investing in connectivity, including in rural and remote areas, is key to ensuring equal access to digital opportunities and activities that require increasingly higher speeds, in line notably with the Declaration on Digital Rights and Principles. Currently, more than half of rural households (55%) are still not served by any fixed very high-capacity network despite progress in fibre-to-the-premises deployment; 65.3% of populated rural areas are not covered by 5G; and 9% of rural households are not yet covered by any fixed network at all [34].

Building on the European Pillar of Social Rights [35], those investments need to ensure connectivity also for vulnerable persons and those at higher risk of exclusion or with less economic power, such as older persons and persons with disabilities.

The remaining gap between total and rural coverage indicates that more investment is needed to ensure full gigabit coverage across the whole single market and 5G coverage of populated areas, thus reducing regional disparities. Reaching the Digital Decade targets for gigabit connectivity and 5G may require a total investment of up to EUR 148 billion, if fixed and mobile networks are deployed independently and a "full 5G" - offering European citizens and businesses the full capabilities that can be offered by 5G mobile networks - is deployed. A further EUR 26-79 billion in investment may be required to ensure full coverage of transport paths including roads, railways, and waterways, bringing the required total investment to more than EUR 200 billion [36]. As 2030 approaches, the more intensive, industrial use of connectivity for internet 4.0 scenarios, and the increasing security requirements, are likely to push the investment needs even higher. Public funding may be necessary to complement private investment where needed, to adequately address market failures in compliance with the applicable State aid rules [37]. Those public investments need to ensure connectivity also to be a reality for vulnerable persons and those at higher risk of exclusion or less economic power such as older persons and persons with disabilities.

30 *See US response at this link.*
31 *SWD (2023)570 'Implementation of the Digital Decade objectives and the Declaration on digital Rights and Principles', Annex 5 Delivering the Digital Decade with EU investments. Beyond RRF funding, the estimate of over EUR 23 billion in grants includes more than EUR 4 billion cohesion policy funding, around EUR 1 billion Horizon2020/Horizon Europe and around EUR 1 billion CEF funding. Additional funding has been granted in the form of financial instruments (namely, trough Invest EU and the Connecting Europe Broadband Fund).*
32 *ETNO, State of Digital Communications 2023, p.31.*
33 *International benchmarking of investments in Digital Decade thematic areas, JRC, 2023*
34 *SWD (2023)571 'Digital Decade cardinal points: digital skills, digital infrastructures, digitalisation of business and digitalisation of public services'.*
35 *Principle 20 on access to essential services states that everyone should have access to digital communications and that support for access should be available for those in need.*
36 *See WIK Consult, cit.*
37 *See in particular the revised Guidelines on State aid for broadband networks, OJ C 36, 31.1.2023, p. 1–42, and GBER possibilities outlined in Section 2.*

Digital transformation for a sovereign and competitive Europe

Space connectivity is becoming more critical for the EU's sovereignty and technological leadership. Satellite broadband can bring broadband services with up to 100 Mbps download speeds to very rural and remote areas, where no fixed or mobile very high-capacity networks are available, even if affordability remains crucial to facilitate take-up in these areas. They can also provide resilient emergency services in disaster or crisis situations. With the infrastructure for resilience, interconnectivity and security (IRIS2) programme launch in 2022, the EU is affirming its willingness to become a major player in space policy. With an initial EU budget of EUR 2.4 billion, IRIS^2 makes space a way to strengthen our autonomy, connectivity and resilience. The IRIS^2 satellite constellation will provide a secure network for the EU's governments, which will be more stable against cyberattacks through quantum key encryption.

The EU also needs to step up its efforts to improve the security of its critical communications infrastructure. Ensuring the **resilience and security of 5G networks** is critical given the importance of the connectivity infrastructure for the digital economy and the dependence of many critical services on 5G networks in non-EU countries. The full application of the 5G toolbox and the eventual application of **restrictions on high-risk suppliers** for key assets in the EU will be essential [38].

Recent events have also shown the vulnerability of the EU's key infrastructure, including **submarine networks**. 99% of the world's digital communications transit through the global cable network and roughly USD 10 trillion in financial transactions are sent via these cables each day [39]. The EU needs to speed up its efforts to ensure digital sovereignty, security of supply and competition in this market.

Overall, the significant market and technology changes to connectivity mean major additional investments and targeted regulatory measures are needed to boost network deployment, ensure a level playing field and unleash the full potential of the single market. In this context, the Commission launched an exploratory stakeholder consultation on the future of the connectivity sector and its infrastructure from 23 February to 19 May 2023. The objective of the consultation was to gather views on the changing technological and market landscape and how it may affect the electronic communications sector as well as the types of infrastructure that the EU requires to lead the digital transformation in the coming years.

38 *Second report on Member States' progress in implementing the EU Toolbox on 5G Cybersecurity, June 2023 and Commission Communication on the Implementation of the 5G cybersecurity Toolbox, C(2023) 4049 final, 15 June 2023.*
39 *European Parliament, Directorate-General for External Policies of the Union, Bueger, C., Liebetrau, T., Franken, J., Security threats to undersea communications cables and infrastructure: consequences for the EU: in-depth analysis, Publications Office of the European Union, 2022, doi:10.2861/35332.*

Recommended policies, measures & actions

Member States should adapt their strategies, steer investments and take the necessary policy initiatives to reach the Digital Decade connectivity targets, in particular mapping their connectivity gaps and exploring financing to complement private investment in areas that are not commercially viable, including rural and remote areas and outermost regions.
Member States should complement efforts towards reaching the Digital Decade 5G connectivity target in terms of network deployment with policy initiatives aiming at accelerating 5G take-up by private and businesses in all sectors.

Member States should fully implement the EU's 5G toolbox measures quickly, in particular apply restrictions on high-risk suppliers, taking into account the Commission Communication of 15 June 2023 to protect the EU's essential security interests, reduce critical dependencies and support the objectives of economic de-risking.

Member States, including national regulators, should fully embrace the pro-investment character of the EU regulatory framework and aim to send the right signals to the investment community.
Member States should put in place all necessary reforms, building on those identified in their Recovery and Resilience Plans, to lower the cost of network deployment, incentivise and maximise private investment in connectivity, stimulate the reuse of existing infrastructure and co-deployment, while boosting competition. Member States are encouraged to quickly adopt the Gigabit Infrastructure Act so that companies investing in networks may benefit from the new rules as soon as possible.

Member States should boost their efforts, including through necessary investments, to ensure that European digital infrastructures are secure and resilient, especially backbone infrastructure and submarine cables.

3.1.2 Target: semiconductors

Semiconductors are essential to all digital technologies and their supply chains are global in nature. The high concentration of semiconductor production in Asian countries has exacerbated the fragility of the semiconductor supply chain. The increasing competition for semiconductor leadership has led to substantial investments by all highly industrialized economies to develop domestic capacity [40]. However, as new fabrication plants and extensive R&D programmes require billions in investment, no region or player alone has end-to-end capabilities for semiconductor design and manufacturing [41].

Reinforcing EU's position on the semiconductor sector and building a resilient semiconductor production chain, is a major challenge requiring massive investments [42]. The EU has core strengths in R&D and manufacturing equipment. However, besides advanced manufacturing, the EU must address current weaknesses in chip design and in packaging and assembling, which represent a significant part of the added value in the supply chain. All European players will need to make a significant effort to reach the very ambitious Digital Decade target. In fact, to achieve the target, the EU's value of revenue in semiconductors may need to quadruple by 2030 because the demand for chips will grow rapidly and is expected to exceed USD 1 trillion by 2030, essentially doubling its value in this decade.

Against this background, the **EU Chips Act** aims to build on Europe's strengths and tackle remaining weaknesses, while setting measures to prepare, anticipate and respond to future supply chain disruptions. It is accompanied by a targeted and well-designed State aid framework [43] which has already ensured the swift mobilisation of funds in support of the Chips Act's objectives [44]. The EU Chips Act will boost EU's great potential for developing and manufacturing chips in important domains such as automobile, industrial automation, internet of things, aerospace, defence, data centres, telecommunications and healthcare.

A fundamental step in this regard is also represented by the **Important Project of Common European Interest on Microelectronics and Communication Technologies** (IPCEI ME/CT) approved in June 2023 by the Commission. This IPCEI involves 19 Member States, 56 companies and over 40 associated participants and it mobilises EUR 21 billion of private and public investments for 68 multi-country projects in research, innovation, and first industrial deployment. It will contribute to the technological advancement of many sectors, including communications (5G and 6G), autonomous driving, AI and quantum computing [45].

