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Digital Decade Country Reports

Accompanying the document

**Communication from the Commission to the European Parliament, the Council, the
European Economic and Social Committee and the Committee of the Regions**

Report on the state of the Digital Decade 2023

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Digital Decade Country Report 2023

Austria

Introduction

Austria is expected to make a positive contribution to the collective efforts to achieve the EU's Digital Decade targets. Austria performs well on the cardinal points on digital skills, the integration of digital technologies, and digital public services. However, further efforts are needed in digital infrastructures.

Austria is aiming at improving further its performance and demonstrates a greater ambition. Austria's vision '[Digital Austria in 2040-2050](#)', which includes the values and characteristics of a digital responsible society, is the starting point for Austria's overall digitalisation strategy and is aligned with the Digital Decade Policy Programme. This vision together with the principles and guidelines provide the necessary framework for the [Digitalisation Strategy](#) (Digital Action Plan Austria), which consists of several chapters focusing on priority topics selected by the respective responsible departments. These make references to and are aligned with the Digital Decade Policy Programme.

The [Digital Action Plan](#) is an evolving strategy that aims to successfully cope with the digital transition. In 2022, plans on the topics of digital universities, digital talents, digitalisation for tourism have been drawn up or planned (e.g. skills in public administration). With the Digitalisation Strategy, Austria aims to make the 'System Austria' crisis-proof by exploiting the opportunities of digitalization, to enhance competitiveness, to position Austria as a digital innovative region, to make targeted use of data for innovation, to design education, training and continuing education as a digital competitive advantage, to promote top digital research in a targeted manner and to facilitate digital communication between the state and its citizens. This way Austria pursues the goal to establish its role as a leading digital nation and to guarantee and expand prosperity, job opportunities and the quality of life in the long term. Moreover, in May 2022, digital competencies were bundled in the Austrian Ministry of Finance, responsible for digitalisation and infrastructure including broadband development. While the above shows a strategic approach, some stakeholders, i.e. telecom operators call for better governance in terms of institutional structure, with one centralised digitalisation agency and clearer regulatory responsibilities.

Austria is collaborating with other Member States on a proposal for a **European Digital Infrastructure Consortium (EDIC) for the establishment of a Cybersecurity Skills Academy.**

Digital in Austria's Recovery and Resilience Plan (RRP)

More than half (52.8% corresponding to EUR 1.8 billion) of Austria's Recovery and Resilience Facility (RRF), is devoted to the digital transformation and is expected to contribute to the Digital Decade targets¹.

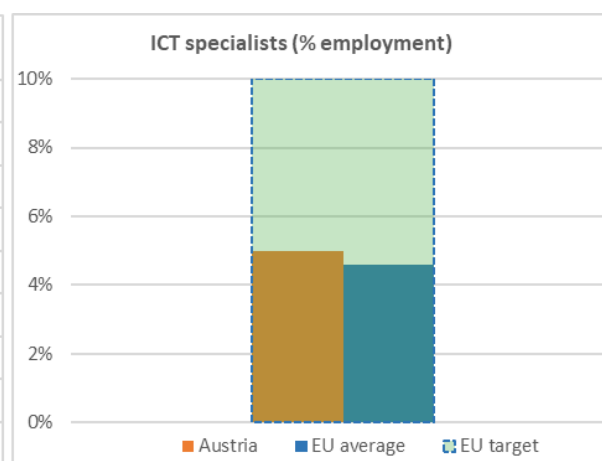
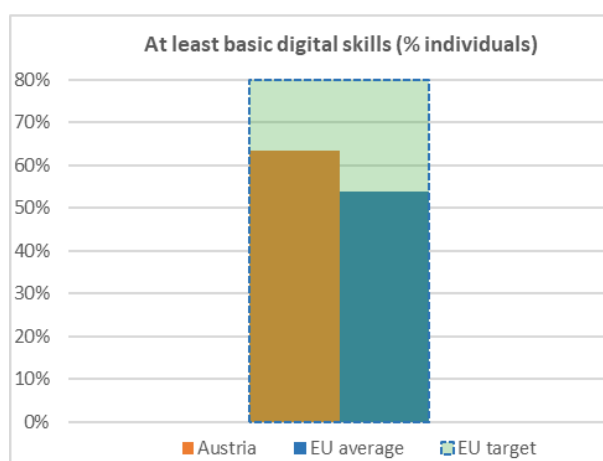
In the context of the first payment disbursed in April 2023, Austria has fulfilled more than a dozen milestones and targets for digital measures, such as:

¹ Each Recovery and Resilience Plan must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plans had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or has no impact (0%) on digital objectives, using Annex VII of the RRF Regulation. Combining the coefficients with the cost estimates of each measure allows assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to allow for an estimation of the possible contribution of RRF measure to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice to potential ongoing revisions of the plan.

- delivery of digital devices for the 5th and 6th grade (first and second year of lower secondary level) of the school year 2021/2022;
- laying the groundwork for measure 'KMU.E-Commerce' which helps SMEs increase their ability to sell goods and services online and measure 'KMU.DIGITAL' which helps SMEs digitalise;
- preparatory steps for funding research infrastructures and research collaborations, with the aim to expand the knowledge base for further developing of quantum computing and sciences;
- preparatory steps for the Important Project of Common European Interest (IPCEI) on Microelectronics and Communication technologies.

1 Digital skills

	Austria			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	86%	89%	90%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	63%	63%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	33%	33%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	75%	75%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	18%	18%	20%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	4.5%	4.5%	5.0%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	4.5%	4.4%	4.8%	4.2%	
% graduates	2019	2020	2021	2021	



Austria performs well in digital skills. On basic digital skills, however, although Austria significantly exceeds the EU average (63% compared to 54%), there is ample room for improvement to reach the 2030 target of at least 80% of the population having a basic level of digital skills. There seems to be a consensus on the need for further effort in this respect in Austria, given that upskilling the workforce in terms of digital skills would also help ease the significant shortage of skilled workers (*'Fachkräftemangel'*). Moreover, digital literacy is essential to enable citizens to participate in modern life and to ensure no one is left behind.

At the same time, it is important to mention that a third of the Austrian population possesses above basic digital skills. Also on a positive note, 75% of Austrians has at least basic digital content creation skills, compared to the 66% EU average, and 90% of the Austrian population uses the internet.

Still, Austria lacks ICT specialists. According to the latest "[Austria Infrastructure Report](#)", **two out of three managers complain that there are too few IT specialists in their company.** This perception is confirmed by the available data; while Austria's share of ICT specialists in the labour force (5.0%)

exceeds the current EU average (4.6%), the share is low considering the composition of the Austrian economy and was identified as a weakness in recent European Semester reports. The lack of ICT specialists can also have an impact on the ability to meet or contribute to other Digital Decade targets. For example, the ambitious initiatives of Austria in the field of quantum computing² also require the availability of highly specialised ICT specialists combining expertise in several different fields.

Therefore, in order to expand basic digital skills among the population for everyday life as well as in more specific fields, Austria is launching a 'Digital Skills Initiative: Closing the Digital Skills Gap in Austria', involving the collaboration of four key ministries. An overarching strategy, a clear structure and a joint platform have been established since Q3 of 2022 to bundle forces and create a broad commitment for joint implementation, with a budget of EUR 3.5 million in 2023 running until 2030. For Austria's economic and innovative strength to remain strong and continue to grow in the light of digitalisation, the goal is to help both basic users and ICT professionals build up the necessary level of skills to keep up in a digital world. The future challenge is to reach as many people as possible and to provide them with attractive, high-quality educational opportunities.

To address these upcoming challenges, a strategy has been developed as the part of Digital Skills Initiative. In a nationwide stakeholder process the strategy 'Digital Skills Austria' was developed in recent months involving more than 500 experts and stakeholders from 80 different institutions. Around 350 measures and initiatives have been identified, clustered and bundled.

The strategy aims to strengthen digital skills among Austria's population through targeted measures in strategic priority areas – from basic digital skills for the general population to top digital skills for business cases. For this reason, the 'Geschäftsstelle für Digitale Kompetenzen (Digital Skills Department)' was introduced in April 2023. The purpose of the Digital Skills Department, established within Austria's Agency for Education and Internationalisation (OeAD-GmbH), is to provide operational support for the initiative.

In the near future, for example, under the coordination of the Digital Skills Department, the National Framework for Digital Skills (DigComp 2.3 AT) will be further developed and implemented nationwide. It is based on the European Digital Competence Framework (DigComp 2.1) and aims to gain broad acceptance among Austria's population. Digital skills courses will be labelled based on referencing processes, making it easier to choose appropriate classes and unify regional and national course categorisation. In autumn 2023, the Digital Skills Initiative will launch a pilot project called 'Digital Skills for All'. Its aim is to provide low-threshold educational opportunities to help all citizens acquire basic digital skills. Following the concept phase, the project will conduct 400 workshops throughout Austria from October to December 2023. After an evaluation phase, a more extensive workshop series called 'Digital Überall' (Digital Everywhere) will act as a follow-up in 2024 to reach a larger portion of Austrian citizens.

In terms of share of SMEs providing ICT training Austria performs below the EU average (19% versus 21%), and several existing measures to support the take-up of digital skills in SMEs are being continued. A well-received example is the '[Digital Skills Vouchers](#)' with the objective of increasing digital skills in SMEs in Austria. A budget of EUR 3.2 million has been allocated so far to support the professional development of employees in digital skills such as IT management, cyber security, cloud services and e-commerce. The current third call is open until 30 June 2023 with a budget of EUR 0.8 million. Another well-established and continued initiative is the '[Digi-Scheck](#)' for apprentices which supports trainees and training companies in teaching future-oriented skills including in the area of

² Discussed in the section on digital infrastructure.

digitisation, as part of vocational training. Funding is provided for 100% of the participation costs up to an upper limit of EUR 500 per educational measure and up to three individual measures per 2023 and 2024 calendar years. A third measure to highlight is the programme '[Digital pro bootcamps](#)', which in 2022 launched its third call for the implementation of digital pro bootcamps with a budget of EUR 2 million. The focus has been set on projects in the subject areas of artificial intelligence, big data, blockchain and e-commerce. In these bootcamps, highly motivated employees from participating companies are trained to become 'digital professionals' within 4 weeks. The future IT professionals should then be able to be fully entrusted with IT projects in the company and further advance the digitalisation agendas.

To increase the number of ICT graduates, which corresponds to 4.8% of graduates (the EU average is 4.2%), Austria is also actively engaged, which could also ease the situation on the lack of ICT specialists in the long term. An example is the '[Digital Pioneers Programme](#)', which is running for the third time in 2023 and offers young women insights into digital and technical professions to encourage them to start a career in STEM fields and the opportunity to complete a digital year. This is a funded apprenticeship and paid internship so that women can gain a better understanding of professions of the future within industry and acquire valuable skills and experience. In an 8-week basic training, young women acquire skills needed for a successful start in jobs with a high amount of digital content. Afterwards, they work on projects in a partner company for at least 8 months so that they can apply in practice what they have learned and at the same time get to know industrial digital jobs. Graduates from the Digital Pioneers programme receive a national diploma. The 2021 'Women in Digital' scoreboard shows that there is still potential upwards. In Austria only about 1.85% of total employment are female ICT specialists, compared to 1.91% at EU level and only 14.4 out of 1 000 inhabitants are female graduates in STEM professions, compared to 14.8 on EU average. The measure is focused on achieving gender balance in specialised digital skills.

Best practice: Artificial Intelligence Competition Austria

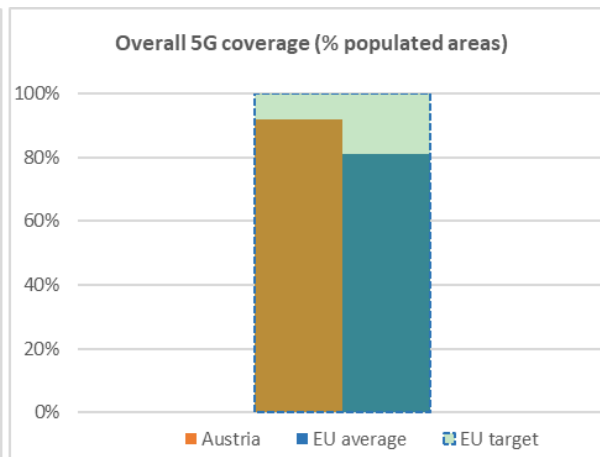
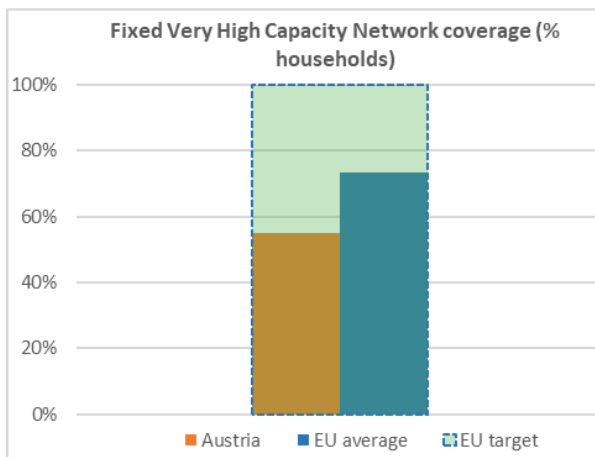
The Artificial Intelligence Competition is aimed at students between the ages of 14 and 19 who have strengths in scientific subjects such as mathematics, computer science or physics and are interested in developing creative solutions for the challenges of the future. This gives young people an early opportunity to try their hand in this promising field. With the competition, we want to inspire the experts of tomorrow on the topic of artificial intelligence (AI), so that they can continue to help shape the future of AI and its influence on society, both scientifically and economically. The project is implemented by ASAI (Austrian Society for Artificial Intelligence) in Austria, with close cooperation with the University of Tübingen. Particularly noteworthy is the implementation of a special category of the 'AI for Green' prize. Here there are links to the AI national programme - 'AI for Green', which focuses on the use of AI for climate change.

Austria should accelerate its efforts in the area of digital skills, notably in upskilling and reskilling of its labour force, especially women, and, in particular, in advanced and emerging technologies³.

³ The recommended policies, measures, and actions in this document reflect the Commission Communication 'Report on the state of the Digital Decade' COM(2023) 570.

2 Digital infrastructures

	Austria			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up	14%	22%	28%	55%	
% households	2020	2021	2022	2022	
2a2 At least 1 Gbps broadband take-up	<0.1%	<0.1%	<0.1%	13.8%	
% households	2020	2021	2022	2022	
2a3 Fixed Very High Capacity Network (VHCN) coverage	39%	45%	55%	73%	100%
% households	2020	2021	2022	2022	
2a4 Fibre to the Premises (FTTP) coverage	21%	27%	37%	56%	
% households	2020	2021	2022	2022	
2b1 Mobile broadband take-up	84%	91%	91%	87%	
% individuals	2018	2021	2021	2021	
2b2 Overall 5G coverage	50%	77%	92%	81%	100%
% populated areas	2020	2021	2022	2022	
2b3 5G spectrum	66%	66%	66%	68%	
Assigned spectrum as a % of total harmonised 5G spectrum	2021	2022	2023	2023	



Regarding the Digital Decade targets related to connectivity, Austria shows a varied picture: Austria is fast approaching 5G coverage for all populated areas and especially coverage on the 3.4-3.8 GHz spectrum band with over 30 percentage points above EU average, but is still far from reaching fixed gigabit connectivity for all. With 55% fixed very high capacity network (VHCN) coverage, Austria continues to perform significantly below the EU average of 73%. However, coverage jumped by 10 percentage points (from 45% in 2021 to 55% in 2022), thanks to investments in fibre-to-the-premises (FTTP), accelerating the progress registered in previous years. To compare, VHCN coverage in the EU overall only increased by 3 percentage points between 2021 and 2022. Austria has also made significant progress in rural areas, a particular challenge for this mountainous country, where VHCN coverage has increased even more sharply (by 11 percentage points), from 16% in 2021 to 27% in 2022. Given this positive trend, Austria is expected to make an important

contribution to reaching the 2030 EU gigabit connectivity target, provided it can expand access to VHCN, in particular in rural areas, at least at the current rate.

Progress driven by fibre deployment has been significant, with 10 percentage point increase in the last year and reaching 37% in 2022. Austria is still very far from a 100% coverage of gigabit connectivity with FTTP and is currently covering many households with DOCSIS⁴ 3.1 (40%). The positive trend also applies to rural areas, where FTTP coverage grew from 15% in 2021 to 23% in 2022, compared to an increase in DOCSIS 3.1 coverage from 1% to 6%. This can be traced back in part to publicly funded fibre deployment under Austria's broadband plan (*Breitband Austria 2030*).

Austria's [broadband plan](#) is driving progress on fibre coverage in underserved rural areas. The plan aims at nationwide gigabit connectivity by 2030, in line with the relevant Digital Decade target. It has an overall budget of EUR 1.4 billion, including EUR 891.2 million coming from the RRF, for deploying gigabit-capable fibre infrastructures in areas of Austria that are not or only insufficiently covered by the private sector.⁵ Public funding under the plan has also incentivised private investment in particular in the state-owned open access networks, with more investment expected in the coming years. However, there may be inadvertent consequences for private network deployment in other areas: Austria's three main telecom operators warn that the plan is preventing a selection of the most efficient and effective broadband deployment projects, as the larger part of funding under the plan is reserved for wholesale-only providers (state owned open access networks). Coupled with a persistent lack of demand, this disincentivises private network deployment in areas not covered by the plan and therefore potentially negatively affects Austria's ability to reach the Digital Decade target of gigabit for all.

Low demand for and take-up of fixed very high capacity connections and strong fixed-to-mobile substitution are a persistent challenge for Austria to reach the Digital Decade fixed connectivity target. These demand side factors remain largely unaddressed. While take-up of at least 100 Mbps fixed broadband has increased from 22% in 2021 to 28% in 2022, it still lies significantly below the EU average of 55% and progress has slowed down compared to previous years (e.g. between 2020 and 2021, take-up increased from 14% to 22%). Moreover, there is no take-up of at least 1 Gbps by Austrian households, compared to 13.8% of households in the EU on average. Even where gigabit internet is available, Austrian end-users opt for lower speeds or mobile connections with comparable speeds. This can be partially explained by price: according to the [2021 Broadband Price Study](#), Austrian consumers enjoy below EU average prices for lower bandwidth offers but have to pay more than EU average for speeds above 100 Mbps. While prices for fixed and mobile broadband with speeds above 100 Mbps are similar, mobile cubes (i.e. devices transforming mobile data into WiFi) allow customers to avoid the potential inconveniences and additional costs of fixed broadband installation. According to the Austrian authorities, about one third of Austrian households are mobile only, and this percentage remained unchanged from the previous year.

Private network deployment by Austria's three main telecom operators remains focused on urban areas and continues to be slowed down by lengthy decentralised permit granting procedures. In 2022, the Austrian regulator TKK (*Telekom-Control-Kommission*) [deregulated](#) the wholesale broadband access market after incumbent A1 concluded nationwide commercial access agreements

⁴ Data Over Cable Service Interface Specification (DOCSIS) is an international telecommunications standard.

⁵ The connections funded under the RRF must immediately offer at least symmetrical 100 Mbps speeds and be upgradable to symmetrical gigabit speeds without further investments in the deployed passive infrastructure, covering at least 50% of Austrian households by 2026.

with several alternative operators⁶. Considering that A1 has announced increased investments in fibre to the home/building (FTTH/B) for the coming years, this is expected to have a positive effect on Gigabit coverage in Austria. To further facilitate network deployment, operators call for full integration of information about nationwide planned civil works in the single information point ([Zentrale Stelle für Infrastrukturdaten](#) - ZIS) and for simplification of the lengthy and bureaucratic permit granting procedures that differ from region to region. To address the latter, Austria established a dedicated working group in the context of PIA 2030 ([Plattform für Infrastrukturausbau Austria 2030](#))⁷, but operators report that discussions have stalled and there has been no progress over the past year. Notwithstanding, Austria has committed as part of its RRP to implement measures developed by the Platform to reduce red tape and simplify procedures for broadband deployment by Q4 2023.

While on fixed connectivity Austria is lagging behind, on mobile connectivity and 5G coverage it is a frontrunner. The framework conditions established under Austria's [5G Strategy](#) (e.g. frequency allocations preceded by consultations, flexible spectrum use like sharing enabled) are bearing fruit. The strategy's goal of nationwide 5G availability by the end of 2025, even more ambitious than the Digital Decade target, is within reach as operators continue to invest in and roll out 5G in the 3.6 GHz and 700 MHz bands. In parallel, preparatory talks for active infrastructure-sharing agreements to meet licence coverage obligations are ongoing.

As of 2022, 92% of populated areas are covered by 5G versus 81% in the EU overall, following a considerable jump of 15 percentage points compared to 2021 (77%). The jump is even more strongly felt in populated rural areas, where 5G coverage rose from 36% in 2021 to a remarkable 69% in 2022. As regards the indicator 5G coverage on 3.4-3.8 GHz spectrum band, Austria exceeds the EU average by 33 percentage points with a coverage of 71% of populated areas and is well advanced towards achieving the related target. Individual take-up of mobile broadband exceeds the EU average with 91% versus 87% in the EU overall. Some operators have enabled 5G access without changing prices and offered 5G stand-alone services with guaranteed bandwidth for home internet including optional installation service.

To facilitate more advanced use cases, Austria is preparing to award spectrum in the 26 GHz band alongside remaining spectrum in the 3.6 GHz band. Following a second consultation on different options of the award procedure conducted in autumn 2022, the Regulatory Authority for Broadcasting and Telecommunications (RTR) expects to proceed with an action still in 2023. Moreover, the regulator is discussing with operators how to improve the energy efficiency of communication networks in order to enhance sustainability.

Removing existing obstacles to deployment in the context of the PIA 2030 requires identifying and implementing concrete measures to simplify and speed up decentralised procedure for granting permits. Moreover, this would also require expanding the single information point (ZIS) from covering existing infrastructure to covering information about planned civil works to maximise synergies and reduce costs along with the environmental footprint of network deployment. The same digital portal could then also be used for standardised permit granting procedures.

⁶ Two nationwide voluntary wholesale offers by A1, a virtual unbundling product ([v-ULL 2.0](#)) and a risk-sharing agreement for access to newly deployed VHCN networks ([V-P](#)), became effective in December 2022 for a period of 5 years.

⁷ PIA 2030 is a task force made up of relevant stakeholders from the federal government, Länder, municipalities, companies and citizens to coordinate broadband deployment in Austria. It was set up in the context of Austria's first RRP payment request.

For the European target of reaching in the EU at least 20% of world production in value of cutting-edge **semiconductors**, in accordance with EU law on environmental sustainability, **Austria is a strong actor and committed partner** in the European institutionalised partnerships on electronic systems (Key Digital Technologies & European High-Performance Computing and their respective predecessors) and with major players present in Austria. Austria is also supporting the upcoming Chips Joint Undertaking. **Austria plays an important role within the European Union.**

Austria participates in the Important Project of Common European Interest (IPCEI) on Microelectronics, which is also part of the Austrian recovery and resilience plan. In the context of the latter the very first milestones were achieved, namely the Austrian projects regarding the development of innovative microelectronics and connectivity technologies have been selected based on recommendations of an independent expert panel, following the two-stage call for expression of interest. Documents regarding the second phase of the call for expression of interest have been published, including climate-related eligibility criteria, which will oblige potential beneficiaries to explicitly commit to the reduction of greenhouse gas (GHG) emissions within their project portfolios and estimate the extent of GHG savings. Moreover, the commitment to emission reductions will represent a key factor in the selection of projects within the subsequent jury process. More in details, Austria is involved in:

- (1) IPCEI Microelectronic I, which has been running since March 2021 with a total investment in research & innovation (R&I) and first deployment of EUR 8.4 billion (including EUR 1.9 billion public funding), with the involvement of 30 enterprises and 2 R&I institutions from the participating countries Germany, France, Italy, United Kingdom and Austria. The objective of the project is research, development and first industrial deployment of microelectronic components and systems and their deployment in automotive, Internet of Things, aeronautic and IT-security. Austrian funding amounts to EUR 145 million.
- (2) IPCEI ME/CT (microelectronics and communication technologies) is still in negotiation with 6 participating partners from Austria. The European IPCEI-project comprises in total 17 participating Member states with around 115 enterprises.

As regards the EU Digital Decade target for 2030 on edge nodes, no information has been shared so far by Austria on how it intends to contribute to the achievement of this target.

Austria is taking a leading role and is making a significant contribution to achieving the Digital Decade target of Europe being at the cutting edge of quantum technologies by 2030.

Austria is making its first steps in implementing its noteworthy measure on quantum in the Austrian recovery and resilience plan. The very first milestone, relating to the receipt of expression of interests from stakeholders and the setting-up of a resolution agency was fulfilled. Moreover, the operational use of this new technology is currently being promoted by the EU through the EuroQCI initiative, and first demonstrations are planned by 2023. In close coordination with EuroQCI, Austrian organisations are also building support platforms and hosting workshops for all EuroQCI Member States to foster the EU initiative for a common quantum communication infrastructure in the EU. Recent projects are Quantum-safe Cryptography for Securing Governmental data ([QKD4GOV](#)), which aims at the establishment of a secure communication network between public authorities to investigate novel encryption schemes based on quantum key distribution (QKD) and post-quantum cryptography. Another noteworthy related project is [QCI-CAT](#) funded under the Digital Europe programme, which was launched in 2023. The project QCI-CAT aims at an adoption of modern encryption technology based on quantum key distribution for highly secure communication between public authorities.

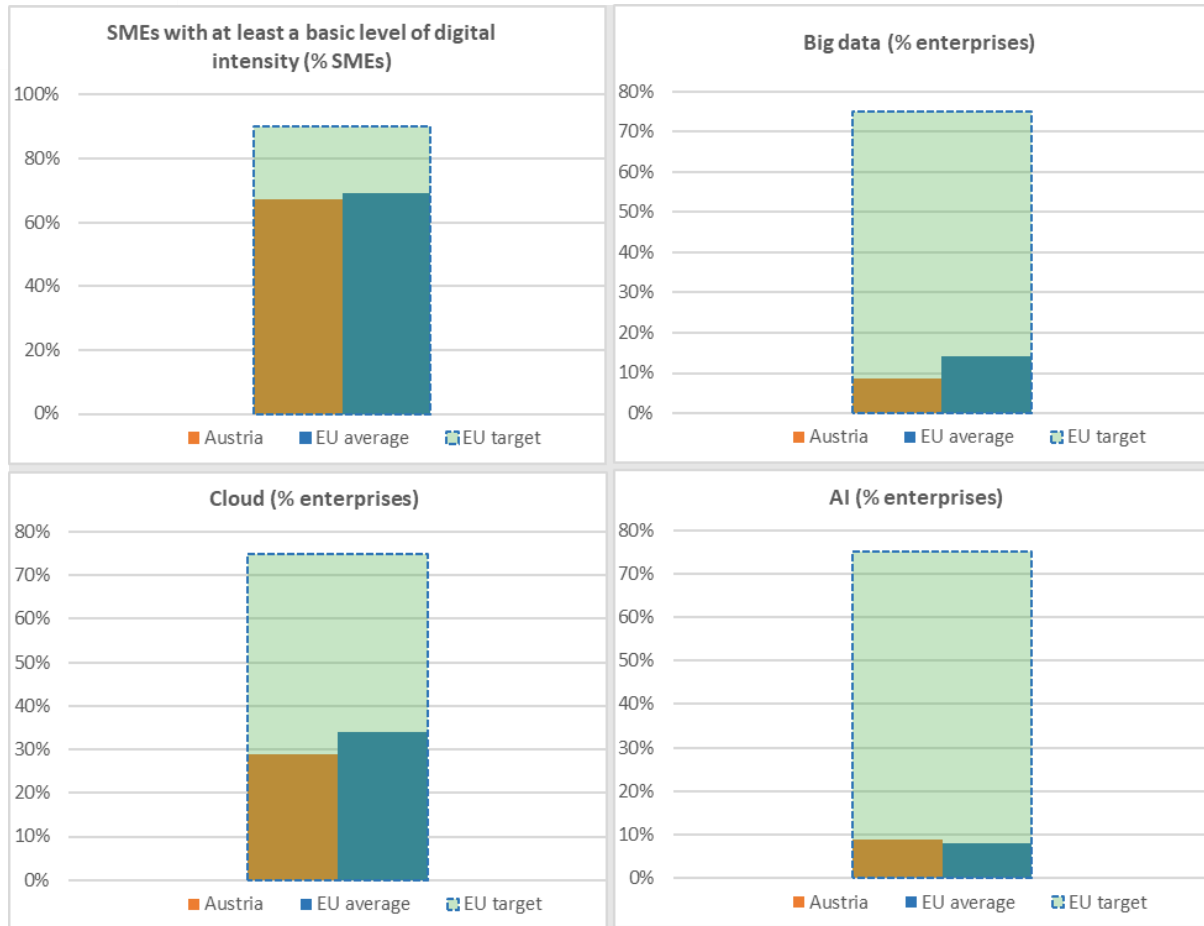
Austria should accelerate its efforts on connectivity infrastructure, especially for the fibre to the premises roll-out in rural areas. This requires maintaining the overall level of ambition in Austria's broadband plan while updating the plan to ensure targeted and efficient investment without distorting the market and improving conditions for private investment in rural areas. Moreover, existing obstacles to deployment should be reduced in the context of the 'Internet Infrastructure Austria 2030 Platform ('Plattform für Infrastrukturausbau' PIA 2030).

Measures taken by Austria in the field of semiconductors and quantum computing should continue in order to help the EU become a strong market player in these areas.

3 Digitalisation of businesses

	Austria			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	67%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	43%	45%	45%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	30%	38%	38%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	9%	9%	9%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud⁸	NA	29%	29%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	9%	9%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	22%	22%	22%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	22%	22%	21%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	11%	10%	10%	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	15%	16%	16%	9%	
% SMEs	2019	2021	2021	2021	

⁸ Enterprises buying sophisticated or intermediate cloud computing services indicator, see [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).



Productivity growth is lagging behind and the OECD found that the steady but modest labour productivity gains of Austria's SME-driven economy are mostly due to improvements within specific sectors rather than shifts towards more productive high-tech sectors⁹. **With only two thirds of SMEs reaching at least a basic level of digital intensity, Austria** performs slightly below the EU average on this key performance indicator. This means that there is untapped potential to improve productivity within specific sectors by increasing digital intensity. Moreover, the current score is considerably below the EU target for 2030 of 90%.

At the same time, Austria is taking action. Since 2017 Austria has been providing support to SMEs with the programme 'KMU.DIGITAL', through which Austrian SMEs receive practical consulting and financial support for the implementation of digital technologies, with more than 20 000 consulting and implementation initiatives supported so far. In 2022 and 2023, EUR 10 million of public funds (both national and EU funds from the Austrian RRP) are being invested in the digital transformation of SMEs. The Austrian recovery and resilience plan also includes other measures to promote the digitalisation of businesses.