Recommended policies, measures and actions

Member States should stimulate domestic chip design and manufacturing capabilities, increase local skills in advanced technologies across sectors and strengthen engagement with the European ecosystem.
Member States should ensure that upcoming standards, certification and common requirements for secure chips, including security requirements and related performance-based specifications are taken into account in public tenders, where feasible (e.g., for communications networks or data infrastructures).
Member States are invited to participate in the upcoming European Semiconductor Board, amongst others to advise the Commission on international cooperation with like-minded countries.

40 *European Commission, Joint Research Centre, Carrara, S., Bobba, S., Blagoeva, D., et al., Supply chain analysis and material demand forecast in strategic technologies and sectors in the EU: a foresight study, Publications Office of the European Union, 2023, doi:10.2760/386650.*
41 *McKinsey, Semiconductor design and manufacturing: Achieving leading-edge capabilities, August 2020.*
42 *SWD (2023)570 'Implementation of the Digital Decade objectives and the Digital Rights and Principles'*
43 *COM/2022/45 final, Communication 'A Chips Act for Europe'.*
44 *See decision of 04.10.2022 in Case SA.103083 - RRF - STMICROELECTRONICS S.R.L. (ST) – NEW SIC SUBSTRATES PLANT IN CATANIA, and decision of 27.04.2023 in Case SA.102430 - FR - Project Liberty - New semiconductor manufacturing plant by STMicroelectronics and GlobalFoundries.*
45 *See decision of 8 June 2023 in Cases SA.101202 (Austria), SA.101141 (Czechia), SA.101143 (Finland), SA.101193 (France), SA.101129 (Germany), SA.101210 (Greece), SA.101151 (Ireland), SA.101186 (Italy), SA.101201 (Malta), SA.101171 (the Netherlands), SA.101175 (Poland), SA.101192 (Romania), SA.101200 (Slovakia) and SA.101150 (Spain).*

3.1.3 Target: edge nodes

The development of edge nodes will represent a paradigm change for data storage and processing, moving to a much more decentralised model (i.e. closer to users, on their mobile, computer, car-based or local devices in cities), reducing the volume of data that needs to be transmitted over the network, along with improving cloud computing's overall performance. Global spending on edge computing is steadily on the rise: it has reached EUR 190 billion in 2023, an increase of 13.1% over 2022, and is expected to reach nearly EUR 289 billion in 2026. [46] By 2025, edge computing will complement cloud computing for nearly every enterprise [47].

The development of edge nodes in the EU is at a very early stage with only three total commercial deployments of edge computing in Europe in 2022, together with announcements of partnerships and pilots in 18 Member States [48], very far from the objective of 10 000 secure, sustainable edge nodes by 2030. Success on the achievement of this target will require a collective focus on setting up a whole ecosystem, based on a mix of skills, infrastructure, security, innovation and public and private cooperation.

As a start, the EU has set up a comprehensive set of measures, in particular with the support of the **Important Project of Common European Interest for Next Generation Cloud Infrastructure and Services (IPCEI-CIS)**, to ensure rapid and balanced development with the objective of avoiding a divide. A divide would imply an unequal distribution of economic opportunities for companies and limit the cross-border usage of latency-critical applications like autonomous driving, which would have consequences for EU competitiveness.

Recommended policies, measures and actions

Member States should take into account the development of edge computing capacities in conjunction with strategies and investment programmes addressing cloud, IoT, and AI, and foster synergies with the deployment of 5G.
Member States are invited to mobilise existing policy tools to ensure that edge nodes deployment is also taking place in remote areas as appropriate.
In line with the 2030 targets, Member States should consider sustainability and security as important considerations in selecting the technology that will be used, as well as the need to give workers the high level of digital skills required for successfully implementing edge computing deployments across Europe.

46 *See IDC Worldwide Edge Spending Guide.*
47 *See https://www.gartner.com/en/doc/750789-infographic-understanding-edge-computing.*
48 *ETNO, The State of Digital Communications 2023, February 2023.*

3.1.4 Target: quantum computing

Quantum technologies are strategic for the EU, given their foundational role in future digital ecosystems and far-reaching economic and social impact, including through security, defence and space applications. Unavoidably, quantum developments face the same difficult geo-economic and security challenges as semiconductors.

With nearly EUR 7 billion combined, Europe ranks only behind China in public investment in quantum. National initiatives aim to develop Europe's research excellence into fully-fledged quantum ecosystems. Since 2021, at least eight Member States have launched national quantum [49] programmes either in the form of consortia (e.g., Hungary and Portugal) or by direct R&D investment schemes dedicated to quantum technologies (e.g., Austria), mobilising often significant funding in countries such as Germany (EUR 2 billion, 2021) [50], France (EUR 1.8 billion, 2021) [51] and the Netherlands (EUR 615 million, 2021) [52].

However, **more coordinated efforts are needed**, in particular to create a vibrant ecosystem of research organisations and start-ups. Despite the launch of the Quantum Flagship programme in 2018 [53], a substantial gap can indeed be observed between the EU and a number of other major world regions as regards private sector investments in quantum (e.g. the US), in a context where around 25% of quantum industry participants globally are based in Europe, but less than 5% of global funding.

Recommended policies, measures and actions

Member States should help address current and future supply chain risks and provide support to start-ups in the budding quantum ecosystem, in terms of technological needs and scaling up.
Member States should support the Commission in mapping and periodically reassessing the position of the EU quantum ecosystem in international value chains and its access to critical components and materials.
Member States are invited to contribute to defining a common EU roadmap, joint procurement procedures and arrangements for setting up a federated quantum infrastructure.
Member States should ensure that participation in international cooperation on quantum initiatives contributes to the attainment of Europe's strategic interests.

49 *McKinsey, Quantum computing funding remains strong, but talent gap raises concerns, 15 June 2022.*
50 *See Quantum technologies – from basic research to market (quantentechnologien.de)*
51 *See Investir dans la France de 2030 | Strategie quantique : lancement d'une plateforme nationale de calcul quantique (gouvernement.fr)*
52 *See Quantum technologies and value chains: Why and how Europe must act now (epc.eu)*
53 *See Quantum Technology | The future is Quantum (qt.eu)*

3.2 CARDINAL POINT: DIGITALISATION OF BUSINESSES

The digitalisation of businesses is one of the most crucial current elements for the success and growth of the economy in a highly volatile environment. In a context of a volatile economic environment and supply chains uncertainty, digitalisation is key for advancing companies' business models, achieving greater efficiency and fostering their resilience, as well as for exploring new opportunities and generating new revenue streams, especially for small and medium-sized enterprises (SMEs). In terms of competitiveness, digitalisation is strongly contributing to growth and increased productivity, improving the capacity to diversify, and helping to cut administrative burden and related costs.

The Digital Decade Decision sets three targets with regard to the digital transformation of businesses. First, at least 75% of EU enterprises shall have taken up cloud computing services, big data, and/or AI. Second, more than 90% of EU SMEs shall have reached at least a basic level of digital intensity. Third, the EU facilitates the growth of its innovative scale-ups and improves their access to finance, leading to at least doubling the number of unicorns.

3.2.1 Target: take-up of digital technologies

The adoption of digital technologies by European companies is still well below these Digital Decade targets, in particular those for the uptake of AI and big data. Under current trends, and without further investment and incentives, the targets will not be met by 2030: the projected baseline trajectory indicates that only 66% of businesses will use cloud, 34% big data and 20% AI, far from the 75% objective set for 2030 [54].

Another major concern is the data service providers sector, increasingly dominated by non-European players. Even in a context of significant market growth, European cloud providers' market share has decreased from 26% in 2017 to 16% in 2020 [55].

The Commission has focused on combining fit-for-purpose legislation and governance with investment in standards, tools, infrastructures, innovation capacities, and skills to ensure the availability of data. The **Data Governance Act** creates a favourable regulatory environment through measures that promote voluntary data sharing by improving trust in data exchanges, increasing data availability, and overcoming technical barriers to data reuse. The **Data Act** complements these rules by clarifying legal access to and use of data, leading to a truly European data market with yearly efficiency and productivity gains estimated at up to EUR 196.7 billion by 2028 [56]. Moreover, the **creation of data spaces** in strategic economic sectors, such as health, agriculture, energy, transport and environment, will provide access to more data in a secure and trusted environment and give rise to innovation thanks to the support of the Digital Europe programme. Finally, the adoption of the **AI Act** should provide the necessary legal certainty to boost AI adoption by businesses in Europe [57].
Some Member States have launched initiatives to foster the uptake of digital technologies by businesses [58], but more needs to be done to collectively achieve the Digital Decade target.

54 *C(2023) 7500 'Communication from the Commission establishing the Union-level projected trajectories for the digital targets'*
55 *Sinergy Research Group, European Cloud Providers Double in Size but Lose Market Share, 21 September 2021.*
56 *Support study to the impact assessment for the proposal for a Data Act*
57 *These acts complement the General Data Protection Regulation that lays down rules relating to the free movement of personal data.*
58 *As an example, Spain launched the Digital Kit initiative to promote scalable, high-impact, and public-private collaboration mechanisms to accelerate the digitalisation of SMEs, and the Agents of Change programme to give SMEs grants to hire digital transformation experts.*

Recommended policies, measures & actions

Member States should take policy measures and earmark resources to support the adoption of trustworthy and sovereign AI-enabled solutions by European companies. Member States should foster the availability of legal and technical support to procure and implement trustworthy and sovereign AI solutions across sectors. This would facilitate the transition of AI solutions from research labs via testing environments to deployment, uptake and commercial markets. Member States should also support active collaboration between companies through e.g., the European Partnership on AI, Data and Robotics, European Digital Innovation Hubs and AI Testing and Experimentation Facilities.

Member States should support the development and deployment of trustworthy, efficient, sovereign, innovative and advanced cloud computing services, including via joint dissemination and exploitation/ procurement efforts. Member States should stimulate national efforts of cloud adoption through cloud-targeted investment, exploitation strategies for advanced cloud solutions among businesses (in particular SMEs) and by developing dedicated skilling programmes, including on cloud security and environmental performance.

Member States are encouraged to join forces under the EDIC or other schemes to jointly build cutting-edge Europe-based AI models, possibly also through the proposed EDIC in the field of language technologies. Further efforts from Member States will be needed to secure sovereign general purpose AI technologies (including large language models).

Member States should support the sharing of data in a secured and trusted manner, including by contribution to the common European data spaces and supporting wider deployment/procurement of big data solutions.

3.2.2 Target: digital intensity of SMEs

Progress toward the digitalisation of SMEs is still insufficient and quite uneven across the EU [59]. It is also at a lower rate than in the US [60]. As shown by the latest European Investment Bank (EIB) survey, there are twice as many SMEs with an international portfolio of so called "4IR patents" (IoT, cloud, 5G, AI) in the US than in the EU [61]. A more ambitious and coordinated policy framework is crucial for promoting digitalisation by addressing infrastructure gaps, improving digital skills, developing the innovation environment (especially by using European Digital Innovation hubs), and regulating efficiently.

Recommended policies, measures and actions

Member States should develop and strengthen their policies and incentives for promoting the digitalisation of businesses.
Member States should raise awareness about the benefits of digitalising businesses, promote the European Digital Innovation Hubs (EDIHs) and the services they offer, as well as ensure that they are adequately financed.
Member States are invited to encourage businesses to use the digital infrastructures, capacities and services that will be deployed through multi-country projects to accelerate the digitalisation of businesses.

59 *SWD(2023)570 'Implementation of the Digital Decade objectives and the Digital Rights and Principles'.*
60 *European investment Bank, EIB Investment Survey 2019-2022.*
61 *European investment Bank, EIB Investment Survey 2023.*
62 *Dealroom.co*
63 *See C(2023) 7500 'Communication from the Commission establishing the Union-level projected trajectories for the digital targets' on the volatility of the trend over the past few years.*

3.2.3 Target: unicorns

The EU seems to have progressed well recently with respect to this target, with analysts [62] pointing also to a strong growth in the number of EU-based unicorns in the past decade. Should this trend continue [63], the EU is likely to meet the Digital Decade target on the number of unicorns in two years.
Despite this, further effort is needed to achieve a leadership position on the global stage, facilitating the growth of the Union's innovative scale-ups and improving their access to finance. At the start of 2023, **only 249 unicorns were based in the EU** [64] **as compared to 1 444 in the US and 330 in China.** Significant further efforts to stimulate the scale-up ecosystem are also needed. Indeed, currently there are no EU start-up ecosystems in the top 10 globally [65]. The best EU ecosystem – Berlin – was ranked 13th worldwide followed by Amsterdam (14th), and Paris (18th). The situation is even more critical in deep tech, including AI, where EU venture capital is still far behind the US [66].

Recommended policies, measures and actions

Member States are encouraged to create new late-growth funding opportunities (e.g. Fund of Funds) that use public funding to crowd private capital into deep tech start-ups and scale-ups, in particular through the European Tech Champions Initiative [67].
Member States are invited to implement the Europe Startup Nations Declaration [68].
Member States should mobilise public policies, including innovative procurement to foster the scaling up of start-ups, to facilitate the creation of spinoffs from universities and research centres, and to monitor progress in this area.

64 *EU unicorn numbers stated are for EU-founded companies that continue to have their HQ in the EU.*
65 *Startup Genome, The Global Startup Ecosystem Report 2023.*
66 *DealRoom, The European Deep Tech Report 2023 edition. Venture capital spent by startup whose HQ is in the EU is worth EUR 30 billion against EUR 166 billion for the US between 2020 and 2022.*
67 *Launch of New Fund of Funds to Support European Tech Champions*
68 *24 EU Member States committed at Digital Day to take action to support growth of EU Startups*

3.3 DIGITAL DECADE OBJECTIVE: CYBERSECURITY

The global cyber threat landscape continues to be volatile, with a rise in cyberthreats of 150% in a year [69], in particular distributed denial of service (DDoS) attacks and an estimated 280 ransomware incidents attacks per month [70]. During 2021, 22.2% of EU enterprises experienced an ICT security-related incident leading to unavailability, destruction or corruption of data, or the disclosure of confidential data [71]. Increased dependencies and the development of new technologies, such as quantum computing and AI, add complexity to the threat landscape and introduce new risks for which further preparedness is needed.

While cybersecurity is not included as a target for 2030, improving resilience to cyberattacks, contributing to increasing risk-awareness and the knowledge of cybersecurity processes, and increasing the efforts of public and private organisations to achieve at least basic levels of cybersecurity is one of the general objectives set out in the Digital Decade Decision [72]. Moreover, the Digital Decade Decision points to the development of a possible specific target as part of its review planned in 2026 [73].

Furthermore, the signatories of the Declaration on Digital Rights and Principles 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 [74].

Since 2020, **the EU has significantly strengthened its policy landscape to prevent, detect, deter, and respond to cyberattacks on the EU**, notably with the NIS2 Directive [75] and the opening of the European Cyber Security Competence Centre in Bucharest, which aims to further increase the EU's cybersecurity capacities and collaboration between Member States in this field.

With the adoption of the e-evidence package this year, Member States' authorities now have effective tools at their disposal to order the disclosure of digital evidence of cyberattacks of criminal nature, and the 2022 Second Additional Protocol to the Budapest Convention on Cybercrime, which the Commission negotiated on behalf of the Union, strengthens our cooperation with third countries on these matters. As an example of sectoral action, the Digital Finance Strategy [76] and, in particular, the Digital Operational Resilience Regulation [77] set out measures to ensure that financial institutions have adequate safeguards against cyber-risks.

However, **more needs to be done to improve situational awareness, crisis preparedness and response, as well as supply chain security** in a context of stark growth in the highly impactful and sophisticated supply chain attacks, where bad actors exploit vulnerabilities in suppliers' products to gain a foothold inside organisations. The proposed **Cyber Resilience Act** [78], which is to introduce cybersecurity requirements for hardware and software made available on the European market, is set to become a major game changer in our efforts to combat this type of attacks. The proposed **Cyber Solidarity Act** [79] will enhance cyber threat detection, preparedness and response. Finally, there is an urgent need to address the lack of cybersecurity professionals in the EU, with estimations on the shortfall ranging between 260 000 and 500 000. The launch of the **Cybersecurity Skills Academy** [80] has to be built upon to counter this.

69 *Thales, A year of cyber conflict in Ukraine, February 2023.*
70 *ENISA, Threat landscape for ransomware attacks, July 2022.*
71 *See Eurostat, ICT security measures used by EU enterprises in 2022, which shows that large enterprises reported significantly higher values of incidents than SMEs.*
72 *See Article 3(1)(k) of the Digital Decade Decision.*
73 *See recital 20.*
74 *SWD(2023)570 'Implementation of the Digital Decade objectives and the Digital Rights and Principles'.*
75 *Directive (EU) 2022/2555 on measures for a high common level of cybersecurity across the Union*
76 *Digital Finance Strategy*
77 *Regulation (EU) 2022/2554 of the European Parliament and of the Council of 14 December 2022 on digital operational resilience for the financial sector*
78 *COM/2022/454 final, proposal for a Regulation of the European Parliament and of the Council on horizontal cybersecurity requirements for products with digital elements and amending Regulation (EU) 2019/1020*
79 *COM (2023) 209 final, proposal for a Regulation of the European Parliament and of the Council laying down measures to strengthen solidarity and capacities in the Union to detect, prepare for and respond to cybersecurity threats and incidents.*
80 *COM (2023) 207 final, Closing the cybersecurity talent gap to boost the EU's competitiveness, growth and Resilience ('The Cybersecurity Skills Academy').*

Recommended policies, measures and actions

Member States should ensure that Digital Decade cybersecurity objectives are fully reflected in their national roadmaps and their further adjustments and that in particular the lack of cybersecurity professionals is also urgently addressed.