In relation to electronic information sharing and social media a higher number of Austrian enterprises uses these than the EU average (45% compared to 38% for electronic information sharing, and 38% to 29%). However, fewer enterprises issue e-invoices in Austria than enterprises on EU average (22% compared to 32%). While more Austrian SMEs sell online both within Austria and

⁹ [European Semester report 2022](#).

cross-border, than the EU average, they obtain a slightly lower turnover from these activities than on EU average.

The take-up of artificial intelligence (AI), cloud services and big data shows a mixed picture in Austria. Use of big data and cloud services is below the EU average in Austrian enterprises, while on AI Austria scores slightly higher than the EU average. The distance to the **related ambitious Digital Decade target is significant.** Despite Austria actively promoting these new technologies and taking action, efforts do not seem to be sufficiently bearing fruit yet. For instance, in terms of cloud uptake, while AT is only 5 percentage points below the EU average, it would still need to more than double its current cloud uptake to reach 75% by the end of the decade. Austria is thus encouraged to foster the use of new advanced cloud solutions among enterprises, in particular SMEs, and to contribute to enterprise advanced cloud upskilling including on cloud security and environmental performance while paying attention to gender equality.

Austria has been supporting digital key enabling technologies in its research and innovation programmes for many years. Notably, in relation to big data, in particular, the '[Data Intelligence Offensive \(DIO\)](#)' was founded for this purpose with the objective of making the simple use and secure sharing of data by third parties more attractive and possible via innovative, decentralised use cases. In addition, Austria launched the Green Data Hub which supports the development of a data-service ecosystem in the fields of mobility, energy, circular economy and the digital climate twin.

Moreover, Austria continues to be part of the Gaia-X initiative. In this context, the '[Gaia-X Hub AT](#)', which is still being set up, will support Austrian organisations in their adoption of data-based business models. The project aims at developing a digital governance that can be applied to any existing cloud/edge technology stack to obtain transparency, controllability, portability and interoperability across data and services.

In Austria several measures are ongoing that can help to increase the uptake of AI, for example the free online platform 'AI Marketplace' with already 140 registered AI providers and the '[AI Mission Austria \(AIM AT\)](#)' funding initiative for research and innovation in this field, with a EUR 12 million budget for 2023.

Digital Innovation Hubs (DIHs) can be an effective tool to improve the digital intensity of SMEs and the uptake of technologies such as big data, artificial intelligence and cloud services. They are one-stop shops that support companies – in particular SMEs – and public sector organisations in their digital transformation. DIHs provide access to technical expertise and experimentation. They also provide innovation services, such as support with access to finance, training and skills development that are needed for a successful digital transformation. So far six national Digital Innovation hubs and four [European Digital Innovation Hubs \(EDIHs\)](#)¹⁰ have been set up in Austria with 50% funding from Digital Europe. A seventh DIH is in the process of being launched on artificial intelligence with the objective of assisting SMEs in gaining a better understanding of artificial intelligence BMAW/FFG: Künstliche Intelligenz für den Mittelstand | FFG. Austria's EDIHs, cover a wide range of fields, from manufacturing to agriculture.

As regards the European target to facilitate the growth of its innovative scale-ups and to improve their access to finance, leading to at least double the number of unicorns, Austria counts five

¹⁰ EDIHs are part of a European network of soon to be over 200 hubs covering all EU regions (plus Iceland, Norway and Lichtenstein), all sectors and technologies. While each EDIH has its own sectoral coverage, their networking ensures that all businesses' digitalisation needs can be met. The network of EDIHs is being financed with 1.5 billion euros of national and EU funds (Digital Europe, ERDF and RRF) for a period of 7 years. Austria's EDIHs are being funded 50% from Digital Europe and 50% from national sources.

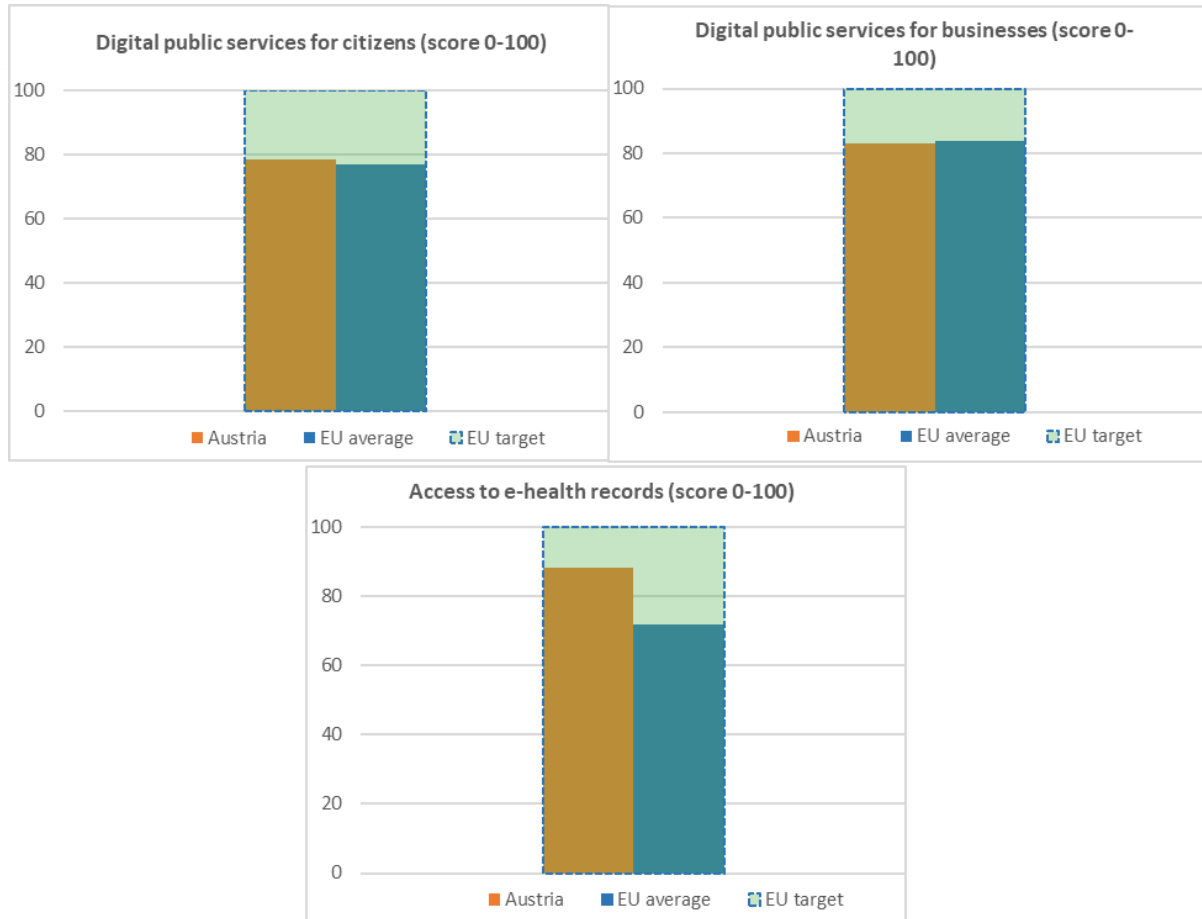
unicorns out of 249 in Europe in 2022. Austria has several initiatives in place to support start-ups, scale-ups, spin-offs and SMEs in Austria. '[Start-up Landscape Austria](#)', presented in December 2022, is the first publicly accessible, daily updated overview of participants in the start-up ecosystem in Austria. It is mapping the Austrian start-up ecosystem as realistically as possible and increases the visibility of the location in order to make it internationally comparable and to create network effects. '[Start-up Navigator](#)' helps start-up founders and entrepreneurs find all relevant contact points on the topic of start-ups in Austria in one place on the internet. The platform includes contact points on federal level as well as on state level. Furthermore, Austria has established a state venture capital fund 'Start-up Fund II' with up to EUR 72 million to succeed the fund that is coming to the end. The fund's target group are innovative technology-oriented start-ups with a particular focus on sustainability and digitisation. Austria has increased its start-up funding via the existing channels like the Austrian promotional bank (AWS) and the Austrian Research Promotion Agency (FFG), targeting start-ups with tailor-made funding programmes incubators, seed financing, spin-offs and scale-ups, partially also co-founded with EU funds.

As well as public investments there are also private investments to highlight, such as '[Fund F \(Female Founders\)](#)', which is a venture capital fund with a focus on pre-seed investments and gender-diverse teams, and '[Speedinvest](#)', a pan-European early-stage venture capital fund with its seat in Austria, which is active in raising new capital to help European start-ups scale to global success. Austria recently launched its first crypto fund called '[Venionaire Tigris Web3](#)', an alternative investment fund that invests in crypto assets on behalf of investors, including in decentralised finance and Web3 projects.

Austria should accelerate its efforts in the area of digitalisation of businesses. Attention should be paid to supporting the development and deployment of advanced technologies, including big data, AI and cloud computing, in particular, in SMEs, including through capacity and knowledge building.

4 Digitalisation of public services

	Austria			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	78% 2022	74% 2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	76 2021	78 2022	77 2022	100
4a3 Digital public services for businesses Score (0 to 100)	NA	81 2021	83 2022	84 2022	100
4a4 Pre-filled forms Score (0 to 100)	NA	71 2021	71 2022	68 2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	68 2021	71 2022	65 2022	
4a6 User support Score (0 to 100)	NA	80 2021	80 2022	84 2022	
4a7 Mobile friendliness Score (0 to 100)	NA	99 2021	99 2022	93 2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	88 2022	72 2022	100



As regards the Digital Decade target on **digital public services for citizens**, **Austria performs well for national services with a score of 89.8, slightly above the EU average score of 89.0**. However, it has a significantly worse performance for the online availability of digital public services which are cross-border, scoring only 67.1 (even if this score still slightly exceeds the EU average score of 65.1).

On the Digital Decade target on digital public services for businesses, with a score of 97.1 Austria matches the EU average of 97.3 for domestic users. As regards the **cross-border dimension Austria scores 68.6 compared to 70.2 EU average, slightly below the EU average**. Like for the target digital public services for citizens, there is a **significant gap in performance when looking at the cross-border online availability of digital public services for businesses**. This should also be kept in mind when implementing the Regulation on the Single Digital Gateway (SDG)¹¹, which entered into force in December 2018. The implementation of the SDG is expected also to support Austria in overcoming its weakness in the cross-border online availability of digital public services for citizens and businesses.

Overall Austria is progressing well on providing eID solutions to its citizens. After the adoption of the positive opinion of the eIDAS Cooperation Network on the Austrian ID scheme in February 2022, Austria formally notified the *ID Austria* to the European Commission. It was published on 27 April 2022 in the Official Journal of the European Union ([2022/C 173 I/01](#)). After a 12-months implementing period for the other Member states, the *ID Austria* can be used in e-Government services across Europe from April 2023 onwards. Austria is involved via public and private entities in three large-scale pilot projects, that will be funded under the Digital Europe programme, with an

¹¹ Regulation (EU) 2018/1724.

overall grant request of over EUR 1.7 million. Austria is leading the work in one of the pilots on remote qualified electronic signature (rQES).

As regards e-health, Austria is a frontrunner. With a composite score of 88, Austria places 5th among Member states in facilitating citizens with full access to their electronic health records with a considerable leading edge over the EU average score of 72. Therefore, **Austria is well on track to achieve the digital decade target related e-health.**¹² Thanks to the opt-out regime in place for the participation of citizens in the Austrian electronic medical records system (*'Elektronische Gesundheitsakte' - ELGA*), in principle all electronic health records accessible via ELGA are already available to patients via eID login on the ELGA portal. The incremental roll-out of the eID solution *ID Austria*, issued to every citizen with the handout of renewed passports, will effectively make it even easier for citizens to access their electronic health records. A dedicated mobile application is not available. However, the most significant limiting factor to full access to electronic health records for all citizens is the fact that only public primary, public secondary and tertiary hospitals together with pharmacies are connected to ELGA in meaningful number and are supplying relevant health-related data. The entire private care sector has not been connected.

On the demand side for digital public services, Austrians continue to use digital public services widely, with 78% of Austrian internet users compared to 74% of internet users on EU average.

In relation to the indicator pre-filled forms, Austria is performing above the EU average with a score of 71.2 compared to 67.5. Therefore, the amount of data which is pre-filled in public service online forms is relatively high.

To this good performance on the indicator pre-filled forms among others, a significantly contributing initiative is the once-only Platform including the Register & Systems Network (*dadeX- Digital Austria Data Exchange*) and the Information Obligation Database, which Austria set up following the adoption of the Business Service Portal Act. The following use cases using once-only methodology were launched in the second half of 2022 or Q1 2023. All these measures are important lighthouse projects for digitalisation of public services and the digital transformation of public administration:

- Criminal records, including financial, are checked automatically via *dadeX* by issuing a business licence. This innovation leads to a faster procedure for issuing more than 90 000 business licences each year.
- The continued receipt of the family allowance is checked automatically via *dadeX* for school children and apprentices. The submission of forms and paperwork are reduced.
- For the start-up of a "one person limited" enterprise, the company register evidence is traded automatically between the Ministry of Justice and the Ministry of Finance via *dadeX*.
- The proof of income for reduced kindergarten fees for the city of Graz are checked automatically via *dadeX*, so that parents don't have to submit them personally.

As regards the newly added indicator on **mobile friendliness**, in Austria almost all services are provided through a mobile-friendly interface and Austria is a frontrunner in this respect. Austria is even very active on the international front on promoting mobile government. Austria is actively

¹² The target on access to e-health records, measured as: (i) the existence of a nationwide mechanism, for citizen online access to health data, such as a patient portal, or a patient mobile app with additional measures in place that enable certain categories of people (e.g. guardians for children, people with disabilities, elderly) to also access their data, and (ii) the percentage of individuals that have the ability to obtain or make use of their own minimum set of health-related data currently stored in public and private electronic health-record (EHR) systems.

engaged in the worldwide initiative 'World Bank GovTech Global Partnership' and is co-leading the related working group, specifically on m-Government.

On the extent to which online support, help-features and feedback mechanisms are available, overall Austria scores slightly below the EU average (80.2 compared to 83.6). Moreover, **user support** is significantly better for national services (93.7) than for cross-border ones (66.7). Since on the latter Austria scores far worse than the EU average (74.3), there is significant room for improvement in Austria in the provision of user support for cross-border services.

Transparency of service delivery, design and personal data is at 71.1, which is well beyond the EU average of 64.7. This represents an area where Austria outperforms some frontrunners and could further increase its lead by taking additional steps to ensure that service processes are transparent, services are designed with user involvement and users can manage their personal data.

In relation to open data, Austria suggests participating in a multi-country project called Integrated Pan-European Digital Platform for AgriFood.

The [Federal eGovernment Strategy 2023 for Austria](#) was adopted on 7 June. The strategy was developed in a collaborative process with the relevant e-Government stakeholders at national and regional level and pursues the efficient implementation of electronic government services. It is based on the basic premise that all businesses and citizens must be able to perform all the procedures of public administration quickly and easily, electronically and without any specific technical expertise. To achieve this goal, the Federal e-Government Strategy promotes the involvement of and close cooperation between the federal state, cities and municipalities. The first concrete implementation priorities are to be the broad introduction of ID Austria, the interconnection of service portals and digital sovereignty.

Through a common vision and targeted initiatives Austria aims at improving service quality as a whole and making noticeable improvements in the related DESI indicators. The holistic approach focuses primarily on the public service dimension of the DESI but is intended also to have a positive impact on other DESI indicators.

Best practice: doing business abroad simplified between Austria and Germany following the once-only principle

The Austrian Federal Ministry of Finance is cooperating with the German public administration in the Doing Business Abroad (DBA) use case that lays an important basis for implementing the Single Digital Gateway Regulation (SDG), specifically the cross-border exchange of evidence according to the once-only principle (SDG OO).

Austria should accelerate its efforts to digitalise public services. In particular, it should monitor the effective use of digital public services as well as possible divides.



Digital Decade Country Report 2023

Belgium

Introduction

Belgium is expected to make a positive contribution to the collective efforts to achieve the EU's Digital Decade targets. The country has improved its performance particularly in the digitalisation of public services, but is lagging on digital infrastructure, although progress has been made on the roll-out and overall 5G coverage. Belgium performs well when it comes to the digitalisation of businesses, and it is advancing well on the uptake of digital tools by businesses. The different digital strategies in the country, coordinated at federal level through the Digital Decade Working Group, are aligned with the Digital Decade Policy Programme.

Belgium is collaborating with other Member States in exploring the possibility to set up a **European Digital Infrastructure Consortia (EDIC)** on Genome, to enable effective and secure cross-border access to repositories of personal genomic datasets. Belgium is one of the Member States that have jointly submitted a formal application to set up the European Blockchain Partnership and the EDIC on European Blockchain Infrastructure, supporting EU-wide cross-border public services.

Digital in Belgium's Recovery and Resilience Plan (RRP)

Belgium's RRP allocates EUR 1.6 billion (i.e. 27%) of its total financial allocation to digital services, of which EUR 1.4 billion is expected to be spent on achieving the Digital Decade targets¹³. Belgium has not yet submitted a payment request. The plan includes measures focusing on digital skills, digital infrastructure and connectivity, cybersecurity, and the digitalising of public services. In particular, measures will support the upgrade of ICT infrastructure in schools and/or educational institutions, digital training courses, the 5G roll-out, the 5G auction and the revision of the legislative framework on radiation standards in the three regions.

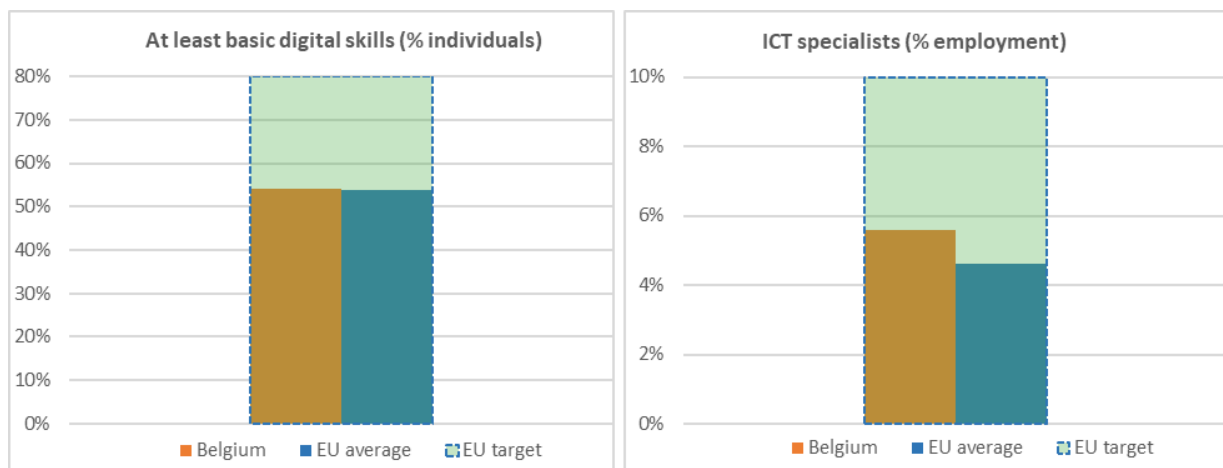
Based on the Council Implementing Decision on the Belgian RRP, other reforms and investments associated with milestones and targets to be fulfilled in 2023 include:

- a regional data exchange platform;
- measures to increase connectivity by adopting a plan to implement EU Connectivity Toolbox best practices;
- measures to improve the efficiency of public services and justice through the digitalisation of the justice system.

¹³ Each Recovery and Resilience Plan must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plans had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or has no impact (0%) on digital objectives, using Annex VII of the RRF Regulation. Combining the coefficients with the cost estimates of each measure allows assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to allow for an estimation of the possible contribution of RRF measure to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice to potential ongoing revisions of the plan.

1 Digital skills

	Belgium			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use % individuals	90%	91%	93%	89%	
1a2 At least basic digital skills % individuals	NA	54%	54%	54%	80%
1a3 Above basic digital skills % individuals	NA	26%	26%	26%	
1a4 At least basic digital content creation skills % individuals	NA	67%	67%	66%	
1a5 Enterprises providing ICT training % enterprises	33%	33%	33%	22%	
1b1 ICT specialists % individuals in employment aged 15-74	5.0%	5.6%	5.6%	4.6%	20 million ~10%
1b2 ICT graduates % graduates	2.1%	2.2%	2.8%	4.2%	



Belgium is scoring around the EU average as regards population with basic digital skills, and above the EU average as regards the share of ICT specialists. While many initiatives are currently being implemented, a significant change of pace would lead to productivity gains, to a more widespread use of technology across the economy and to a higher take-up of public services by citizens.

54% of people have at least basic digital skills, which coincides with the EU average. Moreover, Belgium scores at the EU average for citizens with above basic digital skills and at least basic digital content creation skills (67% compared to 66% at EU level).

Belgium is currently implementing several measures that are expected to help increase the level of basic digital skills. At federal level, the BeCentral digital campus has since 2017 trained more than 425 000 students with the objective of reducing the digital skills gap. Belgium continues to pursue work regarding the 2021 Digital Inclusion and female representation in the STEM and digital sector

through its national and intersectoral strategy Women in Digital 2021-2026. The implementation of this strategy is supported by a dedicated website (BeDigitalTogether.be) and coordinated at the federal level via a multistakeholder working group (from public, private, academic, associative levels). At regional level, the Flemish government has launched many projects to address the issue. The pilot programme 'Everyone digital programme' aims to have each local government come up with digital inclusion plans focusing on access, skills and support for citizens. Digibank aims to promote the social and economic integration of vulnerable groups by fostering their digital inclusion at municipal level. At the end of 2022, 54 out of 200 municipalities had implemented this programme. The Programme Digisprong, is teaching digital skills within the compulsory education stream. It focuses on increasing pupils' digital skills through four main points – safe ICT infrastructure, effective ICT school policy, digitally skilled teachers and trainers and provision of digital learning resources. The Digisprong strategy is accompanied by the Edusprong programme which focuses more on adult education and strengthening digital competences.

In Wallonia, the digital inclusion plan aims to respond to challenges related to giving equal access to Digital skills and reducing the digital divide. This will be achieved through numerous complementary programmes such as the Digital school programme, the Walloon "Basic Digital Training" Programme, the Digital Public Spaces scheme available throughout the region in over 150 locations, and support for workers' basic digital skills through the implementation of the "Upskills Wallonia" strategy. The various schemes and programmes to support the development of basic digital skills use the European DigComp reference framework as a reference tool.

In the Brussels Capital Region, programmes such as the digital ownership plan aim to support and help Brussels residents by specifically targeting vulnerable groups.

In addition, private sector initiatives provide additional support to increase the basic Digital skills level. Agoria, the federation of digital industries, continued with its BEthechange platform which maps the digital skills needed within the labour market. The mapping is then disseminated to all stakeholders. The Digiskills Belgium platform lists all initiatives and training courses to help people improve their digital skills, focusing on digital inclusion and the reskilling and upskilling of the labour force.

Belgium has an above average share of ICT specialists: 5.6% of total employment, above the EU average (4.6%). However, Belgium's shortage of ICT professionals is still particularly pressing. Although there has been a moderate improvement, ICT graduates only account for 2.8% of graduates study ICT programmes, compared to 4.2% in Europe. More efforts are therefore needed to encourage students to become ICT specialists. On a positive note, 33% of enterprises provide ICT training to their employees, 11 percentage points above the EU average. With regards to female ICT specialists, Belgium currently has 18.7%, slightly below the EU average of 18.9%. In this regard, Belgium could **take measures to address the existing gap regarding the number of women in ICT**, including measures aimed to attract girls interest in ICT in general and to advanced technologies in particular.

Belgium is currently working on several programmes and initiatives to address these shortcomings. The Flemish region has a number of initiatives such as the Flemish AI academy. The academy in cooperation with Flemish universities will map the needs of businesses with regards to AI. In Wallonia, the Pix tool, evaluates the skills of users to identify the areas that may need improvement in users' skillset.

In addition, the private sector recently launched a considerable number of activities to tackle the lack of ICT specialists, notably with up- and reskilling efforts by companies for their workforce. Agoria has worked on a number of projects namely, based on the above mentioned Bethechange

plan, Agoria has kickstarted a project to digitally upskill seven manufacturing industries which have been identified as most important.

It is important to coordinate the development, implementation, and evaluation of digital education policy and strengthen the involvement of relevant stakeholders across the whole country, and continue addressing all cycles of education: primary, secondary, tertiary and mainstream digital in the educational system. Integrating digital (in addition to teaching ICT as a self-standing subject) horizontally across all subjects would ensure that school curricula are up to date with how digital technologies are used in everyday life and at the workplace.

It is also important that training programmes in Belgium on basic digital skills are expanded in scale to all demographics, including vulnerable groups (such as low-income individuals, older adults and people with disabilities). Belgium could ensure adequate, efficient, and effective reforms and investments in adult Digital skills, including by mobilising EU funds or by using the European Technical Support Instrument, to develop, deliver and evaluate programmes addressing specific adult learning needs.

Best practice: ADIBib & Leesvoor!Vlaanderen

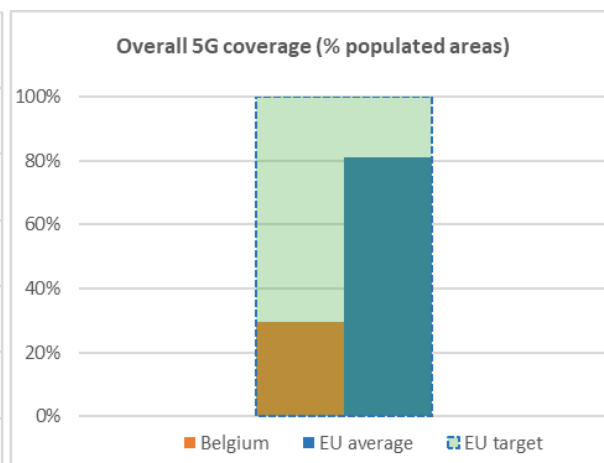
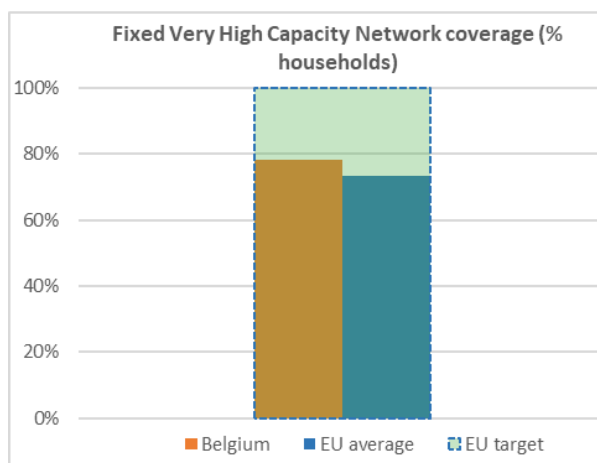
The ADIBib & Leesvoor!Vlaanderen project in Flanders is a project aimed at increasing the digital skills of people with learning disabilities. Through the programme, students with reading and learning difficulties such as dyslexia are given access to materials which can be used online such as specialised reading resources and digitally adjusted books.

Belgium should accelerate its efforts in the area of digital skills, in particular basic digital skills. Attention should be paid to improving the coordination of digital education policy and strengthening the involvement of relevant stakeholders across the whole country¹⁴.

¹⁴ The recommended policies, measures, and actions in this document reflect the Commission Communication 'Report on the state of the Digital Decade' COM(2023) 570.

2 Digital infrastructures

	Belgium			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up	59%	62%	67%	55%	
% households	2020	2021	2022	2022	
2a2 At least 1 Gbps broadband take-up	<0.1%	0.6%	3.1%	13.8%	
% households	2020	2021	2022	2022	
2a3 Fixed Very High Capacity Network (VHCN) coverage	68%	69%	78%	73%	100%
% households	2020	2021	2022	2022	
2a4 Fibre to the Premises (FTTP) coverage	7%	10%	17%	56%	
% households	2020	2021	2022	2022	
2b1 Mobile broadband take-up	84%	90%	90%	87%	
% individuals	2018	2021	2021	2021	
2b2 Overall 5G coverage	4%	4%	30%	81%	100%
% populated areas	2020	2021	2022	2022	
2b3 5G spectrum	3%	3%	66%	68%	
Assigned spectrum as a % of total harmonised 5G spectrum	2021	2022	2023	2023	



Belgium still lags far behind when it comes to fixed gigabit connectivity, with only 17% of coverage of fibre to the premises, while there is progress on VHCN (from 69% to 78%).

A number of joint ventures are currently active in the deployment of fibre. The joint venture of the incumbent operator is already active in the deployment of fibre, with another joint venture in the pipeline. These joint ventures are expected to help accelerate fibre rollout in Belgium. The launch of the fibreinfo.be website with the aim of providing information about fibre deployment and the update of the Landline Atlas with the inclusion of 1Gbps speeds should also help promote the take-up of gigabit networks. However, to date, only 3.1% of contracts in Belgium were at the speed of 1Gbps. Operators are also under increasing pressure to complete the roll-out of fibre networks.

As part of the national broadband plan, a call for projects was launched in December 2022 to promote fixed Internet access infrastructures in the "white areas" of the Belgian territory. With a

budget of EUR 40.7 million, the call covers up to 50% of the cost of installing very high capacity networks (VHCN) in currently underserved areas. The regional government of Wallonia launched a similar project in the course of 2022 for a budget of EUR 12.2 million. The German speaking Community in Belgium has also entered into a private public partnership agreement with the incumbent operator and another player to cover 40 000 homes and businesses in the German-speaking community by 2026. The result of these initiatives should help Belgium to cover areas which would otherwise not be viable to cover under commercial logic.

When it comes to market developments, the merger of two incumbent operators was approved by the European Commission under the EU Merger Regulation in March 2023, which will commit the newly merged operator to providing access to another incumbent operator to its newly acquired fixed network and future fibre to the premises in Wallonia and Brussels for at least 10 years. This will effectively create three national operators which should help accelerate the roll-out of gigabit network.

Issues pertaining to access to infrastructure are also putting a dent in Belgium's aspiration. In this regard, the creation of the Broadband Competence Office should help with reducing administrative costs and speed up the roll-out of gigabit networks. This is a step in the right direction towards the achievement of the Digital Decade goals. The Walloon region has progressed with its **Gigaregion** programme which invested EUR 51 million into among others the Last mile fixed connectivity action plan which should cover all 12 Walloon municipalities and nearly 28 000 households. The Flemish government has also invested through the '100 gigabit readiness plan 2019-2026 for Flemish Research Networks, with the aim of upgrading the backbone of the Flemish fibre network and make every Research Performing Organisation gigabit ready by 2026.