Member States are invited to work closely with the Commission and ENISA towards developing a monitoring framework in cybersecurity to follow progress as part of the Digital Decade 2030.

Member States should improve situational awareness, as well as crisis preparedness and response, at EU level and nationally, in particular by ensuring that EU-CyCLONe [81] becomes fully operational swiftly.

3.4 DIGITAL DECADE OBJECTIVE: RESILIENCE

The COVID-19 pandemic, Russia's war of aggression against Ukraine, and generally the current geopolitical risks underline how important it is to ensure the EU's digital transformation is both secure and resilient. Reinforcing the Member States' collective resilience is one of the general objectives set out in the Digital Decade Decision [82].

This entails first the identification and better monitoring of the value and supply chains that are strategic for the EU to promptly address high-risk dependencies. Action to identify and address strategic dependencies is being taken through several means. First, the Commission stepped up efforts to identify strategic dependencies across sensitive industrial ecosystems [83].

It continues to do this, for example through the **Observatory of Critical Technologies**, as well as updated and refined analyses of strategic dependencies [84]. Second, a wide range of policy actions have been taken to address the identified dependencies, through adapted regulatory frameworks (e.g. the EU Chips Act) and other policy instruments (such as e.g. in the context of the updated Industrial Strategy and the Action Plan on synergies between civil, defence and space industries). The recent proposal for a **Critical Raw Materials Act** [85] also aims to address these challenges and to ensure a secure and sustainable supply of critical raw materials to meet the EU's needs and stay resilient. Third, Important Projects of Common European Interest, as well as **Industrial Alliances** [86], continue to play an important role in addressing known strategic dependencies and increasing the resilience of the value and supply chain that underlies digital technologies.

However, **the vulnerability of the digital environment as a whole is still not monitored comprehensively,** along the lines of the macroprudential stress tests applied in the financial sector. While the Digital Decade is a first step towards such a comprehensive monitoring, an extensive stress testing would require a new analytics infrastructure and expansive datasets to simulate potential disruptions.

Recommended policies, measures and actions

To promote sovereignty and ensure full compliance with EU values, Member States should foster the development and deployment of European digital technologies and services and mobilise equity resources to support companies in strategically relevant sectors, in particular through joint efforts and multi-country projects, as well as by building on the Strategic Technologies for Europe Platform (STEP) [87] and its Sovereignty Seal.

Building on the European Security Strategy [88], the Commission invites the Member States to develop a joint stress test capacity to monitor and anticipate risks that would affect the resilience of the digital ecosystem.

81 *The European cyber crisis liaison organisation network (EU-CyCLONe) is a cooperation network for Member States national authorities in charge of cyber crisis management.*
82 *See Article 3(1)(k) of the Digital Decade Decision.*
83 *See for example SWD (2021)352 and SWD(2022)41.*
84 *See for example Single Market Economics Papers (Working Paper 14, 2023): "An enhanced methodology to monitor the EU's strategic dependencies and vulnerabilities".*
85 *COM/2023/160 final, Proposal for a Regulation establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) 168/2013, (EU) 2018/858, 2018/1724 and (EU) 2019/1020.*
86 *Such as the European Battery Alliance, the European Alliance for Industrial Data, Edge and Cloud and the Industrial Alliance on Processors and Semiconductor Technologies.*
87 *COM(2023) 335 final, Proposal for a Regulation of the European Parliament and of the Council establishing the Strategic Technologies for Europe Platform ('STEP') and amending Directive 2003/87/EC, Regulations (EU) 2021/1058, (EU) 2021/1056, (EU) 2021/1057, (EU) No 1303/2013, (EU) No 223/2014, (EU) 2021/1060, (EU) 2021/523, (EU) 2021/695, (EU) 2021/697 and (EU) 2021/241.*
88 *JOIN (2023) 20 final, Economic Security Strategy.*

4. Digital transformation to empower EU people and society

4. Digital transformation to empower EU people and society

Eurobarometer 2023 As regards safe digital environments and control over their data, less than half of Europeans think the implementation of digital rights and principles in their country is satisfactory, with major deficits identified in **protecting children and young people** (see also 4.4). Nearly three quarters (74%) of Europeans stressed the importance of **improving rules, tools and services to help people control their data online**, while 67% would like for digital products and online services to **be better adapted to their personal needs**, and 67% of Europeans **asking for more education and training to develop their digital skills.** A large majority (86%) thinks cooperation between Member States should **ensure that digital technologies comply with fundamental rights and European values, and that they are accessible to everyone.**

Putting people at the centre of the digital transformation of our societies and economies is at the core of the EU vision for the Digital Decade. The EU and its Member States have agreed to ensure digital technologies enhance the well-being and quality of life of all Europeans, respect their rights and freedoms, and promote democracy and equality. This is reflected in the European Declaration on Digital Rights and Principles, which shall be taken into account by Member States when cooperating to achieve and measure progress towards the general objectives. It is also reflected in the general objectives and targets of the Digital Decade Decision, focused around two further cardinal points: digital skills and digitalisation of public services.

The following sections monitor progress in relation to these two cardinal points. The analysis is completed by a monitoring of progress also in relation to the Digital Decade objectives related to safeguarding fundamental rights and empowering democratic life and protection of children, given their particular importance in the context of current key challenges.

4.1 CARDINAL POINT: DIGITAL SKILLS

The Digital Decade Decision sets concrete targets for 2030 to ensure that people and society at large are given appropriate digital skills to fully benefit from and contribute to current and future opportunities in the information space. The targets envisage that at least 80% of those aged 16-74 shall have at least basic digital skills and at least 20 million ICT specialists shall be employed within the EU, with the aim of achieving gender balance.

4.1.1 Target: basic digital skills

Eurobarometer 2023: The importance of digital skills is clearly appreciated by Europeans. **Almost one third of Europeans (30%) do not feel appropriately equipped for the Digital Decade** and think that supporting more education and training in **digital skills should be among the top five digital priorities in their country** (Special Eurobarometer)

Increasing digital skills in the population is one of the biggest challenges of the EU, cutting across all objectives and targets. In this context, the Declaration on Digital Rights and Principles states that everyone should be able to acquire all the basic and advanced digital skills they need. Still, 46% of Europeans, in particular among older people, do not currently have the basic digital skills, hampering the use of digital technologies for everyday tasks and access to services offered online [89]. While the digital skills gap between men and women has decreased in recent years [90], it is still significant for people who are older, have received less formal education, or live in a rural area or an outermost region. Significant differences also remain between Member States. Based on past observed data, only 59% of the population would have at least basic digital skills by 2030, if no further action is taken [91].

89 *Such as obtaining information from public authorities, using online banking, buying online, or other selected activities related to internet or software use. For more information on the digital skills indicators published by Eurostat see: https://ec.europa.eu/eurostat/web/digital-economy-and-society/data/database.*
90 *SWD (2023)571 'Digital Decade cardinal points: digital skills, digital infrastructures, digitalisation of business and digitalisation of public services'.*
91 *See C(2023) 7500 'Communication from the Commission establishing the Union-level projected trajectories for the digital targets'*

Digital transformation to empower EU people and society

To tackle these issues, **the EU has considerably reinforced its action** through the Structured Dialogue on digital education and skills [92] to support Member States in applying an integrated, coherent, and more ambitious whole-of-government approach. It led, in April 2023, to the adoption of two proposals for Council Recommendations which aim to support Member States and the education and training sector in providing high-quality, inclusive and accessible digital education and training to develop the digital skills of European citizens [93]. In addition, the Commission is mobilising several funding programmes to boost digital skills, for a total amount of EUR 26.9 billion, notably from the Digital Europe Programme, Erasmus+, the European Social Fund Plus and about 18% of the RRF digital expenditure (i.e., EUR 23 billion) [94]. Finally, given the urgency to boost skills, including digital skills at all levels, President von der Leyen announced during the State of the Union address in 2022 [95] that 2023 would be designated as the European Year of Skills [96].

Nonetheless, **reaching the 2030 Digital Decade target on basic skills consequently requires significant investment and targeted policy interventions.**

Recommended policies, measures and actions

Building on the European Year of Skills, Member States should prioritise investment in digital education and skills and adapt to the rapidly evolving digital landscape.

Member States should include in their national roadmaps and subsequent adjustments a clear plan on how they intend to implement the pending actions foreseen as part of national Recovery and Resilience plans as well as how they are planning to take into account the Commission's proposals for a Council Recommendation on improving the provision of digital skills in education and training and for a Council Recommendation on the key enabling factors for successful digital education and training.

92 *Available at: https://education.ec.europa.eu/focus-topics/digital-education/action-plan/action-1.*
93 *COM/2023/205 final/2, Proposal for Council Recommendation on the key enabling factors for successful digital education and training, and COM/2023/206 final, Proposal for a Council Recommendation on improving the provision of digital skills in education and training.*
94 *In accordance with Annex VII of the RRF Regulation.*
95 *State of the Union addresses (europa.eu)*
96 *European Year of Skills (europa.eu)*

4.1.2 Target: ICT specialists

Ensuring an adequate number of ICT specialists is critical for a successful digital transformation [97]. As reliance on digital technology increases, the workforce must keep up with the evolving skills demand and the objective of regaining leadership. While the number of ICT specialists employed in the EU is growing, so is the number of companies operating in the ICT sector, and a majority of companies looking for ICT specialists continue to report substantial difficulties in recruitment [98]. The lack of available staff with the right set of skills is hampering investments for 85% of EU firms [99], with SMEs struggling more often in filling ICT vacancies [100].

The EU needs to step up its efforts in the global race for talents and particularly in the field of science, technology, engineering, and mathematics (STEM). Despite the numerous initiatives and EU funding programmes that play a significant role in developing, attracting, and retaining skills, under a business-as-usual scenario, the number of ICT specialists in the EU will be close to 12 million by 2030 [101].

Hence, **Member States should collectively more than double the average increase of ICT specialists to close the gap with the Digital Decade target**. Innovation depends on the successful nurturing, attraction and retention of talented individuals and a diverse array of skills. High-quality education from early stages and attractive working conditions are key to attracting and ensuring a flow of highly skilled and talented individuals who can help contribute to the digital transformation and give the EU a competitive edge in strategic value chains [102].

Leveraging women's contributions is essential for tackling the shortage of ICT specialist skills and building an inclusive digital Europe. The severe and persistent gender gap in the ICT sector undermines how digital solutions are designed and deployed, with proven negative consequences for social equality and welfare overall. In 2021, 81% of employed ICT specialists were male [103]. To increase the number of women in ICT, all EU Member States must take action to promote their access to this field starting from an early age.

Recommended policies, measures and actions

Building on the European Year of Skills, Member States should prioritise investment in digital education and skills and adapt to the rapidly evolving digital landscape, including by attracting and retaining talents, to meet the Digital Decade general objectives and targets, notably for quantum computing, microprocessors and digitalisation of businesses and digital public services.

Member States should propose in their roadmaps concrete actions on attracting and retaining ICT specialists, in particular through relevant monitoring, and concrete collective actions. Specific attention should be given to addressing the gender gap.

97 *SWD (2023)571 'Digital Decade cardinal points: digital skills, digital infrastructures, digitalisation of business and digitalisation of public services'.*
98 *See also Khan, J. (2021), European academic brain drain: A meta synthesis. European Journal of Education, 56(2), 265-278.*
99 *European Investment Bank, Investment Report 2022/2023: Resilience and renewal in Europe, 2023.*
100 *Eurostat survey on the skills gap | Digital Skills and Jobs Platform (europa.eu)*
101 *See C(2023) 7500 'Communication from the Commission establishing the Union-level projected trajectories for the digital targets'.]*
102 *COM/2022/332 final, A New European Innovation Agenda.*
103 *See ICT specialists in employment - Statistics Explained (europa.eu)*

4.2 CARDINAL POINT: DIGITALISATION OF PUBLIC SERVICES

Access to digital public services, eID and electronic health records are critical elements of a human-centred digital transformation. The Digital Decade Decision sets concrete targets to ensure that public services, health and care services are available and accessible online for all, in particular, for people in disadvantaged situations, including older people and people with disabilities, as well as people in rural and remote areas. More specifically, the Digital targets provide for 100% online accessibility of key public services and, where relevant, the possibility for citizens and businesses in the Union to interact online with public administrations, online access to their electronic health records for 100% of Union citizens, and access to secure electronic identification (eID) for 100% of Union citizens. While working towards the digital transformation of digital public services and their availability online, Member States need to ensure that the services they offer are accessible to all persons, without discrimination and are aligned with EU fundamental rights.

4.2.1 Target: key public services

The situation regarding access to online public services has slightly progressed for businesses and citizens but could nonetheless be further improved. Many Member States are relatively well positioned to achieve the target of 100% online availability of public services for businesses [104] and, in general, 88% of central government services are completely online, compared to 76% for regional government services and 62% of local government services [105]. However **significant challenges remain to achieve general objectives such as resilience, sovereignty and a human-centred digital environment.**

Member States are investing in the reform of their public sector and its digital transformation: the combined planned investment in digitalising public services and e-government solutions through the national Recovery and Resilience Plans stands at EUR 48 billion [106].

Of this amount, EUR 33.6 billion can be directly linked to the digital public services targets. The implementation of the Single Digital Gateway [107] and of the Once-Only principle will be critical for further stimulating the digitalisation of public services, with the effect of increasing the EU's competitiveness and achieving a level-playing field within the single market.

While the roll-out of digital public services is progressing steadily, **investment in public procurement of innovative digital solutions (e.g., based on AI or big data) is insufficient** and would need to increase substantially from EUR 118 billion to EUR 295 billion in order to reach full speed adoption of innovative digital solutions in public services [108]. There is a need for significantly higher investment not only in public services and health, but in all fields of public sector activity, such as transport, security, education and culture, construction, energy, water, and environment.

Furthermore, **targeted action is needed to improve cross-border online availability and the overall performance of online public services** [109]. Interoperability is a key enabler for this. The Commission has proposed the **Interoperable Europe Act** [110] to strengthen cross-border interoperability and cooperation in the public sector across the EU. Cross-border interoperability can lead to yearly cost-savings between EUR 5.5 and EUR 6.3 million for citizens and between EUR 5.7 and EUR 19.2 billion for businesses dealing with public administration [111].

104 *As regards companies, Directive (EU) 2019/1151 of the European Parliament and of the Council of 20 June 2019 amending Directive (EU) 2017/1132 as regards the use of digital tools and processes in company law, OJ L 186, 11.7.2019, p. 80–104, was a major step to reduce the burden. It ensures that companies and their branches in other Member States can be registered, and file their information in the business register, fully online. As a second step, the proposal on Upgrading Digital Company Law (COM/2023/177 final) will help companies to do business in the EU by increasing the availability of company information and removing administrative barriers when companies use their information in cross-border situations.*
105 *e-Government Benchmark 2023, Capgemini, Sogeti, IDC and Politecnico di Milano for the European Commission*
106 *SWD (2023)571 'Digital Decade cardinal points: digital skills, digital infrastructures, digitalisation of business and digitalisation of public services'.*
107 *For further information, see Single digital gateway (europa.eu)*
108 *See result of the Commission Benchmarking of innovation procurement investments and policy frameworks across Europe, March 2023.*
109 *e-Government Benchmark 2023, Capgemini, Sogeti, IDC and Politecnico di Milano for the European Commission*
110 *COM (2022) 720 final, Proposal for a Regulation of the European Parliament and of the Council laying down measures for a high level of public sector interoperability across the Union (Interoperable Europe Act).*
111 *SWD(2022)721, Impact Assessment Report Accompanying the Proposal for a Interoperable Europe Act, p. 54.*

Finally, **Member States need to ensure that the digital public services they offer are accessible to all,** including older people and people with disabilities, and citizens from other Member States, without discrimination, and that these are aligned with EU fundamental rights, values and principles, such as the once-only principle and user-centricity. The Declaration on Digital Rights and Principles states that everyone should have online access to key public services in the EU. Specifically, the EU and Member States have committed to facilitating and supporting seamless, secure and interoperable access across the EU to digital public services designed to meet people's needs effectively, including and in particular digital health and care services, notably access to electronic health records.

Recommended policies, measures and actions

Member States should step up investment and regulatory measures to develop and make available secure, sovereign and interoperable digital solutions for online public and government services.

Member States should monitor the effective use of online public services as well as possible gaps, including between urban and rural areas. Member States should intensify their efforts to ensure that everyone, including older people and people with disabilities, has equal access to online public services, in particular with a swift deployment of the Single Digital Gateway and an active onboarding of authorities to the once-only technical system for the automated exchange of evidence by the end of 2023.

Member States should develop action plans in support of innovative procurement and step up efforts to increase public procurement investments in developing, testing and deploying innovative digital solutions.

Member States are invited to make further progress with their multi-country commitments and cooperation in the field of connected public administration and the European Blockchain Services Infrastructure, possibly also through the proposed EDICs in these areas.

4.2.2 Target: electronic identification

This Digital Decade target could be achieved thanks to a timely implementation of the European Digital Identity Wallet by the Member States [112]. Thanks to the European Digital Identity Wallet, people and businesses in Europe will have a convenient, secure and interoperable identification service at their disposal. There should be less paperwork and red tape for citizens and companies in all their online transactions, with both public sector bodies and private digital service providers.