Despite progress on overall 5G coverage in 2022 (from 4% to 30% in one year) Belgium is still very far from the EU average (81%) and from the 2030 Digital Decade target. Moreover, coverage with the 3.4-3.8 GHz band is very low (6% vs 41% EU average). This is in large part due to the late finalisation of Belgium's spectrum auction in July 2022 which auctioned the 700MHz and 3.6 GHz bands with 20-year usage rights starting in September of 2022 with the precise target of achieving 99.8% coverage of populated areas by 2030. The auction also resulted into the entry of a new market player which should also accelerate the coverage roll-out and the take-up of 5G by consumers. However, when it comes to the 26 GHz band, a public consultation concluded that there is currently no demand for the band, even though experimental licences are available. In this regard, it is worth noting that in Wallonia, the 26 GHz band is subject to scrutiny by the Walloon parliament relating to electromagnetic frequencies. In this regard, it is essential that Belgium regularly assesses emerging market demand for the remaining unassigned spectrum in the 26GHz band (to incentivise and facilitate deployment of 5G services for advanced applications) and assigns it when the demand emerges. At federal level, the Belgian government has launched a 5G pilot funding programme to support promising test cases. With a budget of over EUR 24 million, the programme has already attracted more than 20 proposals.

With regards to the production of semiconductors, Belgium has showed progress with various projects under way at different stages of their life cycle. On semiconductors, Belgium is the host country of IMEC, a research institute on semiconductors. The Flemish government, through its partnership with IMEC, is providing an investment of more than EUR 130 million through to 2026 to continue research into cutting-edge and sustainable semiconductor technology. Through the joint project IMECxpand, a EUR 200 million investment fund has been set up with a commitment to investing in new semiconductor related companies in Belgium. IMEC continues to be at the cutting-edge of semiconductor research and other digital technologies. The resulting partnership should strengthen the European semiconductor ecosystem in areas such as health tech, EdTech, smart

public services, start-up development and more. All these deliverables contribute to the present Digital Decade targets. Belgium's good starting position on semiconductor research are an important contribution to the EU's efforts in semiconductors.

On high-performance computers, Belgium is a member of the EuroHPC LUMI pre-exascale supercomputer consortium with an investment of EUR 15.5 million. Belgium's participation in this project has resulted in Flemish, Walloon and national organisations joining forces under the Digital Europe programme to set up the project Belgian-QCI, the first quantum key distribution network in Belgium. The partners in this network will make use of various interfaced QKD technologies in several different topologies.

On the Digital Decade target to have at least 10 000 climate-neutral highly secure edge nodes are deployed in the EU, distributed in a way that guarantees access to data services with low latency (i.e. a few milliseconds) wherever businesses are located, Belgium has started to work towards the achievement of such goals. The AdvanceRF programme funded by the Flemish government looks at the next generation wireless technology at the frequencies aimed at lower-power, high density, high throughput connections for next-gen devices leveraging III-V materials.

Belgium is also participating in a multi-country project together with France, Germany and Finland to invest through the RRF fund into a testing and implementation facility in Edge-AI in collaboration with IMEC. The Testing & Experimentation Facility for Edge-AI will allow the European ecosystem around AI Chips to find the right components and solutions, which in itself should ensure that the path to market is shortened for this technology. Belgium numerous activities are an important contribution to efforts in this area.

Overall, Belgium continues to progress towards the achievement of the digital decade targets on infrastructure. The progress achieved this year must be sustained, particularly with regards to deployment of a high quality 5G network. However, considerable acceleration is needed.

Best practice: fibreinfo.be

Belgium has launched the website fibreinfo.be which provides information on fibre deployment in Belgium to all stakeholders. The website aims to be a central and neutral information point.

Given Belgium's moderate past performance with fibre deployment, there is lack of awareness of the processes. A central website that contains neutral information about fibre could help in creating this awareness in a neutral way.

The website has been very well received and is being actively used by all stakeholders to monitor the progress of fibre roll-out in Belgium.

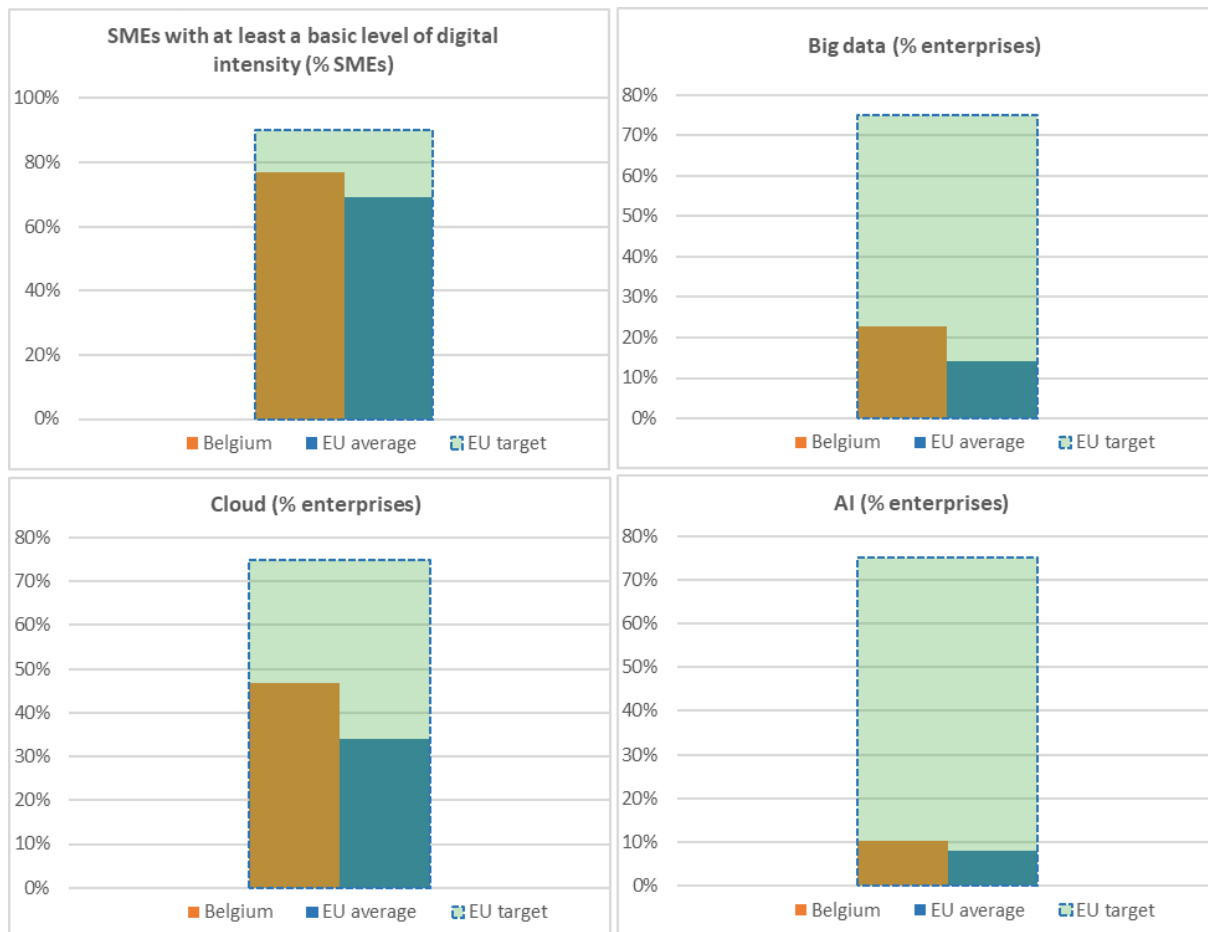
Belgium should step up its efforts on connectivity infrastructure. It should ensure a better coordination to support a more efficient rollout of fibre, notably thanks to a well-functioning Broadband competence office. Belgium should further reduce obstacles to deployment, notably by further simplifying administrative procedures (including permit granting) and measures to grant access to network infrastructure, stimulating reuse of existing infrastructure and co-deployment while reinforcing competition. To ensure that 5G coverage is adequate to market demands, it is essential that Belgium regularly assesses emerging market demand for the remaining unassigned spectrum in the 26GHz band and assigns it when demand emerges. Initiatives like the public-private partnerships to cover white areas are important in this regard.

Measures taken by Belgium in the field of semiconductors and quantum should continue in order to help the EU to become a strong market player in these areas.

3 Digitalisation of businesses

	Belgium			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	77%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	53%	57%	57%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	34%	45%	45%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	23%	23%	23%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud¹⁵	NA	47%	47%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	10%	10%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	25%	25%	25%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	24%	30%	27%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	NA	15%	17%	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	15%	16%	16%	9%	
% SMEs	2019	2021	2021	2021	

¹⁵ Enterprises buying sophisticated or intermediate cloud computing services indicator, see [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).



Belgium performs very well when it comes to the digitalisation of business and is on a good path to contribute to achieving the EU targets.

On the target of having 90% of SME's reach at least a basic level of digital intensity, Belgium performs quite well. **In 2022, 77% of Belgian businesses already achieved a basic level of digital intensity**, compared to the European average of 69%. This augurs that Belgium will make a relevant contribution to the target by 2030 if it continues with the current pace of its reforms.

Belgium performs above the EU average in terms of cloud, AI and big data uptake but still below the EU Digital Decade target of having 75% of Union enterprises taking up one or more of those technologies by 2030. Belgium needs to intensify its measures in order to accelerate take-up and ensure that the target is reached by 2030. Belgium starts from a strong base for both big data and cloud, with respectively 23% (2020) and 47% (2021) of enterprises adopting them, as opposed to 14% and 34% as an EU average. Actions in this regard will need to continue in order to be able to reach the target on one or more of those technologies.

Belgium is currently implementing several measures that can contribute to increase the digital transformation of business in line with the objectives of the Digital Decade. In the Flemish region, a data utility company is being launched, with the aid of RRF funding. The aim of this project is to make access to data more equitable for public and private operators within the connected ecosystems. By making such data flow between public and private organisations more fluent, secure and privacy friendly, the project should help with the uptake of digital solutions by businesses.

On artificial intelligence, Belgium is currently undertaking numerous initiatives. In Wallonia, the Digital Wallonia strategy is also focused on promoting artificial intelligence for businesses, while in

the Brussels region, another RRF funded project is developing an AI institute to use technology within society and business. One of the pilot projects in this regard is the use of AI technology to match job seekers with suitable employers.

The Start AI initiative between the Flemish Industry Partnership and the Digital 4Wallonia programme, aims to help companies fulfil the potential of AI within their business context. Moreover, Flanders provides co-financing for **2 Testing & Experimentation Facilities for AI** launched from the Digital Europe programme, around: Smart Cities & Communities and Agrifood.

These test facilities aim to test proof of concepts on AI in real environments so that they find their way to the market faster and can also be offered to companies in these thematic areas and thereby be incorporated.

On **cloud computing**, Belgium is one of the 12 Member States and more than hundreds of European companies taking part into the Important Project of Common European Interest on Next Generation Cloud Infrastructure and Services (IPCEI-CIS) which forms part of the Multi-Country Project on a Common Data Infrastructure and Services. The IPCEI-CIS aims at equipping the European Union with the next generation of advanced, distributed, secure, sustainable and innovative cloud-to-edge capabilities that citizens and businesses are in need for and will thus supports the cloud uptake among Belgium enterprises.

With regards to cybersecurity, the Belgian federal government has also launched a call for projects to strengthen the **Cyber-Resilience of SMEs and the Self-Employed**, with the aim of improving the cybersecurity of such businesses, in a way which complements the work already carried out by the regional authorities on the matter.

With regards to the target of having 90% of SME's reaching at least a basic level of digital intensity, Belgium **starts from a relatively good position of 77% and should maintain its momentum to reach the targets of 90% by 2030**. Belgium is currently implementing several measures to achieve this target. At federal level, an online platform to help SME's embrace e-commerce has been created with the expectation that over 1 million people will be targeted to encourage entrepreneurship. At regional level, Wallonia is targeting SME's through its Digital Wallonia upskills programme, whereas the Flemish region has in place in the fields of digitalization several actions. Six European digital innovation hubs (EDIH), multi-country projects selected under the Digital Europe programme with a total budget of EUR 9.3 million, will support the digital transformation of SMEs and public service. EDIH can be an effective tool to improve the digital intensity of SMEs and the uptake of technologies such as big data, artificial intelligence and cloud services. They are one-stop shops that support companies – in particular SMEs – and public sector organisations in their digital transformation.

In addition, some private sector initiatives provide additional support to increase the uptake of digitalisation within business. The Industry Partnership, with the collaboration of the Flemish government to stimulate the growth and innovation of the Flemish industry for a period of four years. In this regards the focus is mainly on digital organisations, smart products and services, artificial intelligence and cybersecurity.

Regarding the target on **doubling the number of unicorns**, Belgium is also progressing at a very positively pace, especially for its size. **Belgium currently has seven unicorns present in its territory which would make it rank 7th overall in Europe.**¹⁶ More importantly, Belgium currently has 15

¹⁶ Dealroom (date of extraction 16/01/2023).

companies which are valued between EUR 100 million and 1 billion which is an indication of a strong digital business ecosystem¹⁷. It is important maintaining efforts in this area.

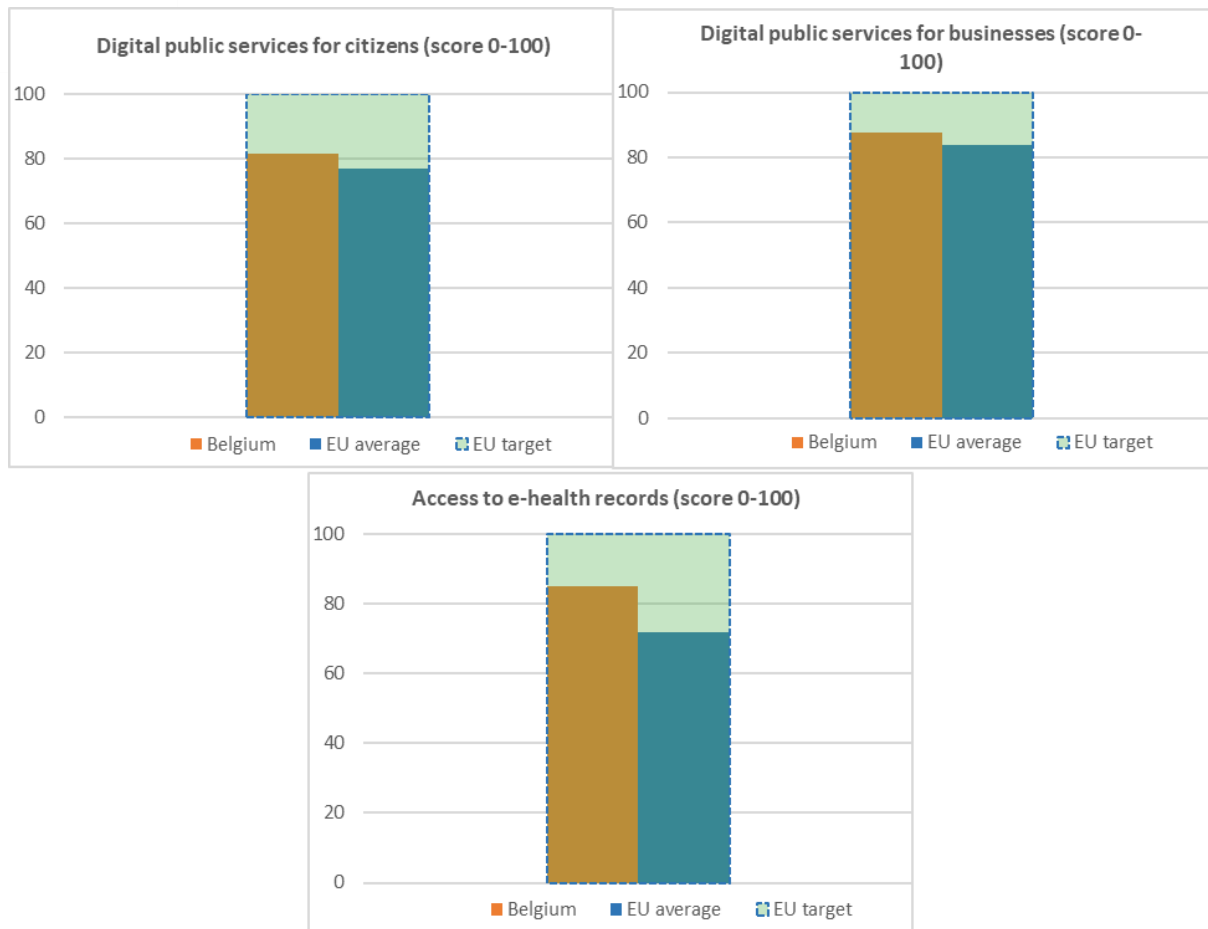
Flanders has started numerous programmes such as Scaleup Vlaanderen with the aim to provide mentorship for start-ups. Wallonia and Flanders also are part of the European Digital Innovation Hubs. The Scaleup Vlaanderen program (A guidance program for digital scale-ups supported by the Flemish government and other partners) offers ten different kind of services that all focus on innovative digital (start-ups and) scale-ups, from a high profile acceleration program for scale-ups ('Ignite'), over exclusive network events and international trade missions, to individual coaching trajectories focusing on internal scaling and internationalisation.

Belgium should continue implementing its policies in the area of digitalisation of businesses, in particular to foster the exploitation of new advanced cloud solutions by businesses and notably by SMEs through more tailored initiatives. Belgium should ensure better coordination of measures within the country to reduce fragmentation and costs for businesses.

¹⁷ Dealroom (date of extraction 15/06/2023).

4 Digitalisation of public services

	Belgium			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	88% 2022	74% 2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	72 2021	81 2022	77 2022	100
4a3 Digital public services for businesses Score (0 to 100)	NA	81 2021	88 2022	84 2022	100
4a4 Pre-filled forms Score (0 to 100)	NA	73 2021	77 2022	68 2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	63 2021	66 2022	65 2022	
4a6 User support Score (0 to 100)	NA	93 2021	93 2022	84 2022	
4a7 Mobile friendliness Score (0 to 100)	NA	99 2021	100 2022	93 2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	85 2022	72 2022	100



On the Digitalisation of public services, Belgium continues to improve and is making a solid contribution towards the achievement of the Digital Decade targets.

With regards to the Digitalisation of public services and the target of having **100% online accessible provisions of key public services**, Belgium continues to perform better than the European average. It reaches a score of 81 as regards digital public services for citizens (as compared to the EU average score of 77), and 88 as regards digital public services for businesses (EU average is 84). Concerning the indicator on digital public services for citizens, this is a marked improvement of 5 percentage points from the previous year score of 72. Belgium also performs very well when it comes to the number of users of e-government services with 88% of its citizens using such services compared to the EU average of 74%.

Belgium has put forward numerous initiatives both at federal and regional level to encourage the Digitalisation of public services and their uptake by citizens. Amongst them is The Federal Service Bus, which is a platform that is managed at federal level to ensure the secure exchange of electronic data between the rent service integrators in Belgium which allows for the once only principle to work in practice on the ground. At regional level, Flanders has pushed forward the project of Municipality without municipal hall which aims to transform the local authorities by digitalising their delivery and internal functions. This project is also included in the Belgian Recovery and Resiliency Plan. In Wallonia and its part of the Recovery plan, actions are being undertaken for the digitalisation of all public services and measures intended for businesses and citizens. On total, the Belgian Recovery plan has estimated EUR 586 million for the digitalisation of the public administration, including the digitalisation of the justice system and in particular of court proceedings.

On the target of having 100% of Union citizens have access to their electronic health records, Belgium has continued to roll out numerous initiatives throughout its various levels of government and stands at 84 as opposed to the EU average of 72.

The effectiveness of digital e-health scheme during the Covid-19 pandemic, boosted the public confidence in such schemes which has resulted in more progress and take up of such services. At federal level the e-Health action plan commits to create initiatives which share as much information as possible to make it available for consultation. This is mainly done through the e-health platform which puts data at the heart of healthcare policy. The federal government has also continued with the development of the **mijngezondheid** platform, which continues to evolve to give an active role to the citizen. Citizens can access all sorts of electronic health data such as: ePrescriptions and eDispensation, medical imaging reports and images, laboratory test results, hospital discharge reports, allergy information, diagnoses, devices and implant, procedures and relevant medicines. However, the data presented is not updated frequently following each care episode which hinders the value of such data to citizens.

At the regional level, Flanders has developed the Vitalink regulatory framework with the ambition of having safe and accessible information shared through the platform by 2025. In Wallonia, the Institute of Analytics for Health (INAH) project was launched with a pilot project aiming to enable the ethical and secure use of health information within the health system.

Belgium was also part of a CEF funded project that aims to help the development of patient summaries and electronic drug prescriptions. Flanders on the other hand, was also actively taking part in the Benelux cooperation for sharing health information.

Overall, Belgium would benefit from technical features that enable a frequent updating of online electronic health records with the newest health data following hours or a few days of each new care episode and encounter with health professionals. Belgium should **improve the range of data that is accessible** so to assure that access to electronic health records with timely updated minimum set of health-related data stored in public and private electronic health-record (EHR) systems is provided.

On secure online identification system, Belgium is also performing well with 70% of the population using one of the different solutions available. With the rollout of the Digital Minds declaration, the Federal government is aiming to have digital citizenship with access to all the online public services in Belgium. Belgium has three eID means notified. The Belgian Citizen eCard and the Foreigner eCard are notified at level of assurance 'high' under the Belgian eID Scheme FAS / eCards. The itsme® mobile App is notified at level of assurance 'high' under the Belgian eID Scheme FAS / Itsme®. Belgium is involved via public and private entities in three large-scale pilot projects, that will be funded under the Digital Europe Programme, with an overall grant request of over 1.1 million EUR. The effectiveness and impact of the considerable investments in digital public services stemming from the RRP could be increased by ensuring more complementarity in the accompanying measures that further strengthen the collaboration and alignment of the different administrative governments involved to further improve the interoperability, effectiveness and availability of online public services.

Best practice: Connectoo

Connectoo is a free online training course that is accessible to anyone working in a federal, regional or municipal administration, regardless of their job. The aim of the programme is to train and certify 10 000 public employees in Belgium by 2030. The main targets of such training are public service employees in direct contact with citizens and also public service employees involved in the design of

digital public services.

Belgium should accelerate its efforts to digitalise public services. In particular, Belgium should improve the range of data that is accessible to ensure that access to electronic health records with a timely updated minimum set of health-related data, stored in public and private electronic health-record systems is provided. It should further strengthen the collaboration and alignment of the different administrative governments involved, to further improve the interoperability, effectiveness, and availability of online public services.



Digital Decade Country Report 2023

Bulgaria

Introduction

Bulgaria has scope to improve its performance in the digital transition and to contribute to the collective efforts to achieve the EU's Digital Decade targets. While Bulgaria continues to perform well in connectivity both on very high-capacity network (VHCN) and fibre to the premises (FTTP), the uneven distribution of digital infrastructure in rural areas requires further attention. Furthermore, the uptake of digital public services is still low and targeted measures are needed, in particular to minimise the administrative burden placed on companies. Significant efforts should be made in the promotion of digital skills.

Bulgaria is collaborating with other Member States in exploring the possibility to set up a **European Digital Infrastructure Consortium (EDIC)** on Genome, to enable effective and secure cross-border access to repositories of personal genomic datasets.

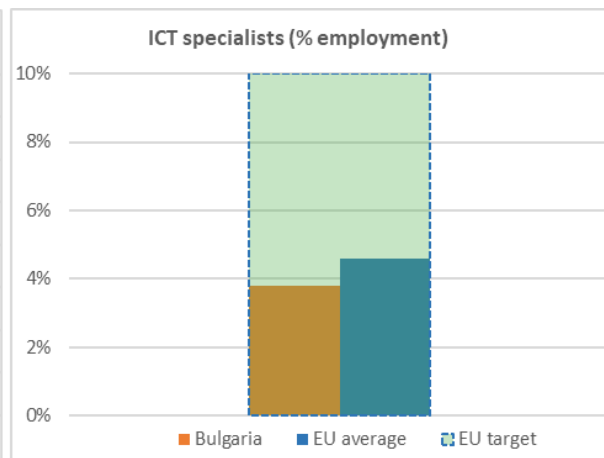
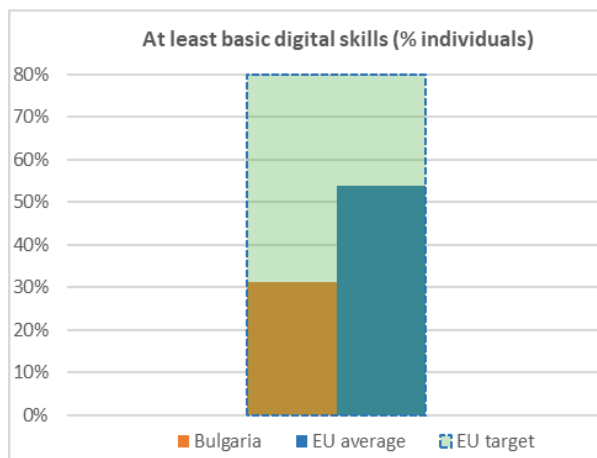
Digital in Bulgaria's Recovery and Resilience Plan (RRP)

The Bulgarian RRP amounts to EUR 6.27 billion. 25.8% of it (EUR 1.6 billion) is devoted to the digital transformation, of which EUR 1.01 billion is expected to contribute to the Digital Decade targets¹⁸. In the context of the first payment request, Bulgaria has achieved 11 milestones and targets. Several of them were related to measures in the digital area, such as reducing spectrum fees, legislative changes implementing recommendations under the Connectivity Toolbox, and awarding contracts to develop the TETRA system and radio relay network. Regarding the second payment request, Bulgaria is expected to achieve 66 milestones and targets out of the 346 in total in the Bulgarian plan.

¹⁸ Each Recovery and Resilience Plan must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plans had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or has no impact (0%) on digital objectives, using Annex VII of the RRF Regulation. Combining the coefficients with the cost estimates of each measure allows assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to allow for an estimation of the possible contribution of RRF measure to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice to potential ongoing revisions of the plan.

1 Digital skills

	Bulgaria			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	69%	74%	79%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	31%	31%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	8%	8%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	44%	44%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	7%	7%	9%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	3.3%	3.5%	3.8%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	4.0%	4.6%	4.9%	4.2%	
% graduates	2019	2020	2021	2021	



Bulgaria is contributing only moderately to the Digital Decade target in digital skills. Only 31% of people have at least basic digital skills, which is below the EU average of 54% and the lowest in the EU which is a risk for the collective Member States' achievement of the EU 2030 targets. The gap with the EU average is also very high when it comes to people with above basic digital skills (8% compared to 26% at EU level). A good indicator which can lead to a wider use of technology in the country, is the rise of ICT trainings offered by enterprises, which is starting to increase compared to previous years. The country also scores low in people with at least basic digital content creation skills (44% compared to 66% at EU level).

Bulgaria is currently implementing several measures that can contribute to increase the level of basic digital skills targeting professionals and the education system. For example, the grant scheme 'Joint actions for social partners for the development of digital skills' which helps various professionals acquiring digital skills still runs under the umbrella of Ministry of Labour and Social

Policy. Another initiative to support gender equality and anti-discriminatory principles are established under the supervision of the National Strategy for the promotion of Equality of Women and Men. The educational programme 'Education for tomorrow', focused on ICT training, has been established for educators and students to strengthen their digital skills. The educational content is provided through an educational platform, free of charge. More than 800 teachers and 5 200 students have been trained in basic and advanced digital skills. Moreover, a new programme, 'Rails Girls' to support women in basic digital skills has been adopted in 2022. Another initiative is the 'Hello Space' festival hosted by many organisations for embracing youth in science, technology, engineering, arts and mathematics (STEAM). Until July 2022 the two annual editions of the festival attracted over 3 000 people and millions of online participants.

Bulgaria is working together with other Member States of the region to foster cross-border collaboration to enhance the EU 2030 targets in digital skills. In this context, there is the national funder project Generation Z: Building up disinformation resilience of the leaders of tomorrow, which uses AI to detect false information spreading on social media. The Women in STEM is an Erasmus+ project that Bulgaria is participating in. The project value is EUR 250 000 and the scope is to build and support more women in pursuing a career in STEM. Since November 2022, a new initiative supported by the European Investment Bank, AI&I Factory, has aimed to deepen the knowledge of AI to youth in everyday life and help in experimentation on creating innovative ideas and attract more females in the tech industry. The initiative targeted 50 young participants, aged 18 – 30, from five universities who attended a series of lectures and mentoring sessions guided by mentors from the tech industry.

The country has a low share of ICT specialists: the percentage of ICT specialists of total employment is 3.8%, remaining below the EU average (4.6%). In parallel, only 9% of enterprises provide ICT training to their employees, 13 percentage points below the EU average. However, 4.9% of graduates are in ICT programmes, which is above the EU average. Bulgaria performs best in the EU as regards the share of female ICT specialists at 28.9%, against an EU average of 18.9%. Bulgaria's overall weak performance in ICT specialists available in the job market also has implications for the EU's efforts to reach the DD target of 20 million ICT specialists¹⁹.

Bulgaria is currently working on several programmes and initiatives to address this shortcoming.

The Human Resources Development Programme introduced a measure providing specific ICT training in digital skills which is expected to contribute to the Digital Decade target for ICT specialists. The programme foresees 161 000 people to take part in trainings by 2029. The total budget of the measure is EUR 17.3 million. Another educational programme, KiTE Projects, focusing on young creators in STEM workshops, takes place every year with young participants from multiple Bulgarian cities. The Bulgarian National Platform for Digital Skills and Jobs provides open access to high-quality resources for national policies in digital skills and good practices in the area of training in digital skills.

ILIAD is a Horizon 2020 project in which Bulgaria participates and will equally support the development of advanced digital skills by sharing technical expertise between the project members. The project capitalises on the expertise and the advanced computing infrastructures available at the AI Laboratory in the Technical University of Varna. The initiative CloudEARTH*i* aims to build capacity for innovation across higher education institutions and businesses. The project has a total budget of EUR 1.2 million and it is co-funded by the European Institute of Innovation & Technology (EIT).

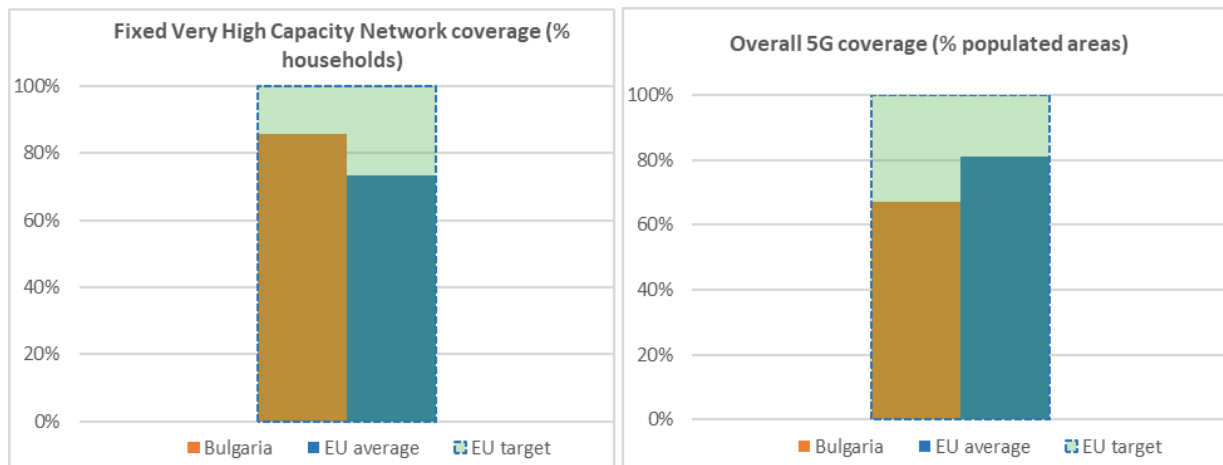
¹⁹ Which corresponds to about 10% of total employment.

Bulgaria should significantly step up its efforts in the area of digital skills. In particular, Bulgaria should ensure a whole-of-government approach to coordinate more effectively and efficiently the development, implementation, and evaluation of digital education policy and strengthen the involvement of relevant stakeholders. It should step up upskilling and reskilling of the labour force, including by mobilising EU funds or by using the European Technical Support Instrument to develop, deliver and evaluate programmes addressing specific adult learning needs²⁰.

²⁰ The recommended policies, measures, and actions in this document reflect the Commission Communication 'Report on the state of the Digital Decade' COM(2023) 570.

2 Digital infrastructures

	Bulgaria			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up	20%	30%	39%	55%	
% households	2020	2021	2022	2022	
2a2 At least 1 Gbps broadband take-up	0.4%	0.6%	0.8%	13.8%	
% households	2020	2021	2022	2022	
2a3 Fixed Very High Capacity Network (VHCN) coverage	75%	81%	86%	73%	100%
% households	2020	2021	2022	2022	
2a4 Fibre to the Premises (FTTP) coverage	75%	81%	86%	56%	
% households	2020	2021	2022	2022	
2b1 Mobile broadband take-up	60%	73%	73%	87%	
% individuals	2018	2021	2021	2021	
2b2 Overall 5G coverage	0%	40%	67%	81%	100%
% populated areas	2020	2021	2022	2022	
2b3 5G spectrum	25%	25%	63%	68%	
Assigned spectrum as a % of total harmonised 5G spectrum	2021	2022	2023	2023	



Bulgaria performs well in terms of VHCN coverage reaching 86% and is above the EU average of 73%. In this respect Bulgaria can make an important contribution to the relevant Digital Decade target. Equally, the FTTP coverage is with 86% significantly above the EU average of 56%. Despite the impressive coverage, Bulgaria needs to make further efforts to boost take-up which remains low in particular for the at least 1Gbps broadband at 0.8% compared to the EU average of 13%.

In terms of 5G, Bulgaria scores below the EU average in overall 5G coverage (67% vs 81%). Mobile broadband take-up remains at 73% below the EU average of 87%. During the reporting period, the National Regulatory Authority issued provisional authorisations to three major mobile network operators (MNOs) for the remaining unassigned 5G bands, apart from the 3.6 GHz spectrum band which has been assigned since 2021. More specifically, in sub-GHz bands a 3x20 MHz has been

assigned in the 700 MHz band and 3x20 MHz has been assigned in the 800 MHz band. Under the Recovery and Resilience Plan, Bulgarian public authorities have signed an agreement with the Air Force to conduct test trials in 2023 in the 700 MHz and 800 MHz bands to identify the impact of the transmissions on ground-based military radio navigation systems.

Moreover, in the 26 GHz band the NRA has issued four authorisations for granting a total spectrum of 1.6 GHz to three undertakings for 5G network deployment. Furthermore, in 2022 a procedure was carried out to assign additional spectrum in the 1800 MHz band and the NRA issued authorisation to three undertakings to use 2 x 20 MHz each and a total wireless spectrum allocation of 120 MHz.

For the first half of 2022 the take-up of mobile broadband in terms of number of subscribers has increased by 3%. However, most of the subscribers (65%) are subscribed mainly to 4G mobile services.

In terms of market developments, one of the MNOs active in Bulgaria, has completed an upgrade towards a fully autonomous 5G network. The new network will offer higher capacity, higher speeds and reduced latency. In October 2022, a 5G product test laboratory has been set up to shorten the production time and the overall time-to-market of optical cables and components for communication networks which are built in Sofia.

In 2022, the European Electronic Communications Code transposition has been finalised and Bulgaria notified it as complete. As part of this process, measures were taken to address universal access for people with disabilities and make it more affordable for people with low income. With regard to regulated access, the NRA has adopted a Decision in June 2022 for the definition, analysis and assessment of the wholesale market.

The telecom sector in Bulgaria has green policies which are reviewed and updated at an annual basis to stay aligned with the EU sustainability goals. To improve the environmental footprint and the energy consumption of electronic communication networks, Bulgaria promotes the deployment of fibre cables in public sector buildings to replace less energy efficient copper cables. All telecom operators are committed to decrease their carbon footprint and gradually switch to clean energy and renewable sources. For example, one operator announced plans to invest in solar and wind renewable energy. The park includes a 70 MW wind farm capable of producing 230 MWh per year and 40 MW photovoltaic park with expected production of 68 KWh per year. The renewable energy plant is expected to be fully operational in 2023. The NRA adopted rules to increase the security standards of networks and services. The new rules are aligned with measures from the 5G Cybersecurity Toolbox.

In 2022, the Ministry of Innovation and Growth (MIG) established a Working Group on Semiconductors (WGS) with representatives from the public administration, non-government associations and universities. The working group will consult and support MIG's activities in making semiconductors a strategic asset for the industrial value chain in Bulgaria. Experts in the group will be able to share good practices and know-how towards the preparation and implementation of public policies in the field of microelectronics by facilitating pro-active exchange of information on the state of the ecosystem, raising awareness and optimising cooperation. With the help of stakeholders, MIG will be able to better map potential short and long term opportunities and risks in the field and thus, support the industry development in the country.

Bulgaria is an active EU player in the field of high-performance computing (HPC). In the Action Plan for the implementation of the National development programme BULGARIA 2030 for the period 2022 - 2024 as part of the EuroHPC Joint Undertaking (JU) in the period 2021 - 2026, Bulgaria is developing a world-class supercomputer named 'Discoverer' that was inaugurated in October 2021 with funding from a joint investment of about EUR 11.5 million from the EuroHPC JU. The new

supercomputer, hosted in the 'Sofia Tech Park', is capable of executing more than 6 petaflops peak performance. The main objective of the Discoverer is to stimulate industry and scientific research with modelling and optimisations in multiple scientific fields, such as pharmaceuticals, bioinformatics and climate. In addition, in the framework of EuroHPC JU, Bulgaria has also established a national HPC competence centre, coordinated by the Institute of Information and Communication Technologies at Bulgarian Academy of Sciences (IICT-BAS).

In 2021, Bulgaria has been a member of a project funded under the Digital Europe Programme (DEP) for the design of a national plan in quantum communications infrastructure (QCI) in the context of the EuroQCI. The project will deploy quantum key distribution systems to develop secure networks. Three Bulgarian ministries will participate in the QCI network deployed between the city of Sofia, Kulata and also a border city in Greece and the pilot project will foster training to public authorities, industry and research staff. Bulgaria's national QCI plan is expected to boost technological developments in the field of quantum communications and cybersecurity. In quantum communication, Bulgaria is therefore expected to contribute to the Digital Decade goal of Europe being at the cutting edge of quantum technologies by 2030.

Bulgaria has also been active in the implementation of blockchain infrastructure in the public sector services and EU cross-border services. In 2023, Bulgaria will start pilot projects under the European Blockchain Services Infrastructure (EBSI).

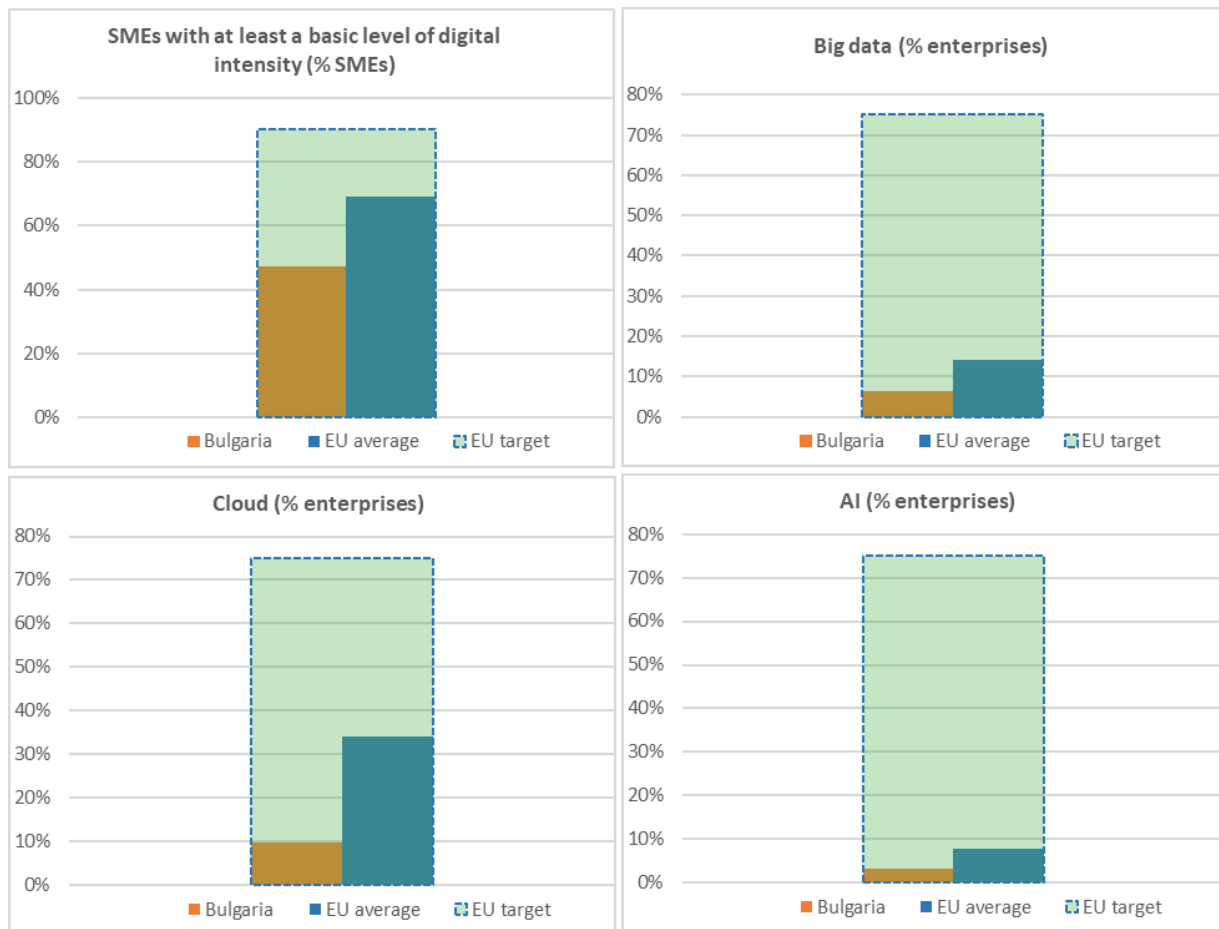
Bulgaria should accelerate its efforts on connectivity infrastructure, in particular by taking measures to incentivise the take up of gigabit connectivity and accelerate 5G rollout.

Measures taken by Bulgaria in the field of semiconductors and quantum computing should continue in order to help the EU become a strong market player in these areas.

3 Digitalisation of businesses

	Bulgaria			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	47%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	23%	22%	22%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	10%	13%	13%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	6%	6%	6%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud²¹	NA	10%	10%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	3%	3%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	10%	10%	10%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	8%	10%	11%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	3%	4%	5%	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	3%	4%	4%	9%	
% SMEs	2019	2021	2021	2021	

²¹ Enterprises buying sophisticated or intermediate cloud computing services indicator, see [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).



The level of digitalisation of businesses in Bulgaria is well below the EU average and far away from the Digital Decade target. 47% of SMEs have at least a basic level of digital intensity; 6% enterprises use big data versus 14% on average in the EU. The adoption of cloud and AI in enterprises amounts to one third of the EU average and therefore needs to be stepped up in order to contribute to the Digital Decade ambition.

Bulgaria has also introduced measures to underpin the Digital Decade target of more than 90% of Union's SMEs reaching at least a basic level of digital intensity, such as the 'technological modernisation' grant scheme under the RRP which is announced by the Ministry of Innovation and has a total financial allocation of EUR 132.7 million. The main objective of this measure is the digitalisation of the manufacturing process in view of expanding the production capacity and the diversification of products and services. More than 900 Bulgarian enterprises were already supported by the grant scheme with a total of BGN 246 million.

Another initiative of MIG which supports digital transformation of the business sector is the grant scheme 'Solutions in the field of information and communication technologies and cyber security in small and medium-sized enterprises' which is another RRP measure with an aim to accelerate the transition to the digitalisation of the economy. The total budget of this RRP measure is EUR 15.6 million and over 1 500 SMEs are expected to be supported under the scheme. In a similar direction, the promotion of Industry 4.0 standards and the implementation of cybersecurity processes in SMEs is the specific objective of the Competitiveness and Innovation in Enterprises programme 2021 – 2027 which is funded under ERDF with a budget of EUR 194.2 million.

Moreover, the MIG has existing measures for digitalisation of SMEs and foreseen some new ones in 2023. For example, the establishment of the national network of European Digital Innovation Hubs (EDIHs) which provides funding to Bulgarian SMEs to foster digitalisation of their manufacturing processes and creating products and services based on digital technologies. Bulgaria has 4 EDIHs funded by Digital Europe under a co-financing mechanism of 50% to support national projects. Eight additional EDIHs have received the Seal of Excellence and are foreseen to be funded by ERDF programme 'Research, Innovation and Digitalization for smart transformation 2021-2027 (PRIDST)', for example, the grant scheme 'Development of innovations in enterprises' with EUR 64.9 million and the grant scheme 'Implementation of innovations in enterprises' with EUR 150 million, respectively. Their objective is to facilitate growth of innovative SMEs and to boost the innovation and investment activity of Bulgarian businesses. Additional resources in this area are also envisaged to be provided under the form of financial instruments more specifically to provide access to venture capital investments in innovative enterprises.

Finally, Bulgaria has endorsed cross-border synergies towards facilitating digital transformation of businesses. Such a project is the 'Ecologically Viable Business Innovation' which is currently being implemented. The project has a budget of EUR 237 000 and entails the development of digital skills on eco-friendly business models and the digital transformation of businesses.

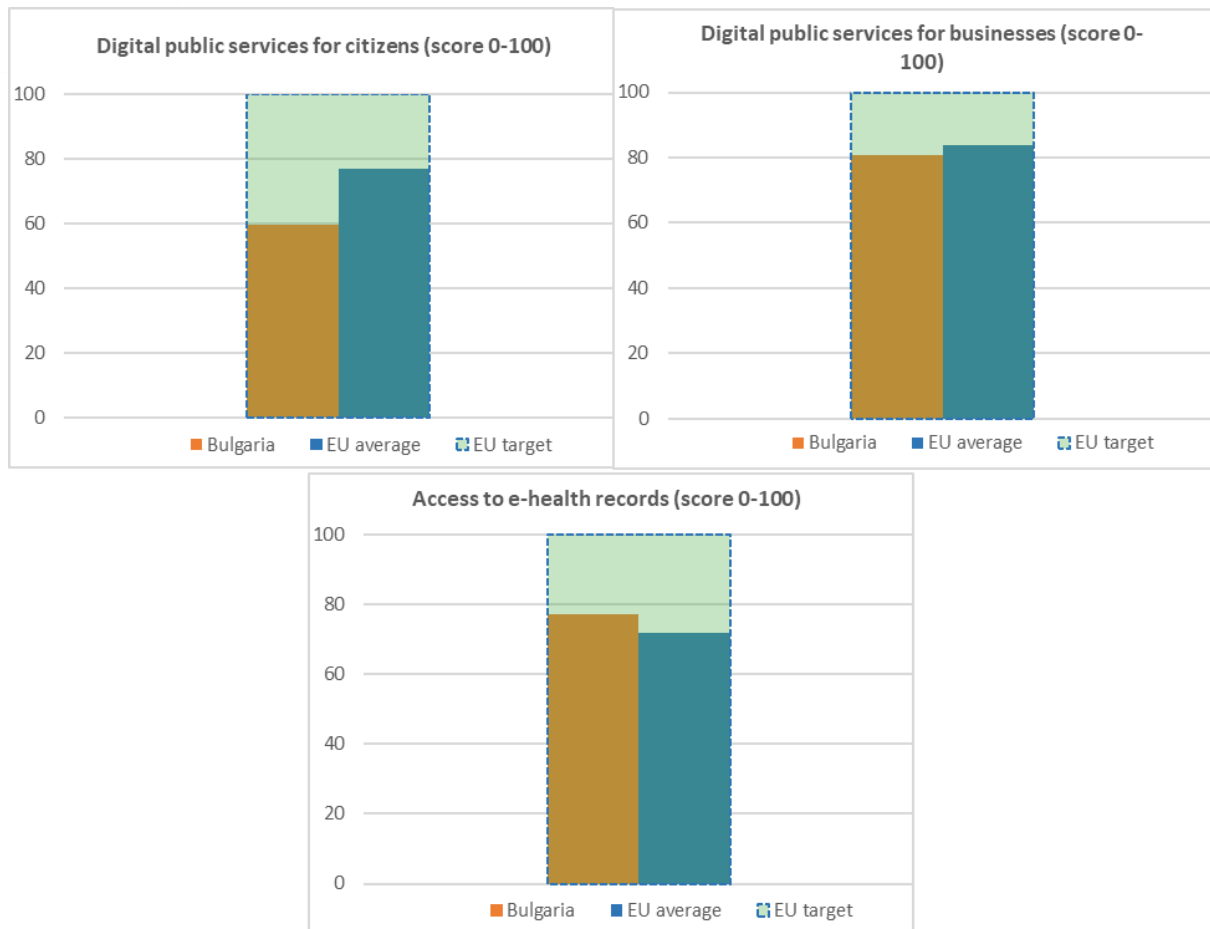
Bulgaria has introduced several measures, including regulatory measures, to contribute to the Digital Decade target of at least 75% of Union enterprises having taken up cloud computing services, big data or artificial intelligence. Bulgaria started developing several data spaces and data platforms. As an example of data spaces, in November 2022, the first Urban Data Space was officially launched. The space allows organisations to share and access data for developing new business products and improving urban services. Regarding data platforms, the iSofMap is an application providing services in the field of geodesy, cadastre, urban planning and geographic information system. It is a commercial company owned by the Sofia Municipality. In April 2022, the institute for Computing Artificial Intelligence and Technologies INSAIT was established in Sofia's University and has created partnerships with other leading institutes worldwide. Bulgaria supports it with nearly EUR 100 million for a period of 10 years with a goal to create a leading technology institute in the country and stimulate innovation in the economy.

In March 2022, Bulgaria has managed to attract investments for the first unicorn company (Payhawk). Bulgaria has developed a dynamic start-up ecosystem with over 1 600 companies which offer 20% of the total start-up jobs market in south-east Europe. Overall, the developments have fostered links with the local market and the research community and show uptake of digital technologies and jobs growth.

Bulgaria should significantly step up its efforts in the area of digitalisation of businesses, in particular, it should take further action towards increasing overall digital intensity in SMEs as well as the adoption of cloud computing services, big data and artificial intelligence.

4 Digitalisation of public services

	Bulgaria			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	32% 2022	74% 2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	59 2021	60 2022	77 2022	100
4a3 Digital public services for businesses Score (0 to 100)	NA	76 2021	81 2022	84 2022	100
4a4 Pre-filled forms Score (0 to 100)	NA	58 2021	64 2022	68 2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	51 2021	51 2022	65 2022	
4a6 User support Score (0 to 100)	NA	78 2021	82 2022	84 2022	
4a7 Mobile friendliness Score (0 to 100)	NA	94 2021	95 2022	93 2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	77 2022	72 2022	100



There is significant room for improvement for Bulgaria on digital public services, also with regard to its contribution to the EU 2030 targets. The country scores 60 in the digital public services for citizens which is below the EU average (77), but is close to the EU average on digital public services for businesses (81 compared to 84 in the EU average). Only 32% of internet users are accessing e-Government services in Bulgaria, whereas the EU average is 74%. In transparency of service delivery and personal data, the country scores 51 out of 65 in the EU average demonstrating that further effort is necessary also in these aspects. Nevertheless, Bulgaria scores highly on the mobile friendliness score (95) which is already above the EU average (93). Moreover, the country is developing a mobile application Civi that tackles the communication and complaints from citizens to municipalities for urban issues that can further improve its performance.

There are several ongoing initiatives in Bulgaria to foster progress in the dimension of digital public services. For example, the Ministry of Justice in Bulgaria has provided electronic services for access of judicial decisions and has set up an electronic register for certain administrative procedures. The implementation is scheduled to be completed by end of 2023 and the total budget is BGN 431 661.

Moreover, the Ministry of Regional Development and Public Works is implementing a unified public register for spatial planning. The project is planned to be completed in Q3 2023, it has a total budget of BGN 3 million and it is co-financed at 85% from the European Social Fund (ESF).

Bulgaria focuses on data as a crucial capital of society with the strategy for a data-driven governance under the national framework of digital transformation of the public services in managing and operating the public data spaces. In this context, a single web-based platform (one-stop-shop) for data access within the national ecosystem is currently being developed. In this direction, a total of EUR 75 million under PRIDST will be targeted toward digital transformation of the

public sector and development of data spaces in priority sectors of high public interest and importance.

Bulgaria has not yet notified the Eurotrust scheme, a pre-notification process was carried out, within which a peer review was carried out. An application for notification of the scheme has been submitted, and the procedure has not been completed.

At the moment, the [Ministry of eGovernment's](#) (MEU) mobile application for electronic identification and electronic signature, BGID, is not implemented, and the process has been stopped with a view to making a decision.

Bulgaria has set cybersecurity as a priority axis and therefore aims to improve the national capacity and adapt the competent authorities to constantly track cybersecurity risks and threats. The establishment of a Secure Shared Information Space for E-Government (SSISG) is planned to ensure centralised intelligent management of information resources in public administrations. A specific project is currently under implementation until October 2023 to support municipal administrations with providing cybersecurity expertise. Bulgaria is participating in a Horizon 2020 project (Aviation, Naval and Power-grid environments - FORESIGHT) with a consortium partner, the national Computer Emergency Response Team (CERT-BG) for training and preparedness on cybersecurity attacks in aviation, naval and power-grid environments. The project has a duration of three years and a budget of EUR 7.3 million.

Bulgaria fosters the project for Development and Implementation of National Health Information System (NHIS) which will include e-health records, e-prescription and a set of other relevant services. The objective is for all people to have access to their personal e-health records through a single web portal and access will also be provided to authorised medical staff. Since September 2022, there is also an accompanying mobile application for accessing personal e-health records available in the NHIS. The mobile application provides also personalised notifications, such as for scheduled doctor appointments. Bulgaria performs above average on providing access to e-health records with a score of 77 compared to the EU average of 71. However, more effort is required to reach the EU 2030 target of 100.

In July 2022, Bulgaria adopted a national plan for the Open Governance Partnership Initiative and among the 14 commitments, five are directly linked to digital citizenship. One of the measures of the national plan refers to the implementation, until the end of 2024, of an effective public dialogue for the development of common standards in the use of artificial intelligence in the digitalisation process in order to ensure guarantees of equal access and respect for human rights.

Bulgaria has established an ICT Community Advisory which will explore interactions with all relevant stakeholders to collect feedback from industry organisations in all areas of digital transformation and support the ministries in policy making.

The State Agency for Child Protection has issued guidelines, together with other government agencies, on how children can be protected from online dangers and actively promotes the use of the national child help line number. Various dissemination events for child safety took place in 2022.

Best practice: Genome Digital Infrastructure (GDI)

As of November 2022, Bulgaria is a partner of the Genome Digital Infrastructure (GDI) project which kicked-off in November 2022. The project will establish the framework for collection of genomic data to be used under research in healthcare. The database will serve for prevention and treatment for many diseases, such as diabetes and cancer.

Moreover, Bulgaria is collaborating with other Member States on a proposal for a Genome EDIC,

which supports the 1+ Million Genomes initiative and its European Genomic Data Infrastructure and seeks to establish a trust framework to enable the effective and secure cross-border access to repositories of personal genomic datasets among participating countries.

The duration of the project is 48 months. The participation of Bulgaria has contributed positively to the creation and development of the European Health Data Space.

Bulgaria should accelerate its efforts to digitalise public services. In particular, it should raise awareness of its public services being available online to all internet users.



Digital Decade Country Report 2023

Cyprus

Introduction

Cyprus has untapped digital potential to contribute further to the collective efforts to achieve the EU's Digital Decade targets. The country has taken a number of steps towards improving its digital performance and recently established the [Deputy Ministry of Research, Innovation and Digital Policy \(DMRID\)](#) with a central coordination role for the implementation of the [Digital Strategy for Cyprus 2020-2025](#), which is broadly aligned with the Digital Decade Policy Programme. Progress is not distributed evenly across the different aspects of the Digital Decade. Cyprus is progressing well in digital skills, but more efforts are needed on the digitalisation of the public sector in particular for citizens, and on connectivity.

Cyprus is collaborating with other Member States in exploring the possibility to set up a **European Digital Infrastructure Consortium (EDIC)** on establishing the European Cybersecurity Skills Academy.

Digital in Cyprus' Recovery and Resilience Plan (RRP)

Cyprus' RRP devotes EUR 282.2 million (23%) to the digital transition; from that EUR 261.9 million are expected to contribute to the Digital Decade targets²²

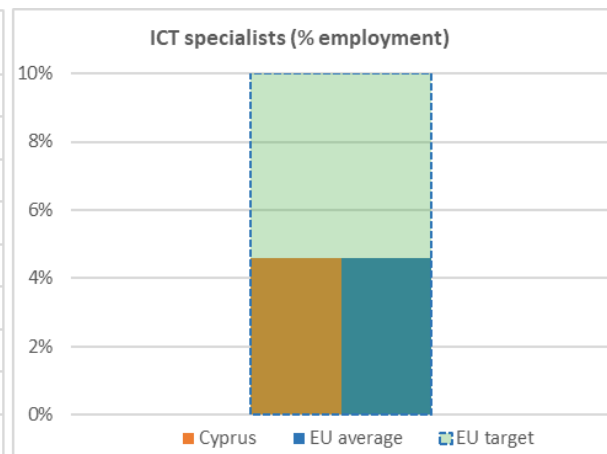
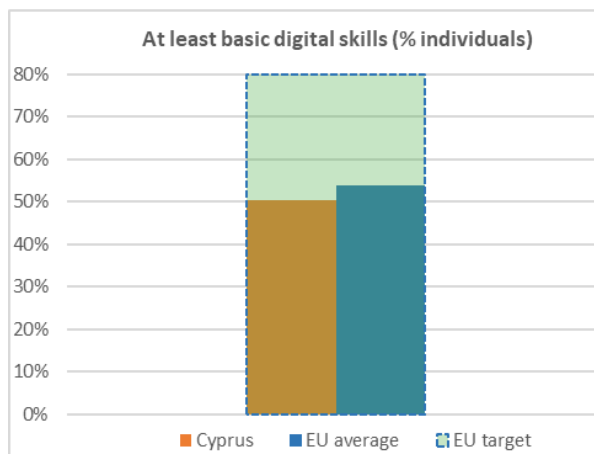
On 25 October 2022, the European Commission endorsed a positive assessment of Cyprus' first payment request for EUR 85 million (EUR 97 million if prefinancing is included) in grants. All the 14 milestones related to the first instalment were satisfactory fulfilled. Few digital milestones were included in this request: for example, the digitalisation in central government and the e-skills Action Plan.

Further milestones and targets are also expected to contribute to fulfil the Digital Decade targets in the coming years, for example measures to expand very high capacity networks, create a regulatory sandbox to enable fintech and implement a new cloud policy for government IT systems and services relevant for digitalisation of public services.

²² Each Recovery and Resilience Plan must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plans had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or has no impact (0%) on digital objectives, using Annex VII of the RRF Regulation. Combining the coefficients with the cost estimates of each measure allows assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to allow for an estimation of the possible contribution of RRF measures to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice to potential ongoing revisions of the plan.

1 Digital skills

	Cyprus			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	91%	91%	89%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	50%	50%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	21%	21%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	60%	60%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	25%	25%	28%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	3.1%	3.9%	4.6%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	2.9%	2.7%	2.8%	4.2%	
% graduates	2019	2020	2021	2021	



In 2022, several initiatives to support digital skills development were ongoing under the umbrella of the [National Digital Skills Action Plan 2021-2025](#). Cyprus' objective, with the support of the Recovery and Resilience Facility (RRF), is to improve digital skills development in all population groups, including upskilling and reskilling the workforce. Digital education and skills for all are one of the country's main priorities. Cyprus recognises the importance of analysing business needs for digital skills, and academic programmes to match the needs of the economy.

In Cyprus only 50% of the population have at least basic digital skills, which is 4 percentage points below the EU average. However, the share of ICT specialists in employment increased significantly in 2022 to reach the EU average of 4.6%. Moreover, at 21.6%, the share of women among ICT specialists is higher than the EU average of 18.9%. Cyprus shows commitment to contributing to the collective effort to achieve the Digital Decade target on ICT specialists. However, some challenges remain such as the low percentage of ICT graduates and the insufficient match between the academic courses available and the need for ICT specialists on the labour market. ICT graduates

account for 2.8% of graduates in Cyprus, compared to the EU average of 4.2%. Cyprus performs above the EU average on the share of enterprises providing ICT training, at 28% compared to the EU average of 22%.

Cyprus is currently implementing several measures that could help strengthen the digital fitness and capacity of people across the whole demographics, social and economic spectrum. The National Digital Skills Action Plan 2021-2025 contains a plethora of measures to help enhance the population's digital skills. The plan takes into consideration the Digital Decade targets for digital skills. It serves as an umbrella document, taking into account other sector-specific strategies like the lifelong learning strategy developed by the [Ministry of Education](#) and the National Cybersecurity strategy developed by the Digital Security Authority (DSA). The plan worth EUR 24 million covers all relevant training provided at national level, including training provided by: (i) the [Cyprus Productivity Centre](#) (CPC) for the general public; (ii) the Deputy Ministry of Research, Innovation and Digital Policy (DMRID), and the [Cyprus Academy of Public Administration](#) (CAPA) for public administrations; (iii) the [Human Resources Development Authority](#) (HRDA) for the private-sector workforce; and (iv) the Ministry of Education for the academy and other educational systems. Through the RRF, the government is planning to equip at least 700 schools with hardware and other materials for improving students' digital skills and to create the e-classroom.

Cyprus Digital Skills and Jobs Coalition is an important leverage for upskilling and overall digital inclusion. In 2023, the government relaunched the National Coalition, which was put on hold in 2022. Numerous organisations from the public and private sector and the academia will participate in this initiative. [Cyprus Digital Skills and Jobs Coalition platform](#), supported by the Connecting Europe Facility instrument, will serve as a hub for enhancing collaboration between all participating stakeholders and for sharing best practices and digital skills trainings. The platform will include a list of available training opportunities from all coalition members and a self-assessment tool to assess people's digital skills. It will also provide suggestions on specific training materials based on participants' digital skills levels.