Following a call for proposals in 2022, four pilot projects co-funded under the Digital Europe Programme were launched in April 2023, to test the wallet in a number of everyday situations and its integration into national eID system in 26 Member States and Iceland, Norway and Ukraine. Member States have already scheduled projects for the implementation of the European Digital Identity Wallet in their National Recovery and Resilience Plans.

In order to make sure that our currency, the euro, is fit for the future, in June 2023 the European Commission proposed a legal framework to regulate the essential elements of a **digital euro** [113], which would enable the European Central Bank to introduce a digital euro that is widely usable and available. A digital euro will allow business and citizens to have an additional choice of payment with which they can pay widely to other citizens and in shops or e-commerce websites – even without internet connection, and with a high standard of data protection. The goal is for the digital euro to be fully interoperable with the European Digital Identity Wallet.

Recommended policies, measures and actions

Member States should prepare to set up and implement of the European Digital Identity Wallet, in particular through pilot projects and by mobilising the digital ecosystem. Member States are also invited to notify eIDAS identification schemes, in particular for businesses, to the Commission.

112 *Following the revision of the Regulation on electronic identification and trust services for electronic transactions (eIDAS) , Member States will be obliged to issue Digital Identity Wallets within 12 months of the entry into force of the Regulation .*

113 *Single Currency Package: new proposals to support the use of cash and to propose a framework for a digital euro*

4.2.3 Target: electronic health records

The digitalisation of health has the potential to transform the healthcare landscape, improving access to care, enhancing patient engagement, and ultimately leading to better health outcomes for individuals and communities, notably in rural and remote areas. Improving access to health data is also the first step towards being able to control the flow of health data and to share it securely: for example, to seek a second opinion or receive treatment from a different healthcare provider.

Overall, the EU performs well on the access to e-health records indicator, and it is on track to meet the EU target of 100% of EU citizens having access to their electronic health records [114]. A successful example of this performance is the **EU digital COVID certificate** [115], as a key digital tool contributing to health objectives, cross-border travel and making people's lives easier, which was put in place in record time at the start of summer 2021. More than EUR 2.3 billion EU digital COVID certificates have already been issued in the EU alone. Several factors contributed to this major achievement: (i) a strong political will across all EU institutions and Member States; (ii) excellent cooperation and coordination between Member States; (iii) funding for Member States. In June 2023, the World Health Organization took up the EU's digital COVID certification to create a global system that will help facilitate global mobility and protect people across the world from ongoing and future health threats, including pandemics [116].

114 *Digital Decade e-Health indicators development, Empirica GmbH and PredictBy study for the European Commission* *115 The EU digital COVID certificate*
115 *The EU digital COVID certificate*
116 *See statement: The European Commission and WHO launch landmark digital health initiative to strengthen global health security*
117 *COM/2022/197 final, Proposal for a Regulation of The European Parliament and of the Council on the European Health Data Space, 3 May 2022.*

Still, issues to be addressed remain and include expanding the number of connected healthcare providers, the range of accessible data, and the use of eIDAS-authentication to health data access services. With the objective of improving the accessibility of health data, the Commission has made a legislative proposal for a **European Health Data Space** [117]. In particular, the proposal aims to improve people's access to their own electronic health data, to support the exchange of health data between healthcare providers, and to encourage the reuse of health data to support research, policymaking and other related purposes.

Recommended policies, measures and actions

Member States should ensure that access to electronic health records, with a minimum set of health-related data stored in public and private electronic health-record systems, is technologically enabled and easily accessible for people (via a patient portal or a patient mobile app).
In line with the eIDAS Regulation and its revisions, Member States should also provide secure means of authentication and take measures to ensure equal and equitable access for all people (including guardians for children, older people and people with disabilities), seeking to ensure that at least 60% of potential public and private providers are technically connected and consistently supplying health data.
Member States are invited to get involved in the preparatory works for setting up the proposed EDIC in the area of genomics and in the federated European infrastructure for cancer imaging data with a view to driving innovation in personalised healthcare and AI solutions in cancer care.

4.3 DIGITAL DECADE OBJECTIVE: SAFEGUARDING FUNDAMENTAL RIGHTS AND EMPOWERING DEMOCRATIC LIFE

Eurobarometer 2023: The importance of **protecting users from disinformation and illegal content** is clearly recognized by Europeans. This ranks **one of the top three priorities of Europeans for their countries** from now until 2030, along with protecting users from cyber-attacks and improving the availability of high-speed internet (Special Eurobarometer).

Digital technologies and services have the ability to shape how we live together and exercise our roles as citizens. They create new ways to exercise and enjoy fundamental rights and freedoms as well as to participate in democratic life, but also new ways in which they can be infringed. This is in particular the case for AI and algorithmic systems which could pose serious risks to human dignity, equality, liberty, security, and invasion of privacy including the potential for misuse of personal data [118]. Technologies are instrumentalised by authoritarian regimes [119], bringing forward new challenges to democracies, the rule of law [120], and growing polarisation and online hate speech, both in the EU and globally.

Promoting a human-centred, fundamental-rights-based, inclusive, transparent and open digital environment where secure and interoperable digital technologies and services observe and enhance Union principles, rights and values and are accessible to all, everywhere in the Union, is one of the general objectives set out in the Digital Decade Decision [121]. Furthermore, the Declaration on Digital Rights and Principles includes 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 highlights notably the role of very large online platforms in mitigating the risks stemming from the functioning and use of their services, including in relation to disinformation. The EU and the Member States have also committed to supporting the development and best use of digital technologies to stimulate people's civic engagement and democratic participation.

In this context, thanks to pioneering regulation, the EU is setting the global standard in creating more human-centred online environments and digital technologies for this and the following decades.
With the Digital Services Act, the EU has introduced an unparalleled and comprehensive new regulatory framework to address the societal impacts of digital services in the EU and ensure the highest protection for the fundamental rights of EU citizens online in a non-discriminatory way. On 25 April 2023 the Commission designated 17 Very Large Online Platforms (VLOPs) and 2 Very Large Online Search Engines (VLOSEs) [122]. At the date of this Communication, the stringent obligations on these platforms have entered into force. They were required to adopt risk assessment and risk mitigation measures as part of a yearly cycle, to address the risks their services pose to our democratic societies and people's rights, including the impact on fundamental rights, disinformation and negative effects on physical and mental well-being and on minors, sale of illegal products and a high-level of consumer protection. In its role as supervisor and enforcer, the Commission is scrutinizing the measures taken by VLOPs and VLOSEs, including their content moderation algorithms, their advertising practices and the design of their recommendation systems [123] [124].
The Declaration on Digital Rights and Principles provides a clear reference point for policy makers, as well as companies and experts, when making their assessments.

118 *See AccessNow (2023): What you need to know about generative AI and human rights ; Marina Escobar-Planas, Emilia Gómez and Carlos Martínez Honarejos, Guidelines to Develop Trustworthy Conversational Agents for Children, Ethicomp, 2022; and https://www.ohchr.org/en/stories/2022/01/web-was-created-everyone-regardless-their-gender .*
119 *Democracy Report 2022 Autocratisation Changing Nature? V-DEM institute*
120 *2023 Rule of Law report*
121 *See Article 3(1)(a) Digital Decade Decision.*
122 *The list of designated VLOPs and VLOSEs is available at this link.*
123 *It will do so with the help of experts from the newly established European Centre for Algorithmic Transparency.*
124 *Several other sectorial initiatives at EU level seek to tackle specific types of illegal or harmful content, while at the same time guaranteeing the protection of fundamental rights. For example, the Audiovisual Media Services Directive , 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, the proposal for the Regulation on political advertising , and the General Product Safety Regulation.*

Digital transformation to empower EU people and society

With the AI Act, the EU is pioneering a regulation to mitigate the threats posed by AI and algorithmic systems and ensure that high-risk AI systems are designed, deployed and used in full consideration and respect of fundamental rights and democratic values. The Commission proposes to classify some systems as high-risk based on their intended purpose and potential impact. These systems would have to comply with specific requirements, like being based on suitable datasets to avoid unlawful discrimination and enabling human supervision of outcomes. In this context, AI standards currently in development [125] will play a key role by defining technical solutions to fulfil the essential AI trustworthiness requirements specified in the legal text. Moreover, the AI Act proposal seeks to ensure an adequate level of transparency and awareness with an obligation to label deep fakes and inform natural persons when they are interacting with an AI system, which are two key elements in light of the new threats and opportunities linked to generative AI. In view of the acceleration of technological developments and of the mainstream adoption of AI technologies, the Commission has also launched discussions towards an AI Pact. This initiative seeks the voluntary commitment of industry to anticipate the AI Act and to start implementing its main requirements ahead of the legal deadline.

Countering the spread of online mis- and disinformation is essential to creating a human-centred digital environment that empowers democratic life. Addressing this threat gains renewed urgency as generative AI technologies provide new tools to bad actors on an unprecedented scale [126]. Beyond the tools offered by the DSA, the **Code of Practice on Disinformation** [127], signed by a broad range of signatories including several major online platforms, contains important commitments to limit the spread of disinformation online and aims to become a Code of Conduct under the DSA [128].

Empowering independent media actors to provide reliable information online and people to seek out such information is key to strengthening our democratic societies' overall resilience in the digital age. The Commission proposal for a European Media Freedom Act, currently under negotiation, seeks to improve the functioning of the Single Market for media services as they become more digital and inherently cross-border. When adopted, it will lead to increased investment and competition, thus giving consumers access to a more diverse range of quality media content and contributing to pluralistic public debates, in line with the Declaration on Digital Rights and Principles.

With the Communication on virtual worlds [129] , the Commission proposes actions to support the development and use of virtual worlds in the EU, structured around the objectives of the Digital Decade Decision. The Commission aims for a Web 4.0 and virtual worlds based on EU values and principles and fundamental rights, where people can be safe, confident and empowered, where people's rights as users, consumers, workers or creators are respected, and where European businesses can develop world-leading applications, scale up and grow.

125 *See JRC Publications Repository, Analysis of the preliminary AI standardisation work plan in support of the AI Act*
126 *Analysis from the European Digital Media Observatory (an independent network of fact-checkers, media literacy experts and academic researchers working together to detect, analyse and expose disinformation campaigns and research mitigating measures) shows that while the percentage of AI-generated disinformation was still quite low in March 2023, it was circulated widely across the EU; see EDMO, Monthly brief no. 22.*
127 *2022 Strengthened Code of practice on disinformation*
128 *See Commission Guidance on Strengthening the Code of Practice on Disinformation*
129 *COM (2023) 442/final, 'An EU initiative on Web 4.0 and virtual worlds: a head start in the next technological transition'.*

Recommended policies, measures and actions

In line with the DSA, Member States should build up capacity and competence for robust enforcement of the DSA, including the appointment of the independent authorities tasked with supervising the rules and with coordinating the regulatory supervision and assistance in each Member State (legal obligation to be completed by 17 February 2024 at the latest).
Member States are encouraged to step up their efforts to support and protect civil society organisations who are working to protect, promote and defend fundamental rights online e.g., as trusted 'problem flaggers' under the DSA.
Member States should continue to intensify their efforts to prevent and tackle risks of inequality and discrimination that may follow from the use of digital technologies, including AI.
Member States should continue their efforts to improve the media literacy skills of people. This is particularly crucial to ensure that people can make their electoral choices free from the influence of mis- and disinformation, and that they are alert to the mis- and disinformation risks posed by new technologies.

4.4 DIGITAL DECADE OBJECTIVE: PROMOTING A HUMAN-CENTRED ENVIRONMENT – FOCUS ON PROTECTING CHILDREN

Europe's human-centred digital transformation must protect the most vulnerable members of society from online harms. The internet has accelerated the emergence and development of new threats and trends and the figures are alarming: data collected by the EU-funded Safer Internet Centre helplines show significant increases in the number of people seeking help or advice between 2021 and 2022 on sextortion (up +60%), online reputation (up +32%) and e-crime (+30%). In 2022, 60% of all contacts were made by children aged between 12 and 18, 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.

A safer digital environment and more appropriate content for children and young people is a key priority of the Digital Decade. The Declaration on Digital Rights and Principles provides that children and young people should be protected from crimes committed via or facilitated through digital technologies. The Declaration contains several commitments in this respect, from providing education to navigate the digital environment, to protecting children and young people from harmful and illegal content, as well as from profiling for advertising purposes, and involving children themselves in the development of digital policies in which they are concerned.

The EU's commitment to a digital transformation that works for children is reinforced in the DSA, which includes specific provisions for the protection of minors. The work of the Safer Internet Centres and the actions taken under the Better Internet for Kids strategy [130] will support the implementation of the relevant provisions in the DSA. **Online age verification** is a priority for the Commission: contributing to the target on access to a digital ID, the Commission will promote the use of the EU Digital Identity Wallet to this effect.

The fight against child sexual abuse and exploitation remains also a key priority for the EU. In May 2022, the Commission adopted a proposal for a Regulation to prevent and combat child sexual abuse [131] setting out clear obligations for online service providers to prevent the risk of child sexual abuse and exploitation on their services, and to detect, report and remove these crimes when they occur.

Recommended policies, measures and actions

To ensure better protection of children online, Member States should build up capacity and competence for robust enforcement of the DSA. Member States should also use digital IDs and the EU Digital Wallet to prove a child's age and develop other age verification mechanisms.
Member States should also organise specific awareness raising campaigns.

130 *See the Better internet for kids' Strategy.*
131 *Proposal for a Regulation of the European Parliament and of the Council laying down rules to prevent and combat child sexual abuse.*

5. Digital transformation to support the EU Green Deal

5. Digital transformation to support the EU Green Deal

Eurobarometer 2023: the twinning of the digital and green transitions is considered a key factor in Europe's digitalisation. **Two out of three people in Europe consider that digital technologies will play an important role in fighting climate change.**

The ICT sector is an important source of emissions and waste. Today, it accounts for approximately 7% to 9% of global electricity consumption, forecast to rise to 13% by 2030 [132], for 2% to 4% of total GHG emissions and increasing amounts of eWaste [133]. The fast-evolving nature of digital technologies and the possible sharp increase in digitally enabled services is likely to reinforce this situation.

At the same time, the digital transformation is a vital ally in our efforts to reduce our environmental footprint. [134] The Digital Decade Decision sets the objective of 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 [135]. Indeed, the Decision includes several references to the **sustainability of infrastructures targets**, notably edge nodes and semiconductors. The Declaration on Digital Rights and Principles promotes digital products and services with a minimum negative impact on the environment and on society, as well as digital technologies that help fight climate change.

Moreover, the Declaration provides that access to accurate and easy-to-understand information on the environmental impact and energy consumption of digital products and services should be available to everyone. Finally, the Council Conclusions *Digitalisation for the benefits of the environment* of December 2020 recognised that digitalisation is an excellent lever to accelerate the transition to a climate neutral, circular and more resilient economy.

As shown in the 2022 Strategic Foresight Report, when implemented under the right conditions, digital solutions have demonstrated significant reduction in greenhouse gas emissions, increased resource efficiency and improved environmental monitoring [136]. The overall potential of emission reduction using digital solutions based on existing technologies is estimated at 15%-20% of total greenhouse gas emissions by 2030, provided they are properly used and governed[137].

132 See the Strategic Foresight Report 2022, the Action plan on Digitalisation of Energy Systems and eWaste Monitor
133 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; see GEM 2020 - E-Waste Monitor (ewastemonitor.info)
134 See Giec- Synthesis Report of The IPCC Sixth Assessment Report (AR6), 2023.
135 See Article 3(1)(h) Digital Decade Decision.
136 Strategic Foresight Report Twinning the green and digital transitions in the new geopolitical context, COM/2022/289 final.
137 IPCCC Report 2022 (B.4.3) available at this link.

Digital transformation to support the EU Green Deal

Nonetheless further action is needed and investment is key to incentivise the move towards more resource-efficient digital technologies. The delegated act of the EU Taxonomy Regulation[147] on climate mitigation and adaptation has set clear criteria that will help steer investment towards greener data centres and proven green digital solutions as a sustainable economic activity. At the same time, the Temporary Crisis and Transition State Aid Framework[148] will help harness digital technologies for a greener and more sustainable economy, in particular the digital component of clean tech manufacturing, whilst the amendments to the GBER have the potential to facilitate, simplify and speed up support for the EU's green and digital transitions, facilitating investments in digital technologies and connectivity[149]. Finally, the revision of the Recovery and Resilience Plans, in light of REPowerEU, where inter alia the potential of digital solutions for the energy transition can be considered, is an opportunity to support the digitalisation of the energy system.

Moreover, **there is a need for science-based assessment methodology on the 'net environmental impact' of increased digitalisation** that take into account both the benefits and the possible rebound effects. This entails also the collection of evidence of the net environmental impacts of digitalisation across the EU to ensure its positive contribution to European Green Deal goals. The Commission has launched dedicated R&I initiatives, including under Horizon Europe, to support this ambition and will intensify its work to on developing common indicators for measuring the environmental footprint of electronic communications services.

Recommended policies, measures and actions

Member States should monitor the impact of digitalisation on the environment and contribute to the development of measurement tools that build on the Toulouse call for a Green and Digital Transition in the EU[150].