In the public sector under the [European Social Fund Plus \(ESF+\)](#) funding instrument, CAPA is implementing a series of training programmes on digital skills, from basic to advanced level. A dedicated survey had identified the key digital skills needed. Based on this, more than 13 000 training needs were identified in 90 public organisations in fields ranging from cybersecurity to social media. In 2022, more than 3 000 civil servants participated in the training programmes which will be available to other public servants throughout 2023. The training on cybersecurity at a basic level will begin in 2023. The estimated number of participants is around 2 500 public servants.

Cyprus's digital transition objective is to include everyone in this journey. The CPC is planning to scaleup trainings for people aged over 55 and other vulnerable groups (e.g., people in remote areas, people with disabilities). In 2022, Cyprus piloted 70 training programmes attended by more than 800 people. In 2023-2025, it plans to make over 450 training programmes available to everyone covering several areas (e.g., use of smart devices, use of e-government services, cybersecurity, digital marketing). The DMRID funds the development of the training courses in consultation with social partners.

The Human Resources Development Authority provides employed and unemployed people with training opportunities. From 2019 to 2022, the authority provided 675 training programmes to more than 5 500 employed people and 127 programmes for more than 300 unemployed people. The authority, in line with the RRP, will also provide training for reskilling and upskilling the population's digital skills for 2023-2026. There are also dedicated training programmes and supporting mechanisms for unemployed people, students, and women who experience difficulties in finding a job.

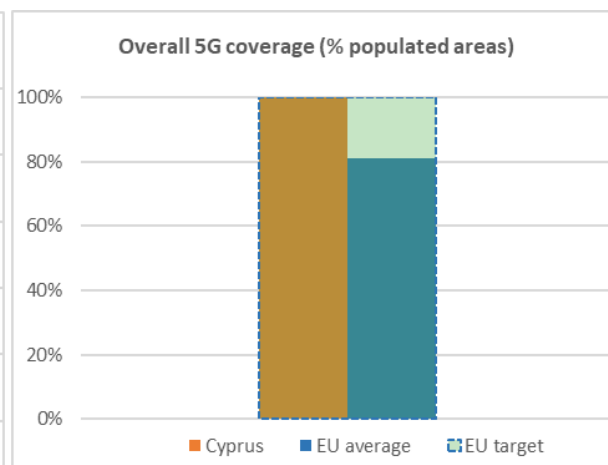
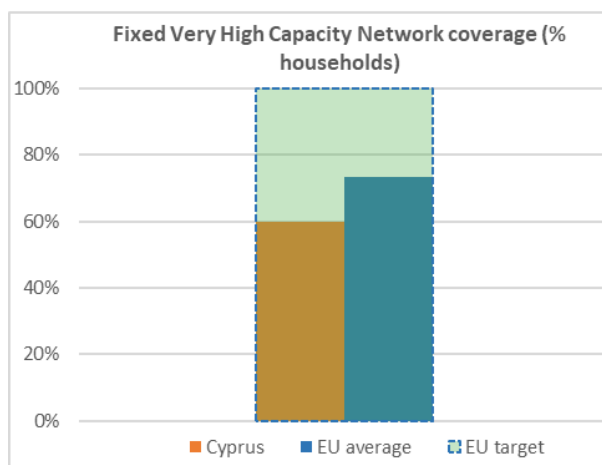
The government systematically monitors and analyses long-term trends in the labour market and predicts the quantitative needs and the knowledge and skills required. In this vein, the HRDA developed a [study](#) to provide forecasts for both the demand and the supply of labour in the Cypriot economy for 2022-2032. Demand forecasts are provided for 52 sectors of economic activity and 309 occupations, while supply forecasts are provided for the economy as a whole, by gender and by education level. Furthermore, the DMRID has completed a dedicated survey among the members of the Cyprus Information Technology Enterprises Association (CITEA) on ICT roles & skills. The results will contribute to additional curricula for training programmes to be launched in 2023, under the RRP.

Cyprus should accelerate its efforts in the area of digital skills, putting a special focus on training people over 55 and other vulnerable people should contribute to improving the overall level of digital skills of the population. Building on the Year of skills, targeted actions for awareness raising on the training courses available for the population is necessary to meet the Digital Decade objectives and targets²³.

²³ The recommended policies, measures, and actions in this document reflect the Commission Communication 'Report on the state of the Digital Decade' COM(2023) 570.

2 Digital infrastructures

	Cyprus			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up	3%	26%	44%	55%	
% households	2020	2021	2022	2022	
2a2 At least 1 Gbps broadband take-up	<0.1%	0.2%	0.9%	13.8%	
% households	2020	2021	2022	2022	
2a3 Fixed Very High Capacity Network (VHCN) coverage	26%	41%	60%	73%	100%
% households	2020	2021	2022	2022	
2a4 Fibre to the Premises (FTTP) coverage	26%	41%	60%	56%	
% households	2020	2021	2022	2022	
2b1 Mobile broadband take-up	84%	91%	91%	87%	
% individuals	2018	2021	2021	2021	
2b2 Overall 5G coverage	0%	75%	100%	81%	100%
% populated areas	2020	2021	2022	2022	
2b3 5G spectrum	67%	67%	67%	68%	
Assigned spectrum as a % of total harmonised 5G spectrum	2021	2022	2023	2023	



In connectivity, Cyprus's plans for a comprehensive roll-out of fixed and mobile networks, together with plans to promote fixed VHCN take-up have started to show first results. In the reporting period, impressive progress was made in both fields. The progress made in very high capacity network (VHCN) coverage in Cyprus over the last year is substantial, with a 19 percentage point increase to 60% coverage in 2022, reducing the gap to the EU average (73%) to only 13 percentage points. At the same time Cyprus is performing well on FTTP coverage, with 60%, higher than the EU average of 56%. The Cypriot authorities are making use of RRF funds to make further advancements in this area, which are especially necessary in rural areas, so as to achieve its national target for rural coverage as well as the Digital Decade target for gigabit coverage. It is planned that EUR 35 million will be drawn from the RRF to expand VHCN in underserved areas. This will take place once the groundworks has been laid with the launch of a geographical survey. Another preparatory measure will be to identify and address bottlenecks and barriers to the rapid deployment of VHCN. These

reforms should be finalised by the second quarter of 2024, so that investment in expansion can build on the outcome of the reforms. The reform and subsequent investment should provide at least 44 000 premises in areas of no interest to private investors with VHCN fixed or mobile network coverage, provided in the case of fixed coverage, that the network is readily upgradable to gigabit.

Cyprus has also introduced plans to increase the take-up of VHCN. Following the pilot subsidy voucher scheme in 2019, the government has launched a new investment scheme to incentivise take-up of gigabit connectivity under the national RRP. While the number of households opting for a connection of at least 100 Mbps has increased from 26% in 2021 to 44% in 2022, the take-up of gigabit connections (0.9%) still lags behind the EU average of 13.8% in 2022. In December 2022, the Commission approved, under EU State aid rules, a EUR 12 million Cypriot voucher scheme. The new voucher scheme will offer households, without a subscription to a connection providing at least a 100 Mbps download speed, a voucher of EUR 120 to cover part of the set-up cost and the first 12 months of the monthly subscription for a connection with a download speed of at least 200 Mbps. The scheme is set to run from 2023 to 2025 and is expected to benefit around 82 000 households.

Contrary to its original 2021-2025 national broadband plan, the government has decided no longer to financially support the deployment of a submarine cable connection between Cyprus and Greece as the private sector is now planning to establish a connection between Cyprus and Greece, with a contribution from the Cypriot incumbent operator. That same operator started operating the 'ARSINOE' submarine cable system in March 2022, connecting Cyprus with France and Egypt.

Roll-out of 5G in Cyprus took place swiftly after the allocation of the relevant spectrum bands at the beginning of 2021. All four mobile operators were awarded a portion of the spectrum in the 700 MHz and 3.4-3.8 GHz bands. Two years after the allocation, Cyprus now has nationwide 5G coverage. This contributes not only to the Digital Decade target on 5G coverage, but also to the national target to cover the entire population living in organised communities and all transport paths with 5G. However, the 26 GHz band has not yet been allocated due to lack of market interest, according to a public consultation that took place in 2019. There has been no further public consultation since 2019, however.

In terms of resilience, Cyprus' Digital Security Authority has issued specific secondary legislation for providers of electronic communications services and networks. This legislation sets increased security standards for these providers including additional provisions on general electronic communications. In addition, there is specific legislation fully covering implementation of the EU 5G Toolbox. The Digital Security Authority (DSA), together with the national regulatory authority, has also submitted a proposal for the MCP 5G-TACTIC focusing on 5G network cybersecurity and trust, bringing together the relevant authorities from three EU countries. The project approved for funding in the Digital Europe Programme will start soon. It aims to develop secure, open, disaggregated and interoperable 5G solutions to support an open and competitive 5G European ecosystem. 5G-TACTIC technical activities include the development of a 5G Cybersecurity toolbox, extensive security analysis, evaluation, testing and relevant mitigation measures for the 5G solution. The planned activities also involve piloting, integration, and evaluation of multi-vendor open 5G solutions considering security aspects. In addition, the project will carry out training activities addressing technical and security audiences as well as European regulatory and cybersecurity authorities. Moreover, the DSA is participating in several other EU-funded projects, and as a result, Cyprus is steadily improving its cybersecurity capacity at the national level.

As regards advanced digital infrastructure, Cyprus' contribution to the Digital Decade targets is currently limited in scope. It reported no activity in the field of edge node development during the reporting period. In cutting-edge semiconductors, Cyprus is among the Member States that have signed the [joint declaration](#) on the next-generation of processors and semiconductor technologies.

However, the country's contribution to the production value in semiconductors is limited. Cyprus expressed its availability and willingness to contribute to the EU's security of supply, resilience and technological leadership in semiconductor technologies and applications through the recently announced [European Chips Act](#), and the work of the 'Semiconductor Expert Group' and of the forthcoming 'Semiconductor Board'.

Cyprus is active in the field of quantum computing. In partnership with the Centre for Quantum Technology and Applications Deutsches Elektronen-Synchrotron ([DESY](#)), [the Cyprus Institute](#) is coordinating the [Quantum computing for Excellence in Science and Technology](#) project funded by the EU. The project aims to provide training in the use of quantum computing for academics, research institutions and industry. The project was launched in January 2023 and will run for 5 years (total funding EUR 2.5 million). In addition, the Cyprus Quantum Communication Infrastructure (CYQCI) project aims to be the first on deployment of quantum communications in Cyprus, introducing the technology to the island and laying the foundations for the country's active participation in the European Quantum Communication Infrastructure ([EuroQCI](#)). The project started in January 2023 and will run for 36 months (total budget of EUR 7.5 million).

Since 2019, the country has participated in the European [High Performance Computing \(EuroHPC JU\)](#). It has appointed members to its Governing Board, and is co-funding the operation of the national HPC competence centre (NCC) with EUR 2 million for the two years from 2020 to 2022 under the [EuroCC](#) project. The NCC is coordinated by the Cyprus Institute's Computation-based Science and Technology Research Centre ([CaSToRC](#)). The role of the NCC is to provide technical support and promote HPC for research and commercial use. The EuroCC project was successfully carried out by CaSToRC and the second phase (i.e. EuroCC2) will be implemented from 2023 to 2025, with budget of EUR 2 million (via 2021-2027 European Structural and Investment Funds). The focus of EuroCC2 is to provide technical support to the Cyprus computational community, with a strong focus on training and industry.

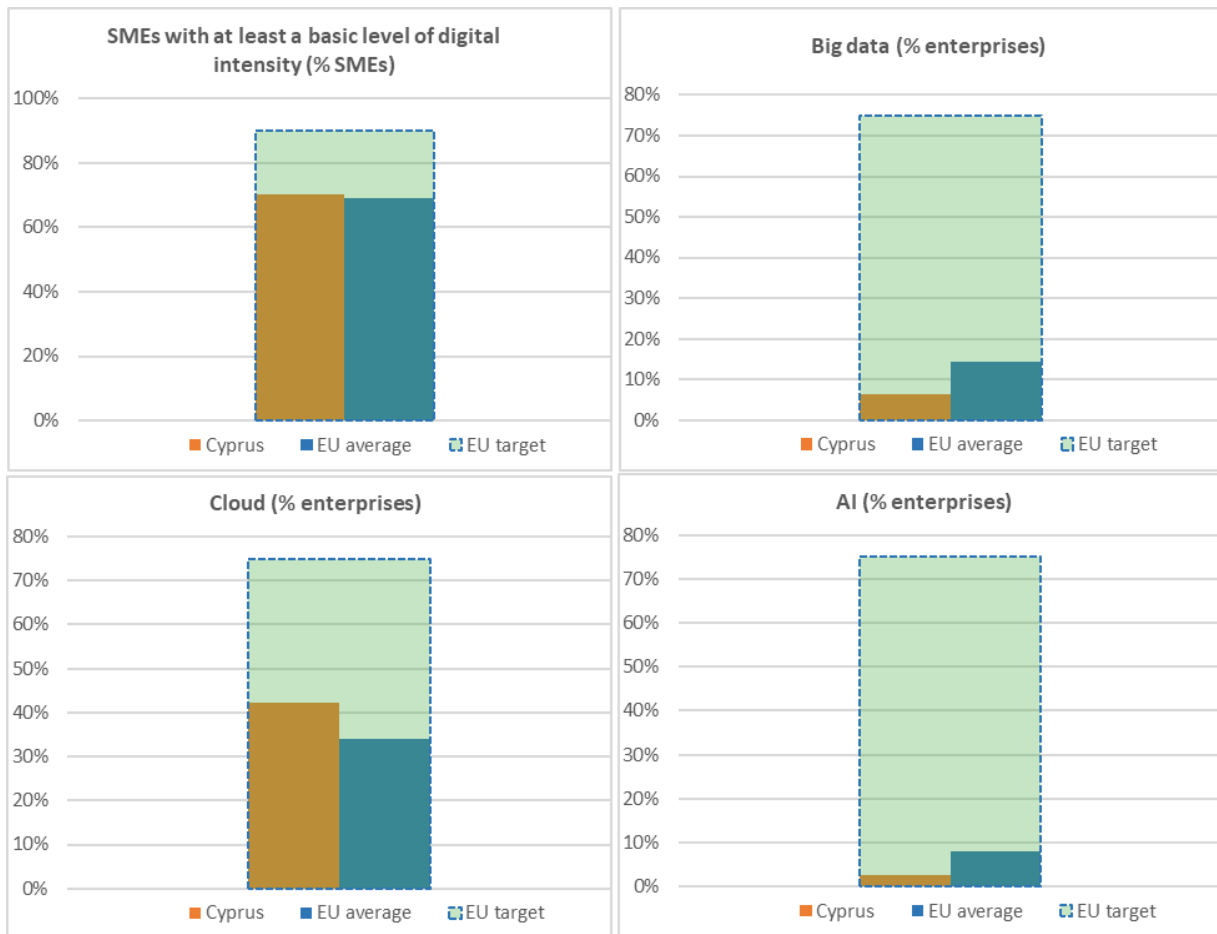
Cyprus should accelerate its efforts on connectivity infrastructure, notably on fixed very high capacity networks. Moreover, Cyprus should regularly assess emerging market demand for the remaining unassigned spectrum in the 26GHz band in order to assign it when the demand emerges under conditions conducive to investment.

Measures taken by Cyprus in the field of digital infrastructures, in particular, in semiconductors and quantum computing, should continue in order to help the EU become a strong market player in these areas.

3 Digitalisation of businesses

	Cyprus			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	70%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	33%	34%	34%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	38%	42%	42%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	6%	6%	6%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud²⁴	NA	42%	42%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	3%	3%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	13%	13%	13%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	15%	17%	20%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	5%	5%	7%	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	9%	8%	8%	9%	
% SMEs	2019	2021	2021	2021	

²⁴ Enterprises buying sophisticated or intermediate cloud computing services indicator, see [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).



In 2022, Cyprus put forward initiatives for increasing the uptake of emerging technologies in enterprises in line with the New Cyprus Industrial Strategy Policy and the objectives set up in the RRP. Subsidy schemes have been launched to support the SMEs' digital transition and innovative start-ups. In addition, Cyprus aims to increase the adoption rate of digital production systems and applications and encourage the setting-up of smart factories and the use of cutting-edge and emerging technologies and digital services infrastructures, thus reinforcing the country's transition to Industry 4.0.

On the Digitalisation of businesses, at 70% the share of SMEs in Cyprus with at least a basic level of digital intensity is above the EU average of 69%, making a positive contribution to the EU's Digital Decade target of having 90% of SMEs in Europe with at least a basic level of digital intensity. 34% of enterprises in Cyprus take advantage of technology capabilities by sharing information electronically, below the EU average of 38%, while 42% use social media, above the EU average of 29%. At 20%, the share of SMEs selling online is slightly above the EU average of 19%. However, Cyprus is underperforming on e-commerce turnover, which accounts for just 7% of total corporate turnover (compared with an EU average of 11%). On the use of advanced digital technologies, the situation is mixed with 42% of enterprises using cloud services in 2021, 8 percentage points above the EU average of 34%. However, in 2020, only 6% of enterprises in Cyprus were using big-data analysis (below the EU average of 14%) and only 3% use AI (below the EU average of 8%).

In 2022, the [Ministry of Energy, Commerce and Industry](#) launched several [funding programmes](#) for facilitating businesses' digital transition. One of these programmes is the 'Digital Upgrade of Enterprises' part of 2021-2027 THALIA programme, with a total budget of EUR 20 million. In November 2022, a first call for proposals was launched (budget EUR 10 million) aimed at encouraging

investments in digital entrepreneurship and strengthening the integration of digital technologies by businesses. The second call was launched in March 2023 (with an additional RPP budget of EUR 10 million) and a third call is scheduled for the third quarter of 2024. In total, the funding programme will make EUR 30 million available. The first call resulted in awareness-raising activities, a landscaping of the digital roadmap, and activities to facilitate and promote SMEs' investment in digital transformation. The programme is open to existing SMEs wanting to invest in digital upgrading (including e-commerce) and new SMEs planning to invest in e-commerce or on-line store or the application of advanced digital technologies.

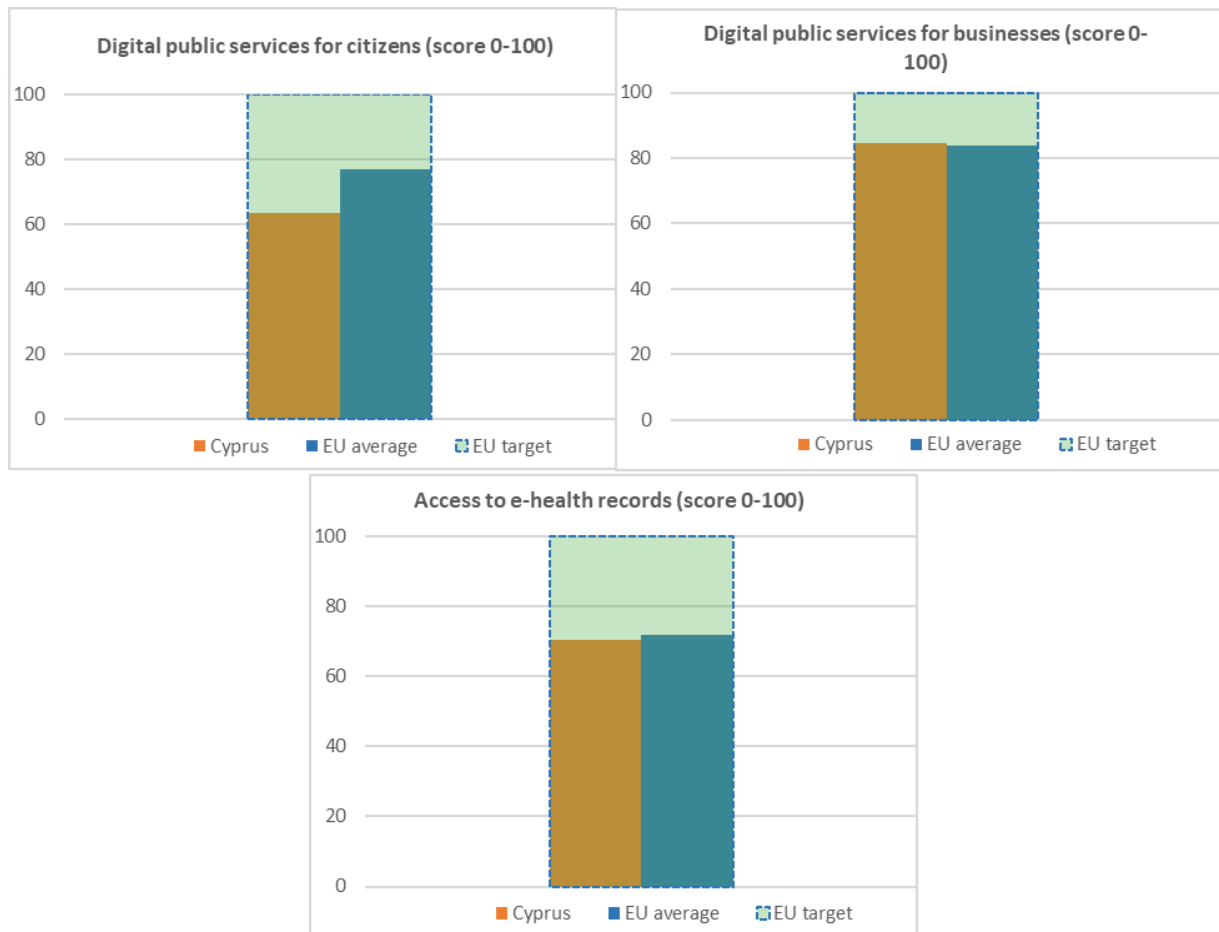
In June 2022, the 'Cyprus DIGital INNovation Hub' (DiGiNN) was selected for funding as a European Digital Innovation Hub (EDIH). DiGiNN is a strategic partnership in the fields of high technology, research, and entrepreneurship. Coordinated by [the Cyprus Institute](#) (Cyl), DiGiNN is to act as a national one-stop shop to accelerate the broad uptake of digital skills and technologies and support the digital transformation of SMEs and the public sector. DiGiNN will act as a coordinated group of 16 organisations from academia, research, business and the technology industry. The parties will be working in synergy and complementing each other for the provision of integrated services covering the entire value chain of innovation. The DiGiNN will cover a variety of areas including HPC, AI, big data, cloud, the Internet of Things, blockchain, digital twins, sustainability and digital skills.

In 2022, Cyprus and the [Research and Innovation Foundation \(RIF\)](#) launched the [Knowledge Transfer and Innovation Initiative](#). The initiative has two objectives: (i) to develop an ecosystem of trainings and capacity building for moving research inventions, knowledge, and know-how into industry; and (ii) to support the transfer of specific inventions and innovations from research organisations to companies for the development of new products and services. Through this initiative, Cyprus aims to encourage innovative behaviour of businesses, and to increase the uptake of innovative technologies by them. A total of EUR 3 million will be allocated to companies via the related RRP investment in 'Enhanced R&I'. The RIF also rolled out other initiatives: (i) INNOVATIVE targets SMEs and large companies to help them growth and to provide funding for R&I investment and the development of competitive innovative products or services with quick global market penetration prospects; (ii) DISRUPT targets all companies regardless of size to help them scale-up by adopting cutting-edge ideas and technologies.

Cyprus should accelerate its efforts in the area of digitalisation of businesses. In particular, the swift implementation of the RRP actions and the roll out of several support schemes will contribute to enhance the percentage of enterprises, which could benefit from the adoption of emerging technologies in particular big data and AI.

4 Digitalisation of public services

	Cyprus			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	99% 2022	74% 2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	56 2021	64 2022	77 2022	100
4a3 Digital public services for businesses Score (0 to 100)	NA	86 2021	85 2022	84 2022	100
4a4 Pre-filled forms Score (0 to 100)	NA	31 2021	49 2022	68 2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	31 2021	32 2022	65 2022	
4a6 User support Score (0 to 100)	NA	84 2021	82 2022	84 2022	
4a7 Mobile friendliness Score (0 to 100)	NA	84 2021	83 2022	93 2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	70 2022	72 2022	100



In Digital public services, the level of online interaction between public authorities and the general public is very high, with 99% of internet users actively engaging in the use of e-government services, well above the EU average of 74%. On pre-filled forms, Cyprus underperforms with a score of 49, still below the EU average of 68 but significantly up on the 2021 figure. On transparency of service delivery design and handling of personal data, Cyprus scores below the EU average (32 versus 65 for the EU). On user support, Cyprus performs close to the EU average (82 against 84 for the EU). The public services provided online by the Cypriot authorities are mobile friendly, but there is still room for improvement (83 against 93 in the EU). Regarding the Digital Decade targets, Cyprus scores below the EU average on digital public services provided to citizens (64 versus 77 in the EU). On the other hand, Cyprus performs well and slightly above the EU average on digital public services for businesses, scoring 85 against the EU average of 84, making a significant contribution to reaching the Digital Decade target.

Cyprus' score for access to e-health records is 70, only slightly below the EU average of 72. People in Cyprus have access to almost all relevant electronic health data through a national online access service. In January 2023, the Ministry of Health, following a recommendation from the National Electronic Health Authority, issued a Decree requiring every healthcare provider to register a minimum set of health data in each person's electronic patient record. The decree follows the eHealth Networks' ['Guidelines on Patient Summary'](#). People can enter their health data themselves or be assisted by an authorised representative. Alternatively, the person's general practitioner can enter the person's data on their behalf. The patient record covers electronic summary data (personal information, allergies, diagnoses, medical devices, procedures, medicines), e-prescription, e-dispensation information and electronic results and reports (lab reports, medical imaging reports and

hospital discharge reports). While the authorities have developed a solid authentication service, a nationally notified eID or an eID that complies with the eIDAS regulation is not yet available. People access their online electronic health records on a web portal with other less secure identification means. Between 60% and 79% of the population have the technical ability to access this service which presents relevant health information from public and private primary, secondary and tertiary care providers, rehabilitation centres, pharmacies, and public mental health facilities. Under the legislation for the National e-Health ecosystem in Cyprus²⁵, the [National e-Health Authority](#) (NeHA) is participating in an RRP project for the deployment of generic cross-border e-Health services. This is keeping with Cyprus's goal of joining a secure peer-to-peer network of EU national governments allowing the exchange of medical documentation through the eHealth Digital Service Infrastructure (eHDSI).

Cyprus is also participating in the PATHED funding programme on 'Enabling patient access to their health data' funded under the EU4Health Programme (EU4H) and with 11 EU countries participating. Cyprus also participates in the 'Enhancing eHealth, including telemedicine and remote monitoring in healthcare systems for cancer prevention and care (eCAN)' programme. With nine other Member States, Cyprus will test the monitoring systems for various cancer patient groups. Moreover, the NeHA and the University of Cyprus participate in projects related to the 'European Health Data Space'.

The Digital Services Factory (DSF) is one of the main strategic initiatives to enhance the government's digital transformation. The DSF defined the new service delivery model, [the Service Standard](#) that will enable the efficient provision of high-quality digital services, based on a modern and flexible methodology that responds to people's needs. The new Cyprus Service Standard is a set of 15 high-level principles for how a digital government service is built and reviewed. Under each principle is a collection of guidance that supports aspects of digital delivery, from advice on what type of user research to do, to how to build a good government application programming interface (API), for teams developing governmental services. The Service Standard emphasises the importance of understanding users' needs and incorporating them into the design of the service. It also outlines how, effectively and efficiently, to develop a product that is secure, reliable, scalable, and consistent. The government sees the Service Standard as the cornerstone for the construction of all government services. It ensures their quality, consistency, user-centricity, security, and uniformity.

The DMRID set up a [blog](#) to serve as a knowledge hub including publications, articles, studies and other useful material related to digital transformation and R&I. Through the blog, users can download the [Design System library](#) for developing a webpage and access featured articles and reports of past events on digital transformation.

The Department of Information Technology Services (DITS), the executive arm of the DMRID, promotes the implementation of major e-government projects, with the goal of improving the service delivery experience for individuals and businesses. DITS established (i) information systems in critical public services, such as the Department of Town Planning and Housing's 'Hippodamos' System; (ii) the new online system for payment of contributions to social insurance services (Sisnet); (iii) the Government Unified Network that upgraded the government network's entire infrastructure by combining the use of digital technologies; and (iv) the State General Laboratory's Information Management System. DITS is also planning other projects, such as the government cloud (G-Cloud), modernisation of the customs and electronic payment system, the integrated information system for the Department of Registrar of Companies and Intellectual Property, the Department of Postal

²⁵ Cyprus eHealth Law 59 (I)/2019

Services' Counter Automation System (CAS), the Road Transport Department's new system, the upgrade of the Tax Department's systems, the e-justice system for the digital operation of the courts and the e-Law project (case management system) for the Law Office of the Republic. The total value of these projects which are at either the planning or implementation stage is more than EUR 300 million, with an amount of EUR 170 million included in the national RRP.

The Government has introduced the national eID scheme in line with eIDAS, aiming for the high assurance level and the qualified e-signature. Under a law from 2021, Trust Service Providers (TSPs) authorised by the Government will be able to issue citizens aged over 18 with eID. The TSPs are required to follow a remote server solution using public key infrastructure (PKI). One was already authorised by the government in February 2022 and started issuing eID in January 2023. The government is working on identifying use cases for eID and has already launched the first stage in the process of purchasing and distributing a number of eIDs for public servants. The public will be able to use eID to access digital public services through the [Cy login mechanism](#).

Cyprus plans to pre-notify its national eID scheme with a 'high' level of assurance in 2023. Through public and private entities, Cyprus is involved in one of the large-scale pilot projects that will be funded under the Digital Europe Programme, with an overall grant request of over EUR 1 million. It is working on the development of a wallet application that will allow all citizens to store their official documents digitally and identify themselves online and offline.

The Cyprus Digital Security Authority (DSA) participates in several projects in cybersecurity: a CEF project together with European partners to design and develop a Joint Cybersecurity Operations Platform (CEF-JCOP), which will increase EU threat situational awareness and information exchange capabilities; and the multi-country project PHOENIX which started in July 2022 and which aims to design, develop, and deliver a cyber resilience framework providing AI automation & response capabilities for business continuity and recovery.

Best practice: The childbirth grant service

The [childbirth grant](#) service allows mothers of new-borns to apply for a grant electronically through a simple, fast, and easy procedure. The service was launched in June 2022 and has a high transactional volume (around 10 000 applications annually). It applies the once-only principle.

The childbirth grant service was developed by the DSF using an agile approach to understand the users' needs, to rapidly test assumptions and to react to changing requirements to meet needs. For the design and development of the service, a multidisciplinary service team was set up with members participating in different roles. A user-centred design (UCD) approach was taken aimed at producing clear, concise, simple and accessible content so users can understand how to use the service.

Cyprus should accelerate its efforts to digitalise public services. In particular, it should take measures that further improve the interoperability, effectiveness, and availability of online public services.



Digital Decade Country Report 2023

Croatia

Introduction

Croatia has untapped digital potential to contribute further to the collective efforts to achieve the EU's Digital Decade targets. The digital transformation of the Croatian economy and society is advancing significantly, with most of its contribution registered in the fields of human capital, fibre coverage and in the digitalisation of businesses. More efforts are still needed on digital skills, although there have been improvements. Progress on online public services and the take-up of gigabit services is more limited. Croatia set up new digital initiatives such as the Digital Croatia Strategy towards 2032, the National Development Strategy until 2030 and the National Recovery and Resilience Plan (NPOO), which are aligned with the Digital Decade Policy Programme.

Croatia is collaborating with other Member States in exploring the possibility to set up **European Digital Infrastructure Consortia (EDICs)** on: (i) Genome, to enable the effective and secure cross-border access to repositories of personal genomic datasets; (ii) Innovative Massive Public Administration inter-Connected Transformation Services, to develop a new generation of advanced cross-border services; and (iii) establishing an Alliance for Language Technologies, to develop a common infrastructure in the field of natural language processing and large multi-language models. Croatia is one of the Member States that have jointly submitted a formal application to set up the European Blockchain Partnership and the EDIC on European Blockchain Infrastructure, supporting EU-wide cross-border public services.

Digital in Croatia's Recovery and Resilience Plan (RRP)

The Croatian Recovery and Resilience Plan amounts to EUR 6.3 billion and EUR 1.3 billion (i.e. 20%) is devoted to the digital transformation in line with the Digital Decade Targets. Out of this amount, EUR 841 million are expected to contribute to the Digital Decade target²⁶. In the first payment, disbursed in May 2022, Croatia has achieved 34 milestones and targets including a few related to the digital transformation, notably in the area of the digital transformation of agriculture and the digitalisation of the energy renovation process.

In the context of the RRP second payment request, disbursed in December 2022, Croatia reached 25 Milestones and Targets, related to digital in particular:

- the digitalisation of government and public administration services provided to the business sector via a new digital platform for the on-line payment of the seven most frequent and cost-intensive compulsory business fees in Croatia.
- the adoption of three legal acts which address the administrative burden and regulatory barriers hampering the construction of broadband networks, including streamlining the licensing/authorisation process.
- Improve the interoperability of information systems to support the provision of online

²⁶ Each Recovery and Resilience Plan must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plans had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or has no impact (0%) on digital objectives, using Annex VII of the RRF Regulation. Combining the coefficients with the cost estimates of each measure allows assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to allow for an estimation of the possible contribution of RRF measures to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice to potential ongoing revisions of the plan.

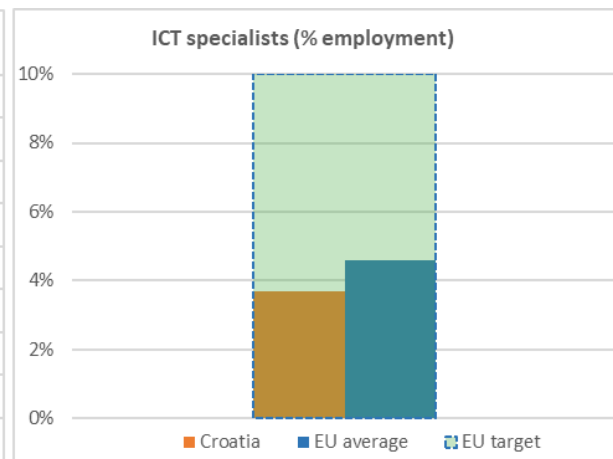
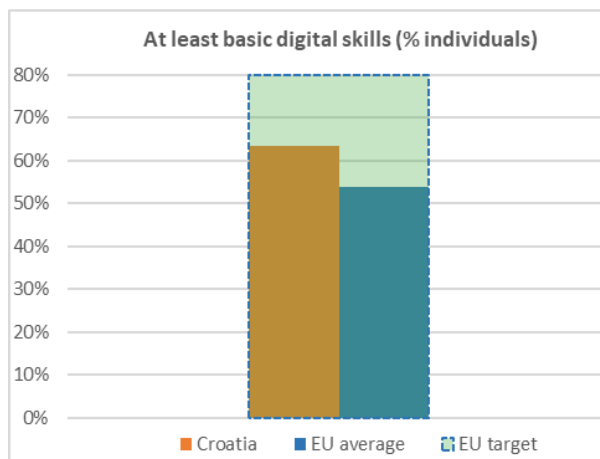
public services to introduce advanced data analytics in the national administration.

- Upgrade the shared services centre to increase the number of users of the state cloud and to develop new functionalities.

Based on the Council Implementing Decision on Croatia Recovery and Resilience Plan, other reforms and investments that are associated to milestones and targets expected to be fulfilled in 2023 include several measures in the area of digitalisation of public services, for example a one-stop shop for all e-public helpdesk services and a digital identity card deployment project.

1 Digital skills

	Croatia			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	78%	80%	81%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	63%	63%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	31%	31%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	81%	81%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	23%	23%	21%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	3.7%	3.6%	3.7%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	4.4%	4.7%	4.8%	4.2%	
% graduates	2019	2020	2021	2021	



Given the positive trend over the past years, **Croatia is expected to make an important contribution to the reaching of the 2030 EU target concerning basic digital skills.** With about 63% of people with at least basic digital skills, Croatia performs well above EU average of 54% and is progressing well towards the **80% target for 2030.**

Moreover, Croatia scores also above to EU average for the indicator 'individuals with above basic digital skills' (31% in Croatia versus the EU average of 26%) and for the indicator 'at least basic digital content creation skills' (81% compared to 66% at EU level). Similarly, Croatia also performs well in terms of the percentage of ICT Graduates scoring 4.8%, and 0.6 percentage points above the EU average of 4.2%.

On the **other Digital Decade indicator, Croatia only marginally increased in the share of ICT specialists settling at 3.7%**, still below the EU average of 4.6%. Moreover, the share of women among ICT specialists is, at 14.5%, among the lowest in the EU, and much below the EU average of 18.9%. This situation needs to improve in view of the Digital Decade target.

Croatia is addressing the shortage in digital/ICT specialists through the Digital Croatia Strategy with a EUR 93 million measure aimed at **'Increasing the number of ICT experts on the labour market'**, and the awarding of STEM (Science, Technology, Engineering and Mathematics) and ICT scholarships (EUR 93 million) intended to further increase the number for ICT undergraduates and graduates.

According to the 2023 [EU Code Week scoreboard](#), Croatia ranks 8th, with 24 Code Week activities. Furthermore, in 2022, the Croatia was among the top 12 countries in the number of **EU Code Week** activities organised (1076), reaching more than 37 000 participants, with a 50% female participation rate. Moreover, informatics has been a compulsory subject in several grades of primary and general secondary school (and optional in other grades) since 2018/2019, and ICT is also a transversal subject in all school grades.

The Croatian RRP also includes a EUR 84m investment for the- Digital Transformation of Higher Education under the Project e-Universities which aims to equip 90% of the public High Education institutions with digital infrastructures in support of teaching.

The Croatian RRP is also contributing to improving digital skills via the CARNET's e-School pilot project²⁷, with a voucher scheme for the digital education of employed and unemployed persons, for smart working, for digital skills for people with disabilities, and vouchers for the digitization of SMEs and for the field of Tourism.

Digital skills investments, including a project aimed at the adoption of AI in schools, are also planned within the context of the European Social Fund and under the European Regional Development Fund 2021-2027 programmes, as well as within the Erasmus+ framework of comprehensive reforms.

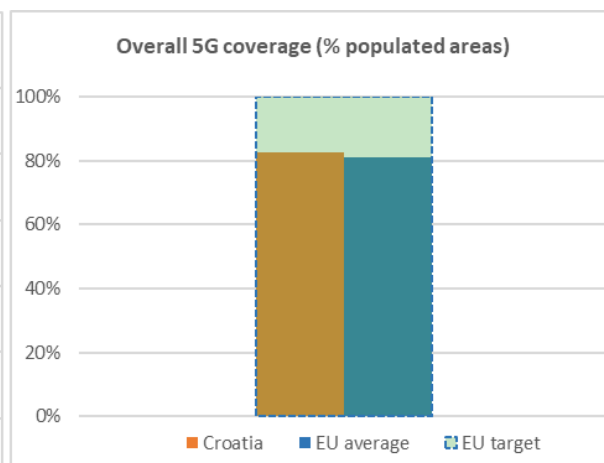
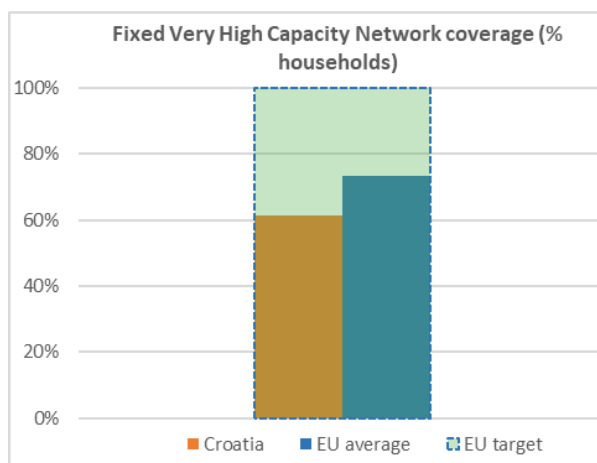
Croatia should accelerate its efforts in the area of digital skills. In particular, Croatia should increase the capacity of its education system to train more ICT specialists and take action to retain these professionals in the labour market while attracting talent. Croatia should encourage more students to specialise in ICT by implementing specific, time-bound, and measurable actions, paying special attention to increasing the number of cybersecurity professionals²⁸.

²⁷ See the section on digitalisation of public services.

²⁸ The recommended policies, measures, and actions in this document reflect the Commission Communication 'Report on the state of the Digital Decade' COM(2023) 570.

2 Digital infrastructures

	Croatia			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up	10%	19%	28%	55%	
% households	2020	2021	2022	2022	
2a2 At least 1 Gbps broadband take-up	NA	NA	NA	13.8%	
% households	2020	2021	2022	2022	
2a3 Fixed Very High Capacity Network (VHCN) coverage	47%	52%	61%	73%	100%
% households	2020	2021	2022	2022	
2a4 Fibre to the Premises (FTTP) coverage	36%	39%	54%	56%	
% households	2020	2021	2022	2022	
2b1 Mobile broadband take-up	70%	81%	81%	87%	
% individuals	2018	2021	2021	2021	
2b2 Overall 5G coverage	0%	34%	82%	81%	100%
% populated areas	2020	2021	2022	2022	
2b3 5G spectrum	100%	100%	100%	68%	
Assigned spectrum as a % of total harmonised 5G spectrum	2021	2022	2023	2023	



Croatia has succeeded in significantly accelerating the deployment of its fibre network, even though it is still lagging behind in terms of VHCN coverage (61% against an EU average of 73%).

During 2022 Croatia has seen some progress in the take-up of broadband 100 Mbps services to 28% although still much below the EU average of 55%. In 2022 Croatia progressed in terms of coverage of fibre-to-the-premises (FTTP), moving from 39% to 53.9%, just below the EU average of 56%.

Croatia's rural areas continue to lag behind in terms of coverage in NGA (51.9% vs. a total average of 87.9%), in FTTP (13.7% vs. a total average of 53.9%), and in VHCN (19% versus a total average of 61.5%).

A very substantial improvement was registered in terms of 5G coverage with a jump of 48 percentage points, reaching 82%, slightly above over EU's average (81%). Yet, mobile take-up is at 81% versus the EU average of 87%. Rural areas are penalised also in 5G coverage with only 73.5% versus a total average of 82.5%.

During 2022 Croatia also made progress in the field of spectrum licencing of three 5G pioneer bands including coverage obligations for 700 MHz, 3.6 GHz, and 26 GHz, and in assigning spectrum licenses with spectrum caps at national and regional level.

In July 2022, the new **Electronic Communications Act that entered into force** and, on 1 June 2022, Croatia had adopted an Ordinance introducing specific 5G security obligations taking into account the **5G Toolbox**. In the first half of 2022, the Croatian Regulator, **Hakom**, also took decisions about **conditions for the access to wiring, cables and associated facilities inside buildings, including the access price**, which are expected to facilitate the roll out of the fiber infrastructure of a third entrant in the market. In May 2022 Hakom settled the dispute between the incumbent and an alternative provider by reducing the wholesale price of access to the latter's fiber optic network. In February 2022 Hakom started the market analysis of the WLA and WCA markets which is expected to lead to a greater utilization of existing fiber networks.

On 1 December 2022, **the Croatian incumbent was designated as universal service provider**, for a period of two years, to provide access to the public communications network and to publicly available telephone services, including adoption of a special price system for socially vulnerable groups. As from January 1 2023, the universal service provider has to ensure data transfer speed at a **minimum of 7 Mbps with an upload of 1 Mbps**. In mid-2022 Croatia also started the process of defining a new national cybersecurity strategy for relevant assets including 5G networks.

The **Croatian National Broadband Plan**, includes also the **environmental monitoring** carried out by the Ministry of Environmental Protection and Energy through the Environmental Protection Information System. Croatian mobile operators have also incorporated Environmental, Social and Governance Strategy and **UN Sustainability Development Goals** into their business activities while operators also report on their environmental impacts and initiatives taken to improve sustainability.

During 2022 a new national **High-Performance Computing (HPC)** resource has been implemented within the HR-ZOO project (Croatian Scientific and Educational Cloud). Since 2018, Croatia has been a member of the **European High Performance Computing Joint Undertaking (EuroHPC JU)**. Furthermore, the National Competence Centers in the **Framework of EuroHPC (EuroCC)** project started on September 1, 2020 and ended in December 2022. In January 2023 the National Competence Centres project started in the framework of EuroHPC Phase 2 (EuroCC 2) with

In June 2022, the Ministry of Economy and Sustainable Development launched a call for the design of **microprocessors and semiconductors**.

Since 2019 Croatia is involved into the **quantum communication infrastructure (CroQCI)** EU cooperation framework with the constitution of the CroQCI Consortium including research institutions, universities and public companies.

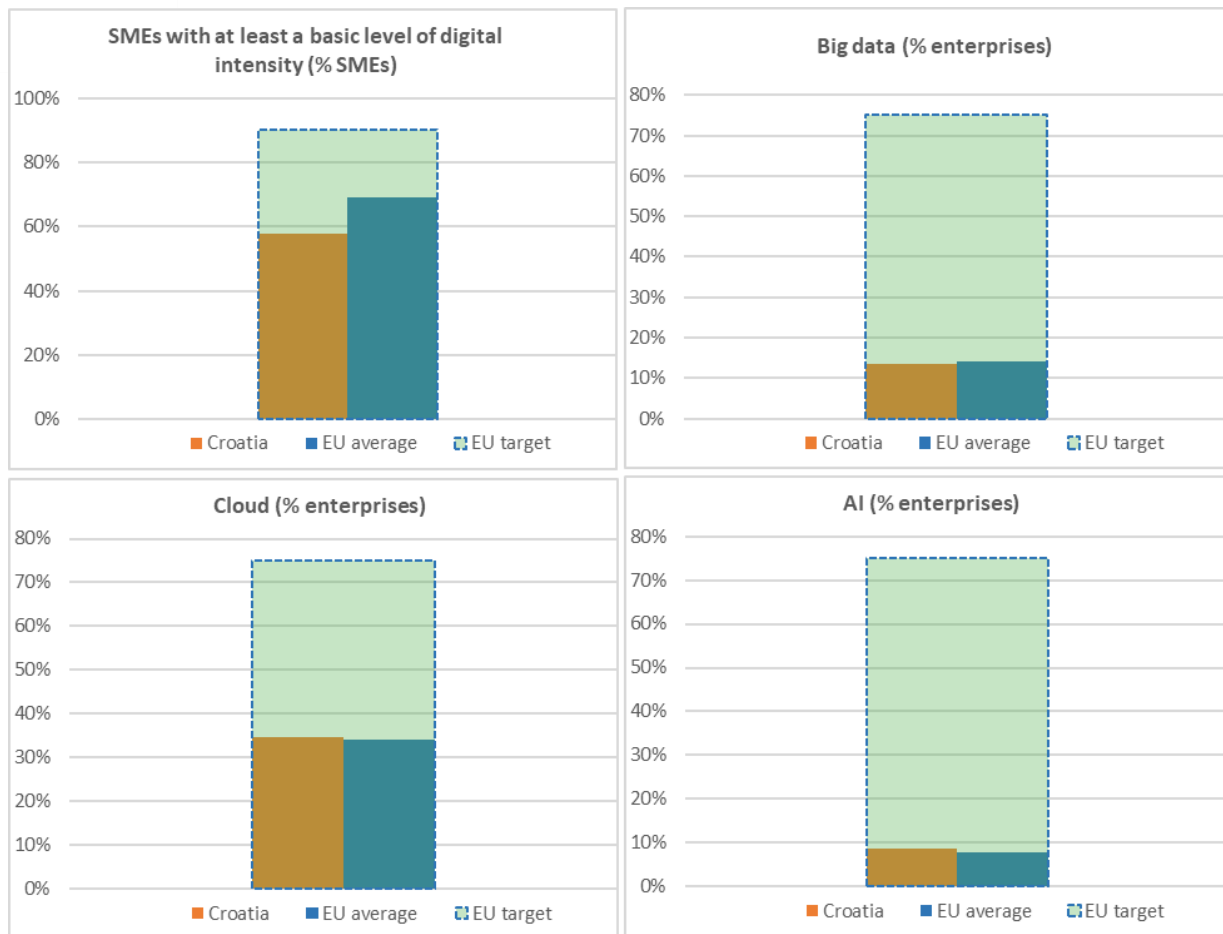
Croatia should accelerate its efforts on connectivity infrastructure, in particular by taking additional action to support demand and take up of gigabit services and further increase its efforts on the roll-out of gigabit connectivity, especially fibre to the premises roll-out in rural areas. The swift implementation of measures financed by the RRF and the ERDF is very important.

Measures taken by Croatia in the field of quantum computing should continue in order to help the EU become a strong market player in these areas.

3 Digitalisation of businesses

	Croatia			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	58%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	26%	24%	24%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	22%	24%	24%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	14%	14%	14%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud²⁹	NA	35%	35%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	9%	9%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	43%	43%	43%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	30%	29%	29%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	14%	13%	13%	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	10%	13%	13%	9%	
% SMEs	2019	2021	2021	2021	

²⁹ Enterprises buying sophisticated or intermediate cloud computing services indicator, see [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).



In 2022, about 58% of Croatian SMEs had at least a basic level of digital intensity, which is below the EU average of 69% and way below the Digital Decade objective of 90% by 2030.

The use of advanced technologies in Croatian enterprises is steadily gaining ground **with 35% using cloud solutions, 9% AI technologies, and 14% big data**, similar to EU's average. For the past two years Croatia has been stable in its adoption of **cloud solutions**, performing at 35%, and only 1 percentage point above the EU average of 34%.

Croatia's performance is progressing in a number of other fields including in the domains of e-Invoices (43% against and EU average at 32%), in SME selling on-line (29% against an EU average of 19%), in terms of eCommerce turnover (13% versus an EU average at 11%), and in terms of selling online cross-border within the EU (13% versus an EU average of 9%).

Despite this progress, Croatia continues to score persistently low, at only 24% (versus the EU average at 38%), with little or no improvement the past three years, in terms of electronic information sharing and in the use of social media 24% (versus the EU at 29%), pointing to a low acceptance of integrated IT solutions, at least in some of the operations of enterprises.

Croatia is taking action to address these weaknesses with a measure in its RRP, 'Upgrade of the Shared Services Center – CDU'³⁰, a measure meant to provide a scalable, highly secure, energy-efficient, **cloud-based platform** for the connection to the state information infrastructure. The CDU platform will also be integrated into the European Common Data Spaces to enable secure hosting,

³⁰ Investment C2.3.R3-I1.

access and modification of data and services at EU level. The action relies on the building of a **Blockchain platform** to establish a service for joining public or private networks using **open-source blockchain solutions** for public sector applications.

The **multi-tenant blockchain** distributed ledger technology **platform**, which will be connected to the European Blockchain Partnership, is expected to encourage investments and projects in the fields of Digital Identity, Digital Post, Digital Diploma, Digital Notary and Trusted Data Sharing.

In mid-2022, Croatia also launched other actions supporting the digitalisation of enterprises (such as the RRP component C1.1), for a resilient, green and digital economy. In particular, the RRP includes "**Grants for Digitization**"³¹, for an amount of EUR 27.3 million, aimed at supporting the digital transformation of about 160 Croatian SMEs by providing financial support for the deployment of digital solutions.

Furthermore, the RRP includes measures aimed at the "**Strengthening Competitiveness and Green transition of the Economy**" through the use of financial instruments, with total value of EUR 106 million. The measure is meant to increase access to finance by strengthening the activities of the banking sector and other financial intermediaries, in order to ensure faster recovery, a stronger transition of the economy through the adoption of green and digital technologies with a view to strengthen the resilience of Croatia's economy.

Home to two unicorns and one potential future Unicorn having a market valuation between EUR 100 million and EUR 1 billion, **Croatia intends to foster research and innovation in digital technologies** to contribute to the Digital Decade goal to double EU unicorns. Croatia is also financing measures supporting **Digital Innovation Hubs (DIHs)** as a contribution to the realisation of the **European Digital Innovation Hubs (EDIHs)** such as [CROBOHUBplusplus](#)³² (CROatian Industry and Society Boosting), [AI4HEALTH.Cro](#)³³ (Artificial Intelligence for Smart Healthcare and Medicine), EDIH Adria³⁴, and [JURK EDIH](#)³⁵ (Digital transformation of Central Croatia and Northern Adriatic).

Croatia should accelerate its efforts in the area of digitalisation of businesses. In particular, it should raise awareness about the benefits of business digitalisation, provide public support for workshops and trainings, increase participation in existing (funding) schemes, especially among SMEs. Croatia should intensify its efforts to support the development and deployment of trustworthy, secure, sovereign advanced technologies and solutions, especially for AI, cloud, big data, including through the availability of legal and technical support and procurement procedures.

³¹ Part of the subcomponent C.1.1.2 (Boosting innovation and digitising the economy).

³² [CROBOHUBplusplus | European Digital Innovation Hubs Network \(europa.eu\)](#)

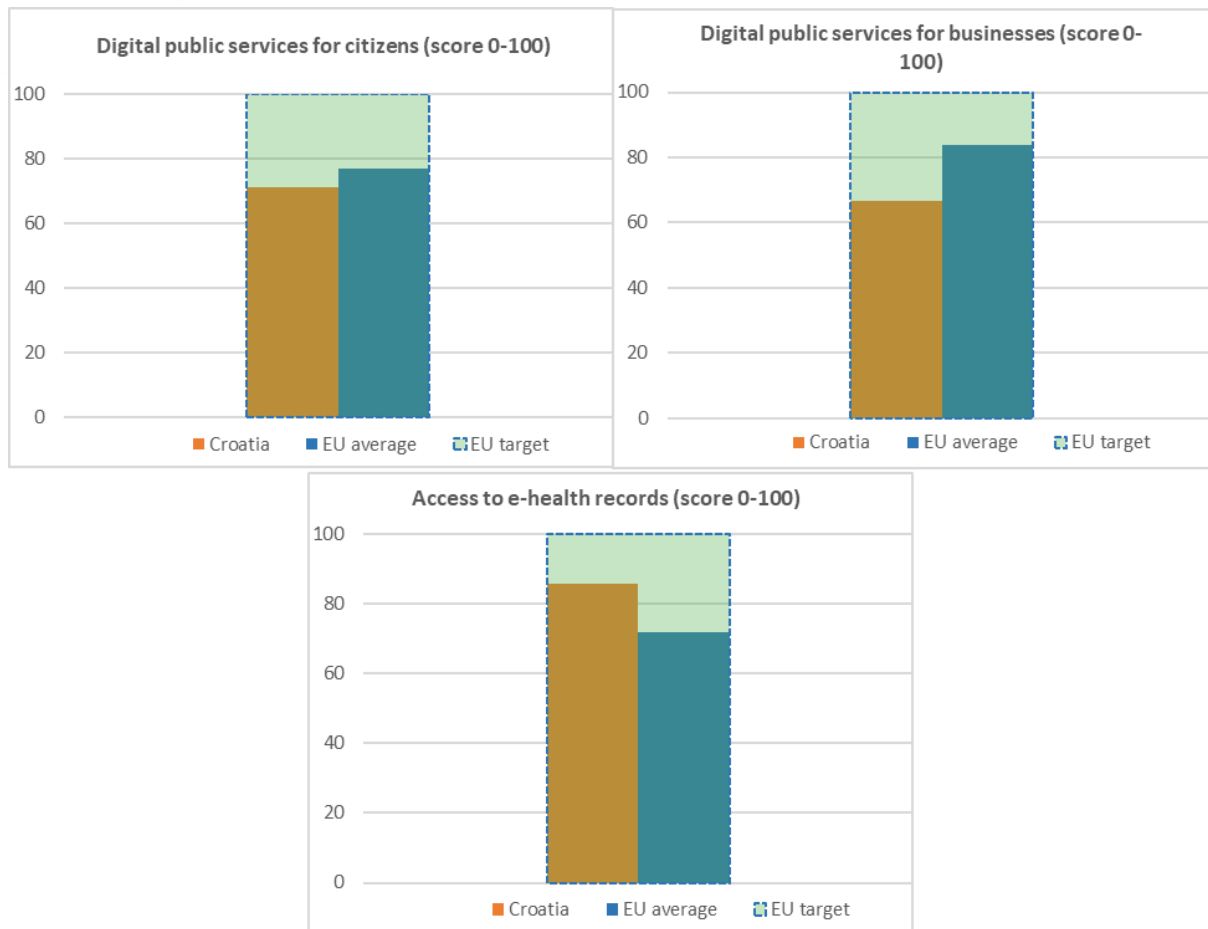
³³ <https://ai4healthcro.eu/>

³⁴ <https://edihadria.eu/>

³⁵ <https://inkubator-pismo.eu/digital-innovation-hub/>

4 Digitalisation of public services

	Croatia			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	69% 2022	74% 2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	69 2021	71 2022	77 2022	100
4a3 Digital public services for businesses Score (0 to 100)	NA	68 2021	67 2022	84 2022	100
4a4 Pre-filled forms Score (0 to 100)	NA	38 2021	38 2022	68 2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	51 2021	52 2022	65 2022	
4a6 User support Score (0 to 100)	NA	75 2021	86 2022	84 2022	
4a7 Mobile friendliness Score (0 to 100)	NA	89 2021	90 2022	93 2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	86 2022	72 2022	100



Data from 2023 reveals that **only 69% of Croatian internet users uptake on-line public services compared with the EU average of 74%.**

Croatia has made little progress in terms of digital public services for citizens (with a score of 71 vs. 77 at EU level) and, even lower, in terms of public services for enterprises (where score is 68 vs. 84 at EU level).

Other indicators where Croatia performs well below the EU average are in the fields of “prefilled forms”, (38 vs. an EU average of 68), in the “transparency of services” (52 vs. an EU average of 65), in “mobile friendliness” (90 vs. an EU average of 93) and in “users support” (86 vs. an EU average of 84).

The performance of Croatia is partially better in the field of access to e-health records where Croatia scores 86, well above the EU average of 72. With the exception of medical images, all types of relevant health data are accessible and frequently updated including electronic health summary data, ePrescription and eDispensation data as well as various electronic reports (lab results, medical imaging reports, hospital discharge reports). **A (pre-)notified eID, compliant with the eIDAS Regulation,** facilitates access for 80-100% of the national population via online portals. Most healthcare provider types are connected to the national electronic access service for citizens and supply relevant health data (including pharmacies, rehabilitation centres and mental health facilities).

Croatia has set up a national Personal Identity Card (eOI) in line with the National Identification and Authentication System (NIAS) scheme, but currently is not involved in the large-scale pilot projects for the testing of the European Digital Identity Wallet in a number of everyday use cases funded under the Digital Europe Programme.

Croatia is seeking to counteract these weaknesses in the field of on-line public services by establishing teams (in line with the “Standard for Developing Public e-Services in the Republic of Croatia”) in order to redesign future services around citizens’ life events. The e-Citizens system is expected to involve a **more intense interaction and dialogue between users** (citizens and enterprises) **and public authorities** and a better coordination between different government levels.

Other actions include **standardised training for public administration employees** involved in the provision of services, and advanced training in the area of ICT, new technologies, and management skills for officials working on digital transformation. Judging from the poor response of users of public services in Croatia, it appears that the effectiveness and impact of these measures could be improved by an increased consultation of users of public services with a view to improve the user friendliness, the interoperability, the effectiveness, the availability and the adoption of online public services.

In order to close the gap in electronic public services Croatia it also important to strengthen the strategic use of innovation procurement to speed up the adoption of innovative digital solutions in all its public services. The country still needs to anchor innovation procurement into its national digital strategy as strategic tool to modernise public services and increase its investments, both in R&D procurements and in public procurements that focus on the adoption of innovative ICT solutions. Notably the Croatian investments in adopting transformative digital technologies, including those that are new to the market, are significantly below the European average.

Tackling this challenge is key to offer top quality public services with a rich set of functionalities that enable to interact in a more efficient and personalised way with citizens, businesses and other administrations. This would help accelerate the wider adoption of advanced digital solutions into the public sector (such as AI / big data, virtual reality/metaverse, robotics, HPC, blockchain etc).

Best practice: e-CARNET's e-School pilot project and AI4Health.Cro

- **CARNET's e-School pilot project** was selected as the second-best project in the field of regional development for the 15th anniversary of the **Regio Stars award**. The prize recognises that Croatia’s digitization of the education system, which **focuses on teachers and students, rather than technology**, is as an example of good practice both among Croatian users and at the EU level³⁶.
- **Artificial Intelligence for Smart Healthcare and Medicine (AI4Health.Cro) project** was rated excellent by the European Commission as part of the **Digital Europe program**. AI4Health.Cro is a non-profit public-private consortium that sees artificial intelligence as key to the advancement of healthcare and as a catalyst for leading Europe to a healthier future. AI4Health.Cro will offer a comprehensive support to businesses and public entities with advanced **AI-based services and technologies**, addressing the current needs of the healthcare and public health systems for digital transformation.

Croatia should step up its efforts to digitalise public services. In particular, it should take further steps to improve the user-friendliness of online public services, including enhancing support for users. Croatia should step up efforts to increase public procurement investments in the development, testing and deployment of innovative digital solutions and to bridge the gap between local & regional governments and central governments.

³⁶ <https://www.carnet.hr/carnet-ov-pilot-projekt-e-skole-osvojio-drugo-mjesto-na-dodjeli-nagrade-europske-komisije-regiostars/>



Digital Decade Country Report 2023

Czechia

Introduction

Czechia has untapped digital potential to contribute further to the collective efforts to achieve the EU's Digital Decade targets. Czechia participates in many multi-country projects and has the ambition to become a key player in state-of-the-art technologies such as quantum and microchips. With its updated digital strategy in line with the Digital Decade Policy Programme, there is a strong focus on boosting basic and advanced digital skills and Czechs are becoming increasingly skilled and online public services are becoming more available. However, enterprises are still struggling to hire ICT experts, or to profit fully from the benefits of digitalisation by using big data tools or the improved communication offered by social media. Limited coverage of fixed very high capacity networks (VHCN) risks hampering digitalisation progress for the economy and society, especially in rural areas.