Member States are invited to build on the European Green Deal and Temporary Crisis and Transition State Aid Framework to foster the transition towards a net-zero economy for digital solutions, in particular with regard to digital innovation hubs, testing and experimentation, ambitious connectivity projects including backhaul networks, gigabit connectivity projects connecting socio-economic drivers like schools.

Member States should ensure synergies between their national Digital Decade roadmaps and the 2021- 2030 national energy and climate plans.

Member States should enhance cooperation and joint investments in the areas relevant for the twin transitions, such as mobility and logistics data, or local digital twins, possibly also through the proposed EDICs in these fields.

147 Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088, OJ L 198, 22.6.2020, p. 13–43.
148 For further information see https://competition-policy.ec.europa.eu/state-aid/temporary-crisis-and-transition-framework_en
149 See above Section 2.
150 Available at this link

Digital transformation to support the EU Green Deal

The EU has been actively working to maximise the synergies of the green transition and digital transformation:

- In the Europe fit for the digital age strategy[138], the Commission set ambitious goals such as the climate neutrality of data centres in the EU by 2030. Measures to improve the circularity of digital devices and to reduce eWaste include the Right to repair Directive[139] and the recently issued eco-design criteria for mobile phones and tablets[140]. Efforts are also ongoing to develop low-energy chips under the European Processor Initiative[141]. Finally, digital skills initiatives are also identified as key to ensuring a workforce with the digital skills needed to contribute to the twin transition (see Section 4.1).

- In the EU Action Plan on the Digitalisation of the Energy System[142], the Commission identifies the ICT sector as a driver of investments in renewables and energy efficiency along the value chain. A declaration of intent[143] towards the creation of a digital twin of the European electricity grid, signed in December 2022, will help drive and coordinate investments in the digitalisation of the electricity infrastructure.

- With the Sustainable and Smart Mobility Strategy[144], the Commission aims to make mobility and the transport systems greener and more efficient. The EU is keen to use digitalisation and automation to improve not only our global competitiveness through efficient and resilient logistics chains, but also the sustainability of the transport sector. With the EU Environment Action Programme[145], the Commission aims to accelerate the green transition to a climate-neutral, sustainable, non-toxic, resource-efficient, renewable energy-based, resilient and competitive circular economy in a just, equitable and inclusive way. Harnessing the potential of digital and data technologies is identified as an enabling condition to attain the priority objectives and to support environment policy, while increasing efforts to minimise the environmental footprint of digitalisation.

- To ensure synergies between green and digital investments and policies, the Commission Notice on the Guidance to Member States for the update of the 2021-2030 national energy and climate plans[146], encourages and assists Member States to make use of the existing tools and to explore the full potential of the twin green and digital transitions, while avoiding duplication.

138 COM/2020/67 final, Shaping Europe's digital future.
139 Right to repair: Commission introduces new consumer rights for easy and attractive repairs
140 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L:2023:214:FULL
Commission Regulation (EU) 2023/1670 of 16 June 2023 laying down ecodesign requirements for smartphones, mobile phones other than smartphones, cordless phones and slate tablets
141 For further information see https:// www.european-processor-initiative.eu

142 COM (2022) 552 final.
143 See statement at this link.
144 Sustainable and Smart Mobility Strategy
145 Decision (EU) 2022/591 of the European Parliament and of the Council of 6 April 2022 on a General Union Environment Action Programme to 2030, OJ L 114, 12.4.2022, p. 22–36.
146 C(2022) 9264 final.

6. International dimension

6. International dimension

International cooperation activities aim at proactively projecting our model based on human-centric values and to promote the EU's interests on the global stage. In the Declaration on Digital Rights and Principles, the EU and the Member States have committed to promote their vision of digital transformation to international partners. This has inspired the Declaration on the Future of the Internet[151] and the OECD's Declaration on a Trusted, Sustainable and Inclusive Digital Future[152], and it is feeding into the works that will lead to the agreement on a United Nations Global Digital Compact[153]. Following the adoption of the Council Conclusions on EU Digital Diplomacy[154] in July 2022, the EU established a strong foundation for our external engagement on digital issues. The subsequent Council Conclusions on EU Digital Diplomacy[155] of June 2023 propose a set of priority actions needed for a stronger, more strategic, coherent and effective EU policy and action in global digital affairs. Team Europe coordination has been enhanced, including EU Delegations' role in communicating and promoting EU legislative and policy developments among governments and stakeholders in partner countries.

The goal of EU Digital Diplomacy is to secure the EU's global role in the digital world. At the bilateral level, international outreach relies on leveraging digital partnerships, building on our strong ties with like-minded partners such as Japan, the Republic of Korea and Singapore, across the four cardinal points. International cooperation is also structured across **Trade and Technology Councils** (EU-US TTC, EU-India TTC), regional alliances (Latin America, Africa) and digital dialogues with Latin America and Asia. The EU has also substantially stepped up its support for the **digital transformation of Ukraine**, focusing both on emergency and long-term measures, in particular on roaming. At multilateral levels, in particular the G20 and G7, in line with the concept of 'trusted connectivity'[156], the EU promotes an approach that recognizes the role of digital regulation to contribute to trust in the digital economy and facilitate data flows.

The **Global Gateway**[157] is strengthening the people-to-people connections between Europe and its partners with targeted digital infrastructure investments aiming at tackling the global digital divide and strengthening secure and trusted digital connections. The Commission is working to reinforce the European backbone infrastructure and connectivity of EU territories 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 the diversification of international routes.

Foreign investment and trade are essential for our economic growth, competitiveness, employment, and innovation. However, today more than ever, the EU's openness needs to be balanced by appropriate tools, in order to safeguard its key strategic asset and to ensure Union-wide coordination. The EU Economic Security Strategy[158] will enable maximising the benefits of economic openness while minimising the risks of economic interdependencies, reinforcing EU's resilience of its supply chains and help addressing technology leakage or the possible weaponisation of economic dependencies including economic coercion. The EU has also rolled out assertive economic measures such as the EU's framework for screening of foreign direct investment (FDI)[159], enabling Member States and the Commission to monitor and influence FDIs' effects on critical infrastructure, critical technologies and dual-use items, supply of critical inputs, access to sensitive information and freedom and pluralism of the media. Moreover, the EU's Foreign Subsidies Regulation (FSR), which entered into force in July 2023, allows the Commission to investigate and remedy subsidies received from non-EU countries that distort the EU internal market. The EU can now also rely on a strengthened export control toolbox to respond effectively to evolving security risks and emerging technologies. The new Export Control Regulation sets up a Union regime for the control of exports, brokering, technical assistance, transit and transfer of dual-use items, which includes a list of digital technologies[160].

151 Available at this link
152 Available at this link
153 Available at this link
154 Available at this link
155 Available at this link
156 President Von der Leyen's speech in Tallinn's Digital Summit, October 10, 2022
157 JOIN/2021/30 final, Joint Communication to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank The Global Gateway.

158 JOIN (2023) 20 final, Economic Security Strategy.
159 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, currently under evaluation with the aim of ensuring that it remains fit for purpose.
160 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.

7. Conclusions

7. Conclusions

The success of the Digital Decade will be critical for the EU's future prosperity. Achieving the EU's Digital Decade agenda could unlock over EUR 2.8 trillion in economic value[161] that is equivalent to 21% of the EU's current economy.

The state of play presented in this report demonstrates that **the success of the EU's digital transformation will require a substantial acceleration and a deepening of the EU's and Member States' action** to make reforms, improve the business environment, create incentives and boost investment in digital technologies, skills and infrastructures. Implementing the cross-cutting approach of the Digital Decade and building on the synergies among the cardinal points, target areas and objectives will be critical to make progress towards a successful digital transformation.

The state of play presented in this report also calls for **a greater coordinated joint action on the EU's digital transformation.** Member States are invited to make further progress with the implementation of MCPs and EDICs in view of their potential contribution to bridging the gaps between the current state of play and the 2030 targets.

The **monitoring** of progress against common objectives and targets through the Digital Decade governance mechanism is essential to better understand the interdependence between regulatory and funding policies, and to find common strengths and synergies to achieve EU's strategic objectives. It is therefore critical that the **national roadmaps** to be adopted by Member States by early October 2023, and further adjustments later on, reflect this integrated approach and take into account the recommended policies, measures and actions contained in this report.

The Commission will now engage in discussions **with Members States**, **the European Parliament, and stakeholders** on how to progress together using the Digital Decade governance mechanism. In parallel, it will also engage with stakeholders and partners outside of the EU.

161 PublicFirst, Unlocking Europe's Digital Potential, 2022. See also Section 5.3 'Investments needed to achieve the Digital Decade targets' of the SWD (2023)570, 'Implementation of the Digital Decade objectives and the Digital Rights and Principles'.

2023 DIGITAL DECADE

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