Czechia is collaborating with other Member States in exploring the possibility to set up **European Digital Infrastructure Consortia (EDICs)** on: (i) Genome, to enable the effective and secure cross-border access to repositories of personal genomic datasets; and (ii) the 'Networked Local Digital Twins Towards CitiVerse' project, using disruptive and immersive technologies for future city related projects.

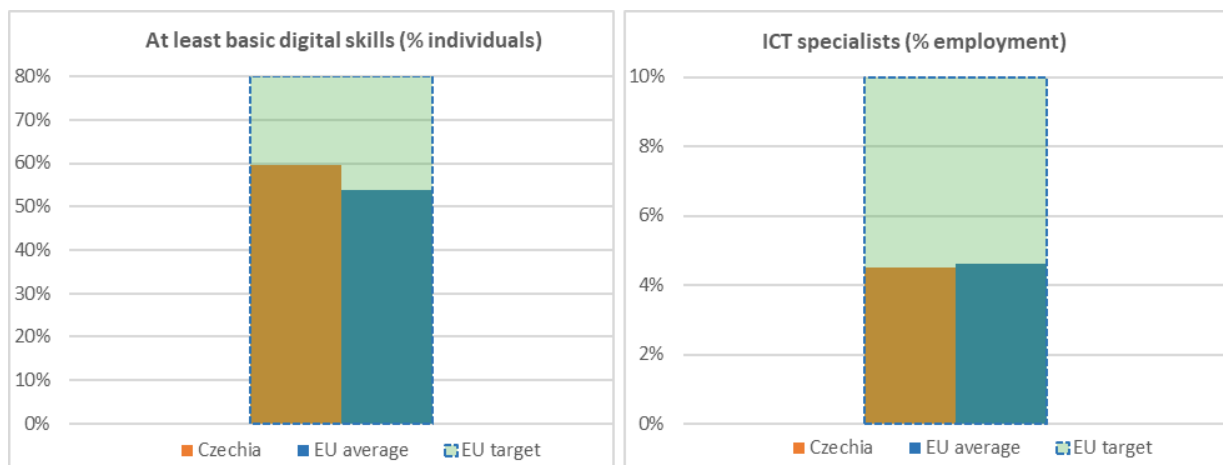
Digital in Czechia's Recovery and Resilience Plan (RRP)

The share of Czechia's RRP allocated to digital priorities is 22%, (amounting to EUR 1.56 billion) of which EUR 1.475 billion is expected to contribute to the Digital Decade targets³⁷. The main investments focus on boosting digital skills and supporting the digitisation of enterprises. So far, Czechia has rolled out new curricula with more IT classes, invested in new digital equipment for schools, as well as defined interoperability standards for the healthcare systems. Czechia launched a Central European Digital Media Observatory, to identify and investigate disinformation in Central Europe. Milestones and targets that are meant to be met in 2023 include measures to digitalise the justice system and implement a common platform to communicate with the state administration.

³⁷ Each Recovery and Resilience Plan must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plans had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or has no impact (0%) on digital objectives, using Annex VII of the RRF Regulation. Combining the coefficients with the cost estimates of each measure allows assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to allow for an estimation of the possible contribution of RRF measures to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice to potential ongoing revisions of the plan.

1 Digital skills

	Czechia			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	86%	87%	90%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	60%	60%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	24%	24%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	66%	66%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	25%	25%	23%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	4.2%	4.6%	4.5%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	5.0%	5.2%	NA	4.2%	
% graduates	2019	2020	2021	2021	



Overall, Czechia has made significant efforts in 2022 to enhance digital skills, but those efforts are not yet fully reflected in the indicators. Regarding the Digital Decade targets, 60% of Czechs have at least basic digital skills (above the EU average of 54%). The percentage of ICT specialists in total employment slowly increased by 0.3 percentage points between 2020 and 2022 but is still below the EU average of 4.6%. Moreover, at 10.9%, the share of women among the ICT specialists is the lowest in the EU, compared to the EU average of 18.9%.

Within the RRF budget, Czechia plans to allocate around EUR 369 million to support the development of digital skills and skills needed for Industry 4.0 (Papazoglou et al., 2023). The new Education Pillar described below provides a framework for these efforts, with a particular emphasis on promoting digital literacy and expanding access to digital technologies and infrastructure. Given the positive trend in recent years, Czechia is expected to make an important contribution to reaching the EU Digital Decade target of at least 80% of the population having basic digital skills by 2030, with increased gender convergence.

In 2022, a new Education Pillar was added to the main Digital Czechia strategy with recommendations from the newly created Inter-Departmental Group for Digital Education, which emerged from the EU Structured Dialogue. Indeed, the Structured Dialogue on digital education and skills inspired Czechia to strengthen collaboration between all relevant administrative departments, the private sector and the non-governmental organisations (NGOs). The Interdepartmental Group was created for that reason and submitted four recommendations for the government to strengthen the focus on increasing the participation of women in ICT, improve lifelong education trainings, bring connectivity to low-income families, and increase the number of cybersecurity experts.

The lack of ICT specialists remains an obstacle that can hamper the digitalisation of both businesses and public services. Even though Czechia scores just slightly below the EU average on ICT specialists and high on ICT graduates, according to Eurostat, 77% of Czech enterprises have reported difficulties in hiring ICT specialists which is significantly higher than the 63% EU average. Moreover, 2022 saw a decrease in the share of enterprises providing ICT training for employees at 23%, compared with 25% in 2020, while upskilling is still crucial for the working population to adapt to new technologies. To train the working population, in 2022, the Ministry of Labour and Social affairs, under the RRF, launched a new instrument to promote active employment policy. This measure is two-fold: first, on the demand side, a financial contribution per person is given to pay for digital education courses (82% of the final price with a maximum of CZK 50 000, equivalent to EUR 2 000, for three consecutive years) and second, on the supply side, a database of retraining and adult education in digital skills development was set up. This database will expand the range of providers, increase the availability of classes, and better match the training needs with the courses offered. Through the database, both courses developing basic digital skills and courses for ICT specialists can be encouraged. Some 65 000 people are expected to be supported through this instrument.

Active partnerships between public and private organisations contributed also to the enhancement of digital skills, particularly among children and women through several initiatives. For example, over 77 000 Czechs (20 000 more than in 2021), 50% of whom were girls, participated in the 2022 EU Code Week through 151 registered activities. 66% of these activities took place in schools. Another example is 'Girls day' organised by the national coalition for digital jobs and skills, [DigiKoalice](#), and the NGO, 'Gender Studies', to address the lack of woman in ICT. Last year, this careers fair gathered 150 young girls, big enterprises in automotive and telecom sector, and women working in the sector pursuing careers as technology specialists.

Best practice: including digital education in school curricula

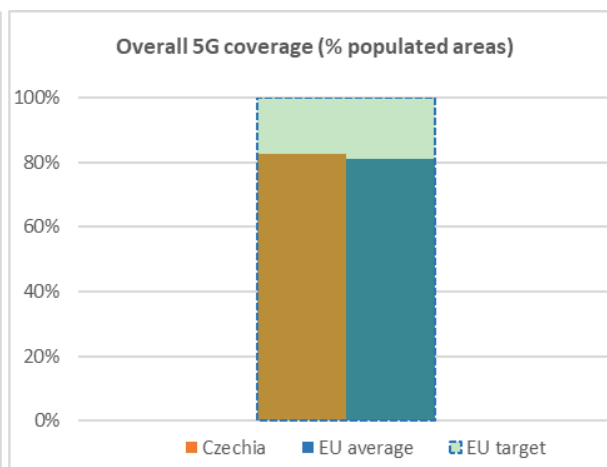
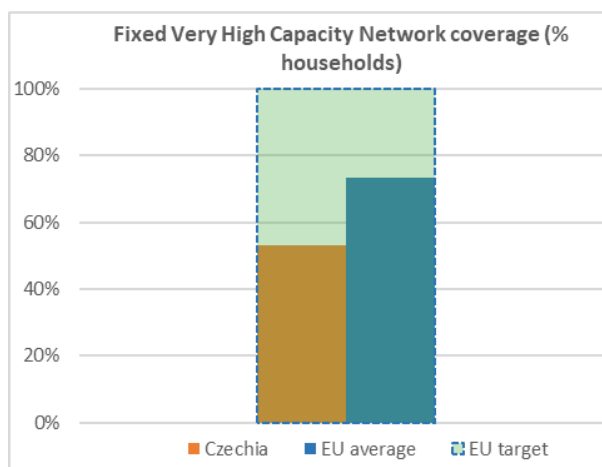
To help speed up digital skills adoption and foster potential ICT vocations, the Ministry of Education, Youth and Sports introduced a new programme supporting digital education in all Czech schools. A new curriculum is being adopted in primary and secondary schools introducing additional new classes for computational thinking and digital skills. It also offers teachers digital learning and training opportunities. Schools have until September 2025 to implement the new curriculum. To support them in the transition, investment and funding are provided for schools to purchase equipment and train teachers, and the Pedagogical Institute is preparing webinars and activities. In December 2022, the project supported 2 936 schools and 9 115 individuals with learning activities. Moreover, a network of 'IT gurus', IT experts from the Institute, are advising schools on the purchase of equipment and helping them set up digital infrastructure.

Czechia should continue its efforts in the area of digital skills, in particular accelerate those needed to achieve the ICT specialist target, starting with making the best of the funding mobilised under the RRF, particularly for STEM education and training. Czechia should also pay attention to increase the number of cybersecurity experts. Czechia should also boost the upskilling and reskilling of the labour force, particularly in advanced and emerging technologies³⁸.

³⁸ The recommended policies, measures, and actions in this document reflect the Commission Communication 'Report on the state of the Digital Decade' COM(2023) 570.

2 Digital infrastructures

	Czechia			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up	26%	28%	31%	55%	
% households	2020	2021	2022	2022	
2a2 At least 1 Gbps broadband take-up	0.3%	0.8%	1.3%	13.8%	
% households	2020	2021	2022	2022	
2a3 Fixed Very High Capacity Network (VHCN) coverage	33%	52%	53%	73%	100%
% households	2020	2021	2022	2022	
2a4 Fibre to the Premises (FTTP) coverage	33%	36%	37%	56%	
% households	2020	2021	2022	2022	
2b1 Mobile broadband take-up	78%	85%	85%	87%	
% individuals	2018	2021	2021	2021	
2b2 Overall 5G coverage	0%	49%	83%	81%	100%
% populated areas	2020	2021	2022	2022	
2b3 5G spectrum	67%	67%	67%	68%	
Assigned spectrum as a % of total harmonised 5G spectrum	2021	2022	2023	2023	



Overall Czechia's progress in fixed connectivity has been limited and might hamper its capacity to contribute to the EU Digital Decade targets. The increase in the percentage of households with access to VHCN has been very limited (rising from 52% in 2021 to 53% in 2022) and well below the EU average of 73%. Without a significant acceleration, this rate of increase would deliver a coverage of just 60% in 2030. The situation is especially worrying on FTTP, with only a slight increase of 1 percentage point in the reporting period. A large part of Czechia's population does not have access to a fibre connection (63% against 44% on average in the EU). The increase of past years is a result of accelerated DOCSIS 3.1 deployment (mainly in urban areas), with 34.9% of households now covered by this technology. The market relies a lot on wireless solutions which do not guarantee the provision of Gigabit speeds. The take-up of 100 Mbps fixed broadband increased by 3 percentage points between 2021 and 2022, but the take-up of fast fixed broadband is still well below EU average (31%

versus 55%). Only 1.3% of households took up connection speed of at least 1 Gbps, whereas the EU average is 13.8%.

High speed internet access is particularly lacking in rural areas due to limited commercial incentives to deploy such networks. Under the National Plan for the Development of Very High Capacity Networks and with funding from the RRP, a Digital Technical Map (DTM) will be completed with precise information on the location and technical infrastructure of public and private entities. This will provide the information needed to share the physical infrastructure, improve the coordination of civil works and speed up the development of VHCN infrastructure.

Efforts by telecom operators to provide customers with faster connections may result in better coverage and take up in the coming years. On fixed broadband, one operator plans to offer users a faster fibre connection from April 2023. The new 2 000/1 000 Mbits tariff will enable users to download and upload at twice the speed of the previous highest tariff (1 000/500 Mbits). In May 2022, a vertical player announced the modernisation of the cable network to DOCSIS 4.0 over the next 5 years, this will involve the deployment of new technologies and the replacement of network elements along with the expansion of the optical infrastructure (with an estimated investment of CZK 3 billion). Construction was also underway as part of a joint investment project in FTTH between two operators. According to the Czech Telecommunication Office (CTU) current information, this cooperation will also include mutual access to some of the connections already in place in various cities, including Prague and Brno. Moreover, last July, the Commission accepted the commitments from three players to ensure that their network sharing agreements do not reduce infrastructure competition. These network sharing agreements will allow efficiencies, such as faster roll-out and cost savings. However, in rural areas fibre availability is limited and operators do not seem to be incentivised to invest in those areas.

5G deployment is accelerating, rising from 49% in 2021 of covered populated areas to 83% in 2022, with 42% 5G coverage on the 3.4-3.8 GHz spectrum band. Czechia managed to reach a 5G coverage above the EU average. 67% of the 5G spectrum has been assigned, but Czechia has not awarded yet the 26 GHz bandwidth. 5G in a higher bandwidth offers faster data transfer rates and lower latency allowing high-quality streaming, industrial automation, expansion of Internet of Things, and enabling smart city applications and autonomous vehicles to work. Under the National Recovery Plan (NRP), the government is planning to improve 5G network coverage in rural areas by building 120 5G network base stations by 2030, but this measure is currently being amended. The NRP also contains plans for coverage of railway corridors with 5G signal on the trajectory Prague - Ostrava and Česká Třebová – Brno routes. In January 2023, one of the mobile network operators acquired the 3600 to 3640 MHz band (40 MHz) frequencies for the future development of its 5G network. This could lead to the development of more robust 5G networks.

Telecom operators underline the difficulties in rolling out infrastructure and describe the Czech telecom market as very fragmented with numerous providers at local level, hindering the possibility of economies of scale. The main operators investing in 5G roll-out and in fibre encounter administrative complexities that delays the deployment of networks. A specific problem is that building permits procedures are lengthy. This is particularly constraining, in relation to the RRF, where investments have to be completed by 2025 and operators are worried about not meeting the target. Under the RRF, by end of 2024, the government plans to create a new central information system for authorities involved in the construction permission process that will hopefully smooth and accelerate the administrative process.

Mobile broadband take-up is still lower in Czechia than the EU as a whole (85% versus 87%). One deterrent could be the high prices of mobile offers. Averaging all the baskets of mobile broadband usage, Czechia is one of the most expensive countries³⁹. With inflationary pressures, several operators have increased their prices. To enhance take-up, the CTU is working on promoting end-user empowerment by developing a transparency tool (price and quality [comparison tool](#)) and QoS measurement tool, [NetTest](#), which enables end-users to verify the quality of service provided and to aim for better quality if needed.

Ten million chips are produced daily in Czechia, and the country is beginning to play a very important role in chip manufacturing on a global scale. Two enterprises in Rožnov (in Zlin region) are leading the way. The first is a research and development centre for chips, microcontrollers and software for car manufacturers and others. The second is a US company that designs and manufactures silicon wafers and semiconductor chips with sales of CZK 3.7 billion last year and employing 2 200 people. Czechia has supported the Chips Act as a comprehensive set of proposals to ensure the EU's security of supply, resilience and technological leadership in semiconductor technologies and applications.

Czechia is also a participant in the IPCEI on Microelectronics and Communication Technologies and presented four projects. The country, which is very dependent on the automotive sector, can see the IPCEI as one of the tools for further development and support of the whole ecosystem. A CEF Digital funded study is ongoing with the aim of preparing the roll-out of 5G and FRMCS communication systems with a view to connected and automated mobility of the railway corridor linking Brno to Bratislava in Slovakia. It is expected to be completed by the end of 2023.

Czechia has also been part of the European Quantum Communication Infrastructure (EuroQCI) since 2020. Four universities are involved in building the Czech National Quantum Infrastructure, a quantum backbone network between Prague, Brno, Ostrava and Olomouc with further connections to Germany, Austria, Slovakia and Poland. The goal is to create an extremely secure communication network based on quantum key distribution and connecting critical national and European infrastructure institutions.

Czechia participates in the multi-country project on common data infrastructure and services (see 'Digitalisation of businesses' for more details), which so far has chiefly enabled it to contribute towards the **edge nodes target**.

Best practice: the LUMI-Q Consortium

In October 2022, the European High-Performance Computing Joint Undertaking (EuroHPC JU) announced the selection of six sites that will host the first European quantum computers including a site in Czechia. The computers will be integrated on site into existing supercomputers and will form a wide network across Europe. The LUMI-Q consortium was among the projects chosen, and its quantum computer will be located at the IT4Innovations National Supercomputing Centre in Ostrava, which is also the LUMI-Q consortium leader. Installation and start-up of the quantum computer is planned for 2024 and should be made available to those interested in using it.

To support the installation, several technical universities in Czechia are running specific study courses in the field, and the entire study programme at the Czech Technical University in Prague is relevant.

In 2022, the Czech Ministry of Education, Youth and Sports, co-financed two pan-European supercomputers, Karolina and LUMI. The LUMI supercomputer is one of the most powerful and

³⁹ Mobile and Fixed Broadband Prices in Europe 2021 - Final report, EC, 2022.

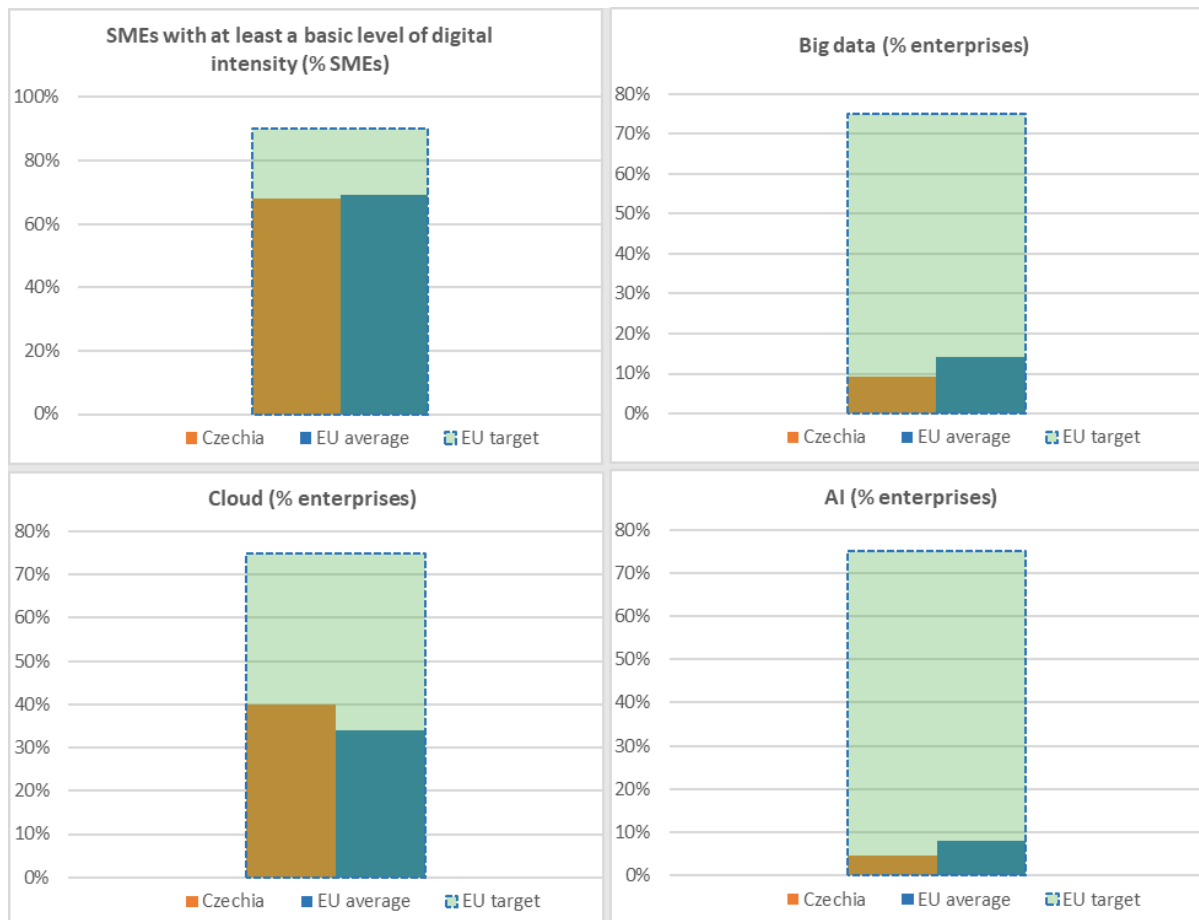
energy-efficient supercomputers in the world.

Czechia should accelerate its efforts on connectivity infrastructure, especially fibre-to-the-premises rollout in rural area. The swift implementation of measures under the RRF and European Regional development Fund is very relevant. Czechia should continue deploying 5G including by completing the overdue assignment of radio spectrum in the 5G pioneer bands. Czechia should regularly assess emerging market demand for the remaining unassigned spectrum in the 26GHz band (to incentivise and facilitate the deployment of 5G services for advanced applications) and assign it when the demand arises. Measures taken by Czechia in the field of semiconductors and quantum computing should continue in order to help the EU become a strong market player in these areas.

3 Digitalisation of businesses

	Czechia			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	68%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	38%	38%	38%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	20%	24%	24%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	9%	9%	9%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud⁴⁰	NA	40%	40%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	5%	5%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	12%	12%	12%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	29%	23%	23%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	18%	17%	17%	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	15%	11%	11%	9%	
% SMEs	2019	2021	2021	2021	

⁴⁰ Enterprises buying sophisticated or intermediate cloud computing services indicator, see [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).



Czechia is a long way off the Digital Decade target of at least 75% enterprises using cloud computing, big data or AI. The percentage of SMEs selling online stagnated compared with the previous year. In 2022, the proportion of SMEs with at least a basic level of digital intensity was 68%, slightly below the EU average of 69%. Only 9% of enterprises were using big data technologies in 2020 (EU 14%), whilst in 2021 40% were using cloud services (EU 34%) and 5% were using AI technologies (EU 8%). Given that *"businesses are not yet making adequate use of the opportunities offered by digital technologies"*⁴¹, the Confederation of Industry of Czech Republic stresses that business digitalisation should be a priority for the government.

The AI strategy was adopted 4 years ago and is now being evaluated and rethought to integrate more stakeholders from the AI ecosystem into the designing of the objectives. An 'AI map' is already available online. It maps and pins enterprises and academic institutions doing AI projects to better understand and coordinate the ecosystem. To boost the uptake of AI, Czechia is part of a cross-border consortium called AI-MATTERS, in Testing and Experimenting Facilities and aims to increase the uptake of AI in the European Manufacturing sector under the Digital Europe Programme. Moreover, at the end of 2022, Czechia completed a project to set up a European Centre of Excellence in Artificial Intelligence for a Safer Society (ECE). Led by a consortium of research organisations and universities, the project established national and international cooperation (especially between academia and enterprises), to design model instruments for financing AI research and development, and laid the foundations for a platform on the socio-economic and legal impacts of AI.

⁴¹ Complex analysis of starting points and proposal for implementation of revised measures of National RIS3 Strategy 2021+, MIT and EY, 2019, page 51.

Six Czech candidates submitted successful proposals in the round of the call for European Digital Innovation Hubs in 2022. The purpose of the call was to support projects related to the use of AI for SMEs, cybersecurity, digitisation of public administration and SMEs, automation in manufacturing sectors and supercomputing. These EDIHs became part of a network of European Digital Innovation Hubs (EDIHs) and have already received their funding from the Digital Europe Programme. The EDIHs provide services for SMEs and Local Public Authorities (LPAs) to address digital challenges and improve business/production processes, products/services using digital technologies. They help mainly with (i) identifying investors, (ii) training in acquiring digital skills, (iii) testing before investment, and (iv) creating an ecosystem for innovation and networking. Creating a data-oriented ecosystem will push enterprises to invest in big data software and better keep track of their key performance indicators. In 2024, under the RRF, Czechia aims to create a training platform for SMEs to support them in digitalisation and educate them about the risks and opportunities posed by new digital technologies.

In 2022, the National Recovery Plan announced two calls under the Digital and Virtual Enterprise investment to support the digital transformation of businesses. Successful projects will be supported in acquiring sophisticated solutions such as cloud computing services, big data, artificial intelligence, etc. In response to the call, 623 projects worth CZK 2.1 billion were submitted. The total allocation of this investment in the current National Recovery Plan is CZK 4.625 billion. In 2022, the 'Operational Programme Technologies and Applications for Competitiveness' was approved for the period 2021 to 2027. The programme aimed at supporting SMEs in the processing of large-scale data, the use of AI tools, block-chain, virtual reality, development and acquisition of specialized software for working with big data.

The Czech start-up scene is growing. In 2022, another business-to-business start-up became a Czech 'unicorn' (start-up valued at over USD 1 billion). Czechia now counts 4 unicorns according to the Dealroom database. According to a report by Mavericks⁴², 200 start-ups received venture capital investments in 2022. Czechia is rapidly increasing the number of initiatives to fund and support start-ups. The CzechInvest agency uses the state budget and the RRP to support start-ups. Last year, it launched a first technology incubation call to support early-stage start-ups. The state agency aims to support up to 250 innovative start-ups with CZK 850 million (EUR 36.2 million) over the next 5 years. This first call focuses on start-ups in the field of mobility, ecotech, AI and creative industry. Support was granted to 12 AI start-ups. The support includes a standard grant and an incubation package. A team of experts from the agency will work intensively with the enterprises for up to 2 years, helping them with their business and providing legal, marketing and finance services

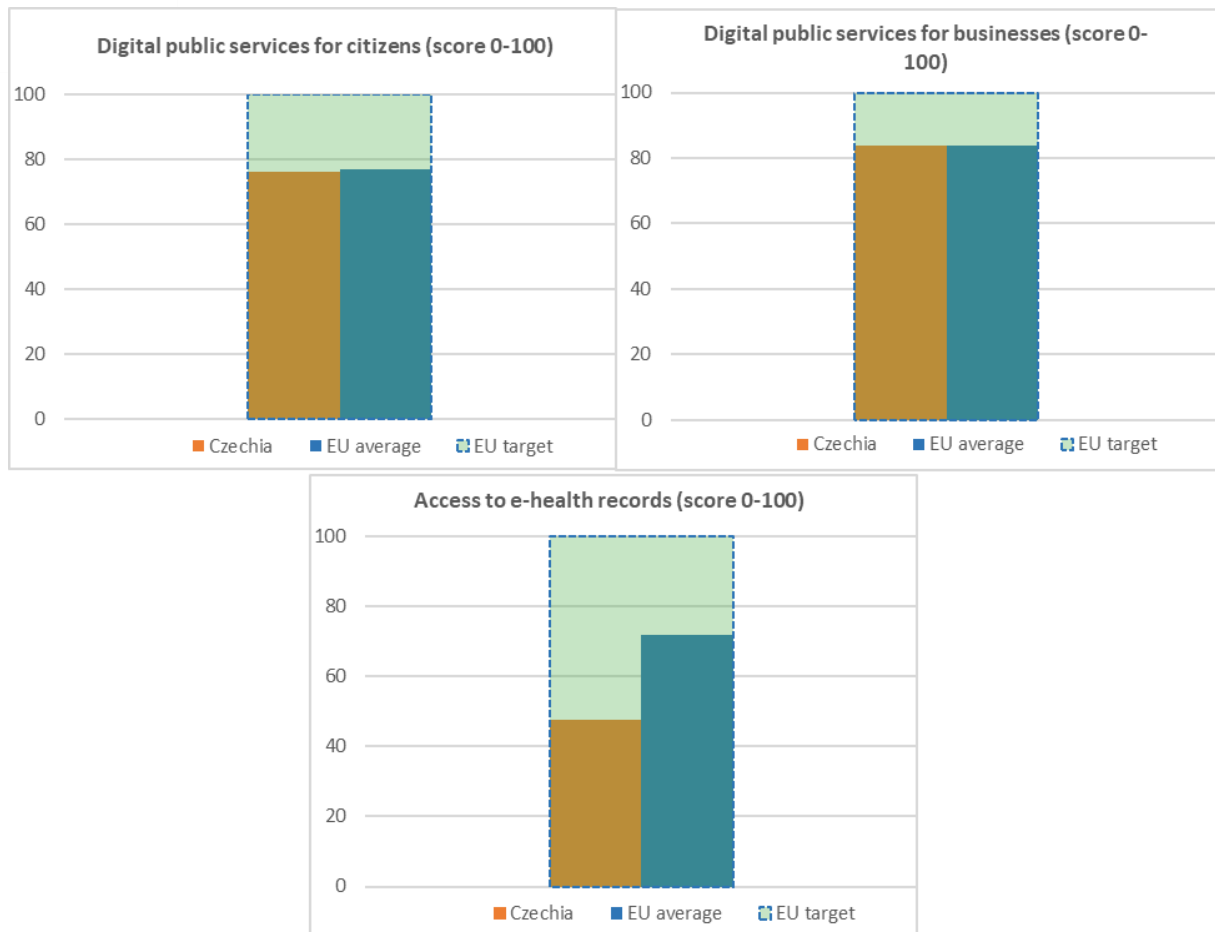
The Ministry of Industry and Trade is also becoming a significant investor in tech through two funds, the Central European Fund of Funds managed by the European Investment Fund, and the Initial Public Offering Fund managed by Národní rozvojová investiční, a.s. As a result of implementing these facilities, growth equity investment in Czech businesses was more than triple the annual average for 2021-2027 (0.27% of GDP against 0.08% as percentage of GDP). Czechia has reached the level of EU countries like the Netherlands, Sweden or France in terms of growth capital investment.

Czechia should accelerate its efforts in the area of digitalisation of businesses. In particular, it should facilitate access to advanced technologies and strengthen policies and incentives to encourage the digitalisation of businesses, especially SMEs, through sustained and complementary measures, including access to training, raising awareness about the benefits of digital transformation

⁴² https://www.mavericks.legal/wp-content/uploads/2023/01/Mavericks-VC-deals-report_annual_2022.pdf

4 Digitalisation of public services

	Czechia			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	86% 2022	74% 2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	75 2021	76 2022	77 2022	100
4a3 Digital public services for businesses Score (0 to 100)	NA	81 2021	84 2022	84 2022	100
4a4 Pre-filled forms Score (0 to 100)	NA	41 2021	42 2022	68 2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	54 2021	57 2022	65 2022	
4a6 User support Score (0 to 100)	NA	67 2021	68 2022	84 2022	
4a7 Mobile friendliness Score (0 to 100)	NA	81 2021	80 2022	93 2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	47 2022	72 2022	100



Digital transformation of public services continues to be one of the government's main priorities and substantial efforts are made to reach the Digital Decade targets, such as a newly established digital and information agency that will help support the digitalisation of the public services by 2025 and introduce several key digital projects.

Czechia succeeded in getting internet users to access public services online (86% versus an EU average of 74%). Regarding the Digital Decade targets, Czechia scores slightly under the EU average on digital public services for citizens (76 versus 77 in the EU), and at the EU average (84) on digital public services for businesses, making a significant contribution to reaching the Digital Decade targets. However, the scores for transparency, mobile friendliness and for user support, are all below the EU average.

To ensure progress, the new agency, Central Digitalisation Agency (DIA) was set up in April 2023.

This central authority ensures inter-institutional alignment, interoperability between systems and common standards in architecture, design and functionalities of new or upgraded digital public services. Other public administration bodies can consult the DIA experts for support with digital transformation in line with number of guidelines and resources developed in 2022. One of the Agency's objectives is to improve IT procurement by making use of standard procedures. Some measures have already been implemented such as new mandatory technical standards for ICT commodities procurement in place since last summer. To monitor digitalisation, a service catalogue was created. At the moment, this catalogue covers 98% of public administration agendas and contains over 6 800 services. The government also decided to bring all state administrative websites under a single domain – gov.cz – which will make it easier for service users to interact with the

government and will also provide improved cybersecurity and legal certainty. The implementation of this project is ongoing.

Czechia is advancing well on implementation of the Single Digital Gateway (SDG) that will be completed by 2023. The Gateway will provide online access to information, administrative procedures, and assistance services that EU citizens and businesses may need in another EU country. Czechia has met 62 out of 68 requirements under the relevant EU Regulation. Czechia has also been working on the Once Only Technical System (OOTS) that enables information to be shared between public administrations across borders between Member states.

The Czech government has successfully designed and implemented an electronic identification system that enables citizens to access public services online using their electronic identity cards in line with eIDAS requirements. The system has made it easier for people in Czechia to access government services without having to visit government offices in person. In 2023, more than 60% of people living in Czechia have at least one of the 13 forms of eID that can be used to access e-government services (an increase of one million on the previous year). Bank ID is the most popular method of authentication. Last year, over 1.6 million people used it at least once. The country is following an ambitious strategy and is planning to increase the use and popularity of e-government solutions by allowing citizens to carry ID cards or driving licences in a mobile app instead of physical cards in 2023. Czechia is involved via public and private entities in four large-scale pilot projects funded under the Digital Europe Programme, with an overall grant request of over EUR 2 million.

Czechia is only now starting to build infrastructure for sharing health data, this is why its score is well below the EU average (47 against 71). Concerning eHealth, Czechia is lagging, the country ranks 25 out of the 27 EU Member State for this indicator. Instead of a centralised national approach to making health data accessible, only individual healthcare providers offer such services. However, none of them offers citizens with access to their health-related data in significant numbers resulting in a low coverage of 0-19% of the population. Opportunities exist in law for legal guardians to access children's electronic health records and for carers to access care-dependent people, for example, but the technical solutions to make this possible in practice are not yet in place. Czechs clearly lack appropriate means to access the full range of electronic health data, despite significant efforts to make ePrescription and eDispensation data accessible for citizens both nationally and in cross-border settings. A national online access service to other health data should be prioritised, tested and rolled-out in the coming years.

Thanks to the RRF, Czechia aims to extend the functionalities of the National Health Information Portal to enable health services providers to enter information and communicate with citizens, other healthcare service providers and health insurance enterprises. Czechia is also participating in European initiatives to boost digitalisation of the health sector. The Ministry of Health is involved in the Digital Transformation in Health and Care call under Horizon 2020. The 'X-eHealth: eXchanging electronic Health Records in a common framework' project aims to create a unified interoperable format for sharing health data, such as, health records for the exchange of discharge reports, orders and results of laboratory tests, orders, etc. The project was completed in November 2022.

On **cybersecurity**, the activities of the National Cyber and Information Security Agency (NUKIB) were in 2022 highly impacted by the Russian invasion of Ukraine. NUKIB strengthened its efforts to secure its networks and increase overall cybersecurity awareness among the citizens and the private sector. The NUKIB put in place a framework for the cybersecurity certification system and became the national cybersecurity certification authority under the Czech Cybersecurity Act. The Act is currently being amended due to the adoption of the NIS2 Directive. A catalogue of cloud services providers has been established for the public administration to choose a secure provider.

Moreover, in 2022, a National Coordination Centre was set up to support the European Cybersecurity Competence Centre (ECCC). The National Coordination Centre will help the ECCC to increase Europe's cybersecurity capacities and competitiveness, by promoting the participation of civil society, industries and research communities in cross border projects and actions funded by the EU. Cyber awareness materials were made available on NUKIB's website in line with its mandate, both for entities regulated under the Czech Cybersecurity Act and for the broader public. NUKIB also organises cybersecurity exercises for employees to learn about secure behaviour at work.

By implementing electronic identification and digitalising public registers, tax administration, healthcare services, and public procurement, the Czech government has made it easier for people and businesses to access public services online and reduce the administrative burden.

Best practice: incentives to adopt eID

From the beginning of 2023, data mailboxes are being set up automatically for individuals doing business, since their use is now mandatory. This legislative change will contribute to a rapid growth of a number of the eID users. To attract more users, in November 2022, a digital voting card application for the presidential election was made available on the Citizen's Portal. Logged-in users only need their data mailbox to make the applications and then to choose how they want to receive their voter's card. All other information is being pre-filled. Almost 70 000 citizens set up a data mailbox to apply for a voter's card, which significantly increased the number of newly established data mailboxes for individuals.

Czechia should accelerate its efforts to digitalise public services. In particular, it should take further steps towards improving the user-friendliness of online public services, including developing user-friendly interfaces, stepping up support for users abroad and/or users who have difficulties accessing digital public services, creating an easy mechanism for citizens to provide feedback (e.g., user satisfaction survey).



Digital Decade Country Report 2023

Denmark

Introduction

Denmark is expected to make a very strong contribution to the collective efforts to achieve the Digital Decade targets. Denmark is undertaking further efforts to improve access to open data and to provide more public digital services benefitting all its citizens and companies. Denmark recently created a ministry responsible for digitalisation, which demonstrates the country's firm commitment to continue the successful digital transformation of its society and economy. The newly adopted digital strategy⁴³ is a good foundation for the ongoing digital transformation, taking into account digital decade rights and principles.

Digital in Denmark Recovery and Resilience Plan (RRP)

25% of the funds related to the Danish RRP (EUR 380 million) is allocated to the digital transformation and the same amount is expected to contribute to the Digital Decade targets⁴⁴. Denmark submitted to the Commission a request for the disbursement of EUR 301 million under the RRF. The request was based on the country's achievement of the 23 milestones and two targets for the first instalment. The Danish plan supports a range of measures to improve the resilience of the health sector, including those measures to ensure stocks of critical drugs and a sufficient supply of medical products in crisis situations, which have also been implemented. It also supports a broad digital strategy designed to promote a digital transformation of all sectors of society. The milestones and targets relating to the Digital Strategy are covered in future instalments and do not feature in the first payment request.

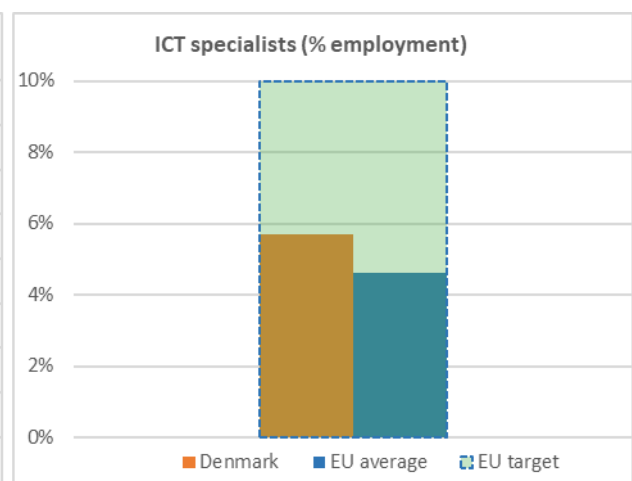
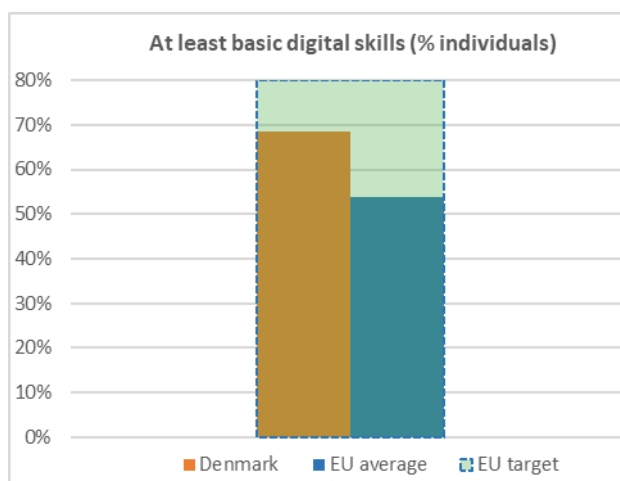
⁴³ [The Joint Government Digital Strategy \(digst.dk\)](https://www.digst.dk)

⁴⁴ Each Recovery and Resilience Plan must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plans had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or has no impact (0%) on digital objectives, using Annex VII of the RRF Regulation. Combining the coefficients with the cost estimates of each measure allows assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to allow for an estimation of the possible contribution of RRF measure to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice to potential ongoing revisions of the plan.

1 Digital skills

Denmark continues to perform well on skills. Basic and above basic digital skill levels are higher than the EU average and the share of enterprises providing ICT training has slightly risen to 33% – 11 percentage points above the EU average. The proportion of employed ICT specialists in the workforce stands at 5.7% compared to an EU target which corresponds to around 10%. The share of ICT graduates is 1.5 percentage points over the EU average. Companies report difficulties in recruiting ICT experts and find it increasingly difficult to fill vacancies, echoing comparable signals in the region. This must be seen in a digital economic context, where Denmark's leading position is being challenged as there is a constantly growing demand for more digital experts in both small and large companies.

	Denmark			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	97%	97%	96%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	69%	69%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	37%	37%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	76%	76%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	30%	30%	33%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	5.3%	5.6%	5.7%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	4.9%	5.4%	5.7%	4.2%	
% graduates	2019	2020	2021	2021	



Denmark ranks well above the EU average when it comes to digital skills. 69% of people aged between 16 and 74 in Denmark have at least basic digital skills, which is significantly above the EU

average of 54%). However, the country is still 11 percentage points below the 80% Digital Decade target for 2030.

Denmark performs only slightly above the EU average in terms of the number of employed ICT specialists in the workforce (5.7% vs. the EU average of 4.6%), and this percentage has only slightly increased since 2019. 5.7% of graduates have studied ICT in Denmark (against 4.2% in the EU as a whole). The share has increased very slightly over the last five years.⁴⁵ While a positive trend is discernible, this alone will be unlikely to enable Denmark to contribute meaningfully to achieving the Digital Decade target of 20 million ICT specialists in employment by 2030. With 22% the share of women among ICT specialists is above the EU average of 18.9%.

Several new initiatives are awaiting parliamentary approval and expected to be launched in 2023, as part of the digitalisation strategy presented in May 2022.⁴⁶ Implementation of many initiatives has already started. Furthermore, the FVU Digital project introducing basic IT skills as a new subject in preparatory adult education has been extended by an additional year to 2023. The project was part of a tripartite agreement dating back to 2017.

In May 2022, the Danish government presented a comprehensive new Digital Strategy,⁴⁷ based on the recommendations of the Digitalisation Partnership.⁴⁸ The strategy is a key deliverable in the Danish Recovery and Resilience Plan's digital component 6, milestone 54.⁴⁹ The new digital strategy is a main digital component of the Danish Recovery and Resilience Plan, where EUR 37 million is allocated to initiatives related to strengthening digital competences among Danes. This includes an initiative to make technology part of compulsory education, skills development of teachers, a digital boost of higher education including adult higher education and training, and an upgrading of digital equipment in vocational education and training (VET) and more labour market training. However, the new strategy only implicitly plans for investment in boosting the number of ICT or sector specialists with advanced use of digital skills, which seems unambitious.

Denmark is expected to make a positive contribution to the collective efforts to achieve the 2030 digital decade target for ICT specialists, making the best of the new digital strategy investment, supported by the Danish RRF plan funding.

According to the Digital Decade targets for 2030, 20 million ICT specialists are needed in Europe to keep up with the growing demand for digital skills in the labour market. This would require a doubling of the current number of ICT specialists (8.9 million) in just eight years. To help meet that target, Denmark would need an additional 200,000 ICT specialists by 2030, on top of the around 160,000 employed in Denmark today. The reality, however, is that in Denmark, in 2022, 19,753 qualified and committed young people applied for an IT education, but only 5,956 were admitted, mainly due to insufficient funding for education schemes.⁵⁰

The ambition for the new educational reform is to strengthen education and increase the labour supply, but it remains to be seen if the reform will solve the educational challenges in the years ahead. The IT industry is concerned that the shortage of IT specialists' will hinder from keeping up its leading role.

⁴⁵ DESI 2022 <https://digital-strategy.ec.europa.eu/en/policies/desi-denmark>

⁴⁶ <https://en.digst.dk/strategy/the-national-strategy-for-digitalisation/>

⁴⁷ <https://en.digst.dk/strategy/the-national-strategy-for-digitalisation/>

⁴⁸ [The Government Digitalisation Partnership](#)

⁴⁹ [Denmark's recovery and resilience plan \(europa.eu\)](#)

⁵⁰ [Vi kommer ikke længere ved at gøre uddannelserne kortere - IT-Branchen \(itb.dk\)](#)

Denmark may benefit from a more strategic approach, focusing on the shortage of ICT specialists and sector specialists with ICT skills, as emphasised in vision 9 in the Danish digitalisation strategy. There are too few workers with digital skills in the labour force and too few ICT graduates. Companies lack people with digital competencies at all levels. There is fierce competition among companies to get students with a STEM background from university courses. In addition, the decline in the number of young people anticipated in the coming years will further intensify competition to hire digitally competent employees.

Best practice: DigiQ

The "DigiQ: Digitally Enhanced Quantum Technology Master" project, coordinated by Aarhus University and co-funded through the Digital Europe programme, aims to offer short-term courses in quantum technology, drawing on existing quantum courses, fostering collaboration among partner universities, and setting up internships with over 100 industrial partners. This project is associated with the Quantum Flagship initiative.⁵¹

Looking at Denmark's performance in the reporting period, Denmark has made progress and is close to reaching the Digital Decade target on basic skills. However, the share of digital experts in Denmark's workforce is only slightly above the EU average and prospects are undermined by low rates of ICT enrolment and graduates.

Denmark should continue implementing its policies in the area of digital skills. Notably, it should focus on upskilling and reskilling of the labour force, in particular, in advanced and emerging technologies as well as increasing the capacity of the educational system to train more ICT specialists⁵².

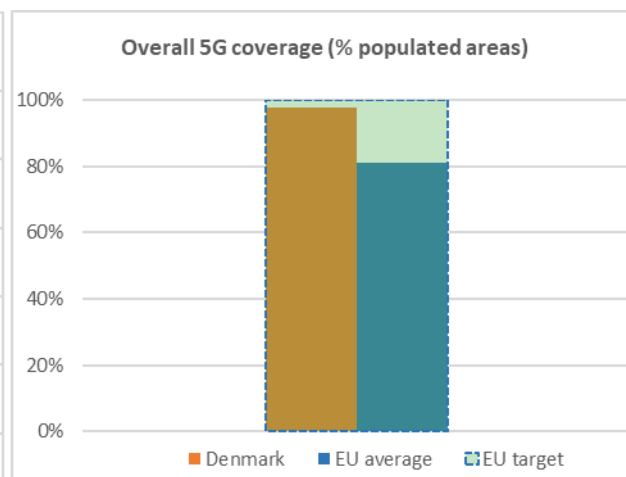
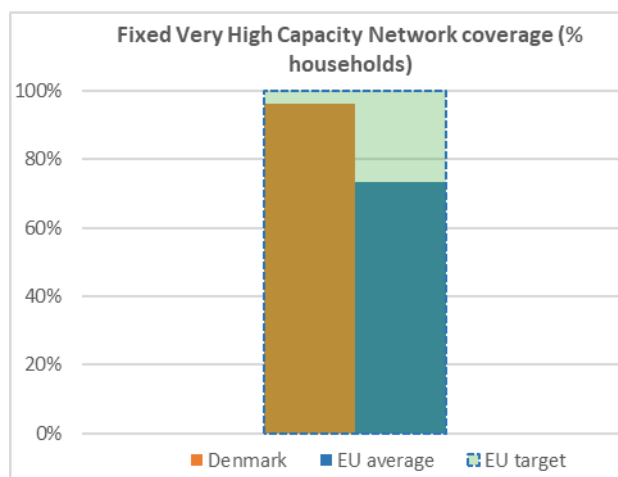
⁵¹ [DigiQ: boosting talent and teaching resources in quantum technology – Barcelona Institute of Science and Technology – BIST](#)

⁵² The recommended policies, measures, and actions in this document reflect the Commission Communication 'Report on the state of the Digital Decade' COM(2023) 570.

2 Digital infrastructures

Denmark remains in a strong position to reach the connectivity targets. The country has an excellent fixed very high capacity network (VHCN) coverage of 96% of households. FTTP coverage continues to increase at a strong pace, from 74% to 78%, due to sustained substantial investment by consumers owned local and regional utility companies in rural areas.

	Denmark			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up	48%	62%	69%	55%	
% households	2020	2021	2022	2022	
2a2 At least 1 Gbps broadband take-up	4.9%	12.0%	18.7%	13.8%	
% households	2020	2021	2022	2022	
2a3 Fixed Very High Capacity Network (VHCN) coverage	94%	95%	96%	73%	100%
% households	2020	2021	2022	2022	
2a4 Fibre to the Premises (FTTP) coverage	70%	74%	78%	56%	
% households	2020	2021	2022	2022	
2b1 Mobile broadband take-up	95%	97%	97%	87%	
% individuals	2018	2021	2021	2021	
2b2 Overall 5G coverage	80%	98%	98%	81%	100%
% populated areas	2020	2021	2022	2022	
2b3 5G spectrum	99%	99%	99%	68%	
Assigned spectrum as a % of total harmonised 5G spectrum	2021	2022	2023	2023	



Denmark has successfully followed a market-based approach to the roll-out of digital infrastructure. There have only been minor state aid projects to support the roll-out in underserved remote areas. This is reflected in the uptake, 18.7% of households now have at least a 1 Gbps broadband connection, up from 12% last year and above the EU average of 13.8%. In Denmark, 69% of households have speeds of at least 100 Mbps, which is significantly above the EU average of 55%.

Investment in the telecommunications sector continued to grow, reaching a total of around EUR 1.45 billion. The sector's substantial investments in fixed broadband and mobile infrastructure translates into widespread coverage in Denmark. Since 2021, fibre has been the dominant technology on the Danish fixed broadband market, with around 1.1 million subscriptions in 2022. As

fibre subscriptions have increased, xDSL subscriptions have decreased markedly over the past years and stand at around 450,000 xDSL in 2022 compared to 900,000 in 2018. The goals for Denmark set out in the Broadband Strategy in 2021 are: by 2025, all households and businesses should have access to broadband with speeds of at least 100 Mbps and 98% should be covered by infrastructure capable of providing speeds of at least 1 Gbps (download).

In 2023, the political parties are expected to re-evaluate and take stock of the progress made on the strategy and assess what measures should be taken to reach the goal by 2025. The Broadband Strategy goals are expected to be reached mainly through technology-neutral regulation and a market-based rollout, supported by limited public grants in rural underserved remote areas. The allocation of funds to the National Broadband Fund used for the public grants has been delayed due to parliamentary elections. In the meantime, funds for 2023 were allocated in the May 2023 Finance Act, adopted by the Danish Parliament. The new application round was opened on 2 June 2023, earlier than in 2022. Further stock-taking will take place in 2025 as a basis for discussion on how to reach the remaining 1-2% of households that are expected not to have access to 1 Gbps by then.

Denmark has assigned all 5G pioneer bands, with licensees under usage and coverage obligations for the 700 MHz and 3.6 GHz bands. Overall 5G coverage in Denmark stands at 98%, demonstrating that the country has successfully implemented its 5G Action Plan. In the 3.6 GHz band, a gradual increase in the outdoor demographic coverage obligation is still planned over the coming years: to 60% in 2023 and 75% in 2025. In the 26 GHz band, a usage obligation forms part of the license. The use of local private mobile networks is facilitated through a leasing obligation for one licensee in the 3.6 GHz band.

There are many new initiatives in Denmark around quantum computing, both public and private. For example, via the [Danish e-infrastructure Cooperation](#) ⁽⁵³⁾ Denmark is part of the consortium behind the LUMI-Q quantum computing initiative. Aiming to link a quantum computer to a classic high performance computer, LUMIQ is supporting the EU's ambitions to have computers with quantum acceleration. The Danish contribution to the LuMI-Q amounts to EUR 500,000.

Denmark has also been selected as the home of the new NATO centre for quantum technologies. The Niels Bohr Institute will host the new centre, which will include an accelerator site and an incubator.⁵⁴

Denmark is investing in quantum communication by participating in the EuroQCI initiative with the project 'Danish Quantum Communication Infrastructure - QCI.dk'. The project, which will run from January 2023 to July 2025, is led by Technical University of Denmark (DTU) and includes four Danish ministries as partners in the project.

The Novo Nordisk Foundation has made a major investment in developing Denmark's first fully functional generally applicable quantum computer, scheduled to be available in 2034. The programme which was started in 2022 and which will run until 2034 is fully funded by the private Novo Nordisk foundation with a budget of around EUR 200 million.⁵⁵

⁵³ Danish e-infrastructure Cooperation (DeiC) is the collaboration with and between the Danish universities. DeiC coordinates the delivery and development of the national digital research infrastructure.

⁵⁴ <https://investindk.com/insights/new-danish-nato-center-for-quantum-technology>

⁵⁵ <https://novonordiskfonden.dk/en/news/major-investment-for-developing-denmarks-first-fully-functional-quantum-computer/>

On 19 June 2023, the Danish government launched a Quantum Strategy, with EUR 137 million in support for new quantum activities.⁵⁶ Denmark is therefore in a strong position to contribute to achieving Europe's Digital Decade quantum targets.

In 2018, Denmark launched a data management strategy for research data based on FAIR (Findable, Accessible, Interoperable and Reusable) principles. This is the national response to the requirements of the European Open Data Directive. In 2023, DeiC allocated EUR 1.8 million to the creation of national data repositories for research data, with similar levels of investment in the coming years. DeiC is also insuring the Danish participation in the MCP EOSC (European Open Science Cloud) with a contribution of EUR 0.9 million for EOSC and the national data management activities.

As regards edge technology, Denmark is now using edge computing in a growing number of the municipalities (13% of municipalities are using it, 6% have tested the technology and 16% have considered using it) for traffic counts (cars, bicycles with/without helmets and pedestrians). Edge computing is also used to make signal-regulated intersections more intelligent.⁵⁷ These activities are making a direct contribution to the digital decade objectives for more secure edge technology nodes in Europe.

In the field of semiconductor technology, in April 2022, the DTU presented a project aimed at doubling its clean room facilities for microchip production at the National Centre for Nano Fabrication and Characterisation. The proposal to extend the clean room — which forms part of the National Centre for Nano Fabrication and Characterization — is based on a pre-project in which DTU has mapped the need. DTU is proposing an extension of around 3,600 m², consisting of approximately 700 m² of clean room and 900 m² of supporting areas, 300 m² of learning and innovation environment, and distribution and technical areas. DTU expects that the extension can be completed by 2025 if public and private funding is obtained. The clean room was last extended in 2000 and 2003, and today DTU has more than 1,350 m² of clean room at its disposal with many machines for production of sensors and microchips, for example lithography and deposition.⁵⁸ Such initiatives make a direct contribution to doubling the production of micro processors in Europe before 2030.

In conclusion, despite Denmark performing very well, there is still room for improvement, in particular with regard to the take-up of very high speed broadband by its people and companies. The coverage of remote areas is significantly higher than the EU average, but some people and companies are still not covered by fast connectivity.

Denmark should continue implementing its policies on digital infrastructures. In particular, concerning connectivity, it should explore available sources of financing to shoulder private investment in those areas which are not commercially viable. The Danish authorities are also encouraged to boost investments in developing European-own digital infrastructures in areas such as cloud, quantum and edge computing and encourage EU businesses and public administrations to take up digital tools and solutions, including through joint efforts and multi-country projects.

⁵⁶ Strategy for Quantum Technology: Part 1 – World-Class Research and Innovation — English (ufm.dk)
⁵⁷

<https://www.kl.dk/media/53125/statusafrapportering-paa-kommunernes-digitaliseringsprogram-efteraar-2022.pdf>

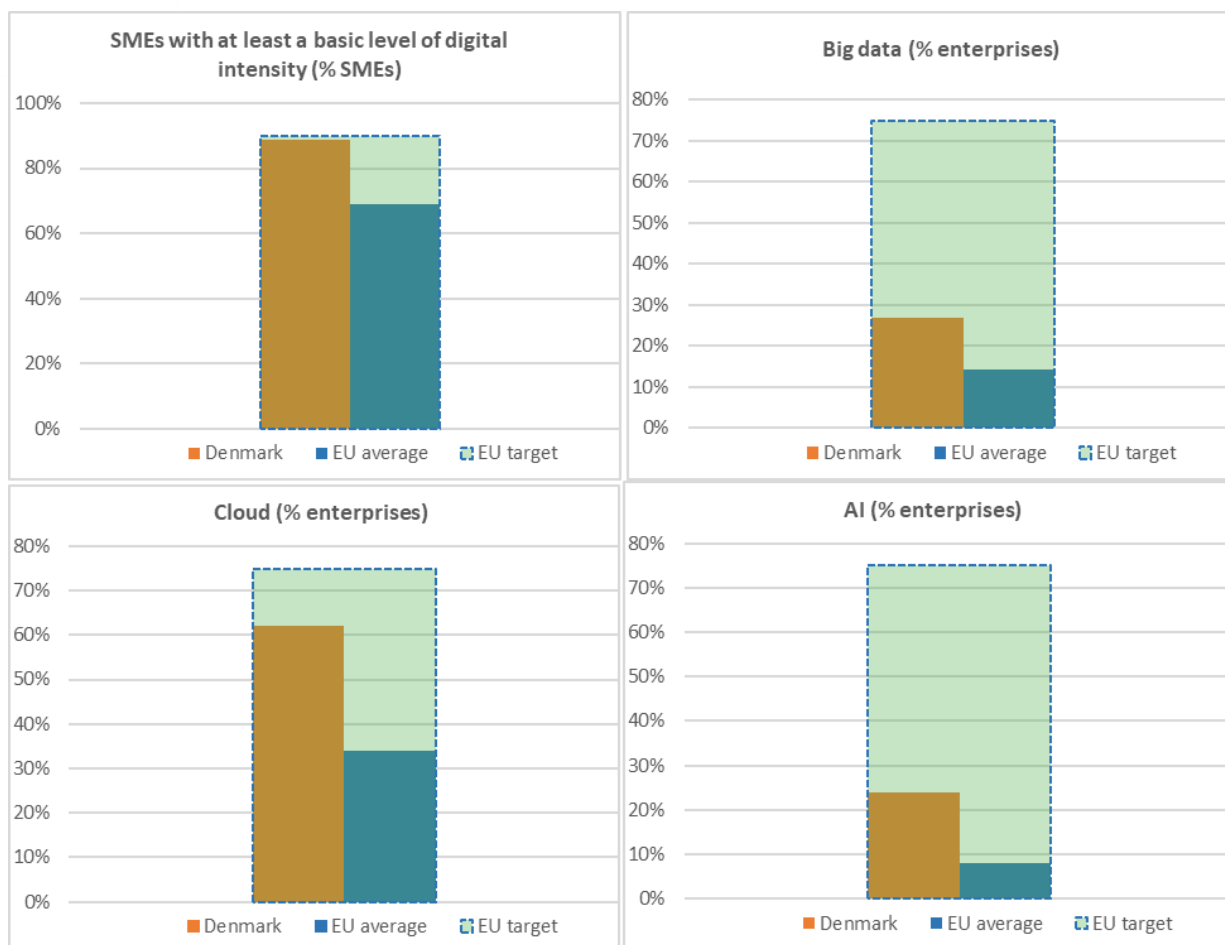
⁵⁸ <https://www.dtu.dk/english/news/all-news/companies-are-queuing-up-for-chip-production-in-clean-room?id=281ec930-1c1d-4dfc-a16a-e9a075ebc09b>

3 Digitalisation of businesses

Denmark performs very well on the digitalisation of business. The proportion of SMEs with at least basic intensity is 89%, which means that Denmark has almost reached the Digital Decade target.

	Denmark			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	89%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	50%	50%	50%	38%	
% enterprises	2019	2021	2021	2021	
3b2 social media	32%	36%	36%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	27%	27%	27%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud⁵⁹	NA	62%	62%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	24%	24%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	57%	57%	57%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	38%	38%	35%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	20%	18%	19%	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	10%	14%	14%	9%	
% SMEs	2019	2021	2021	2021	

⁵⁹ Enterprises buying sophisticated or intermediate cloud computing services indicator, see [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).



The digital transformation of businesses is advancing. However, companies should make a much wider use of more advanced ICT applications to remain competitive.

The use of AI (24%) is three times the EU average, and the use of cloud technologies (62%) and big data (27%) almost twice the EU average. The percentage of SMEs selling online has remained steady at 35% – 14 percentage points higher than the EU average. E-commerce turnover has remained at a similar level, 20% in 2020, 18% in 2021 and 19% in 2022, but is 8 percentage points higher than the EU average. The percentage of SMEs selling online cross-border remains stable at 14% in 2022, which is 5 percentage points higher than the EU average of 9%. The use of more sustainable ICT is increasing, in line with the digital green policy ambitions. **Denmark has launched a national programme 'SME: Digital'**⁶⁰ which offers services to advance the digital transition and e-commerce capabilities of Danish SMEs. This is linked to the Danish Recovery and Resilience Plan target 51, which will be reached when at least 550 SMEs have received funding.⁶¹ In 2022, the programme had a special 'theme subsidy' to encourage SMEs to make better use of the data they are collecting (for example with the use of AI). The demand for the theme subsidy was high, and a similar subsidy will be created in 2023 with even more focus on advanced technology and data collection such as AI and big data. Moreover, there are five European Digital Innovation Hubs in Denmark.

Usage of access to innovative AI applications is increasingly important in a digital economy. The Danish fund 'Industriens Fond' is funding the AI Denmark initiative, a collaboration between six

⁶⁰ <https://smvdigital.dk/content>

⁶¹ [Denmark's recovery and resilience plan \(europa.eu\)](https://denmark.europa.eu/recovery-and-resilience-plan)

universities and research institutions along with the Danish Innovation Centre in Silicon Valley, aimed at supporting AI in SMEs. This is linked to the Danish Recovery and Resilience Plan target 57.⁶² The initiative, with funding of around 4.6 million EUR, runs from 2020 to 2023 with the purpose getting 120 businesses to use AI.⁶³ Denmark has two nodes in the EU's AI testing and experimentation facilities network within Smart Cities and Communities (CitCom.AI) and Manufacturing (AIMatters), co-funded by the Digital Europe Programme.

Future competitiveness depends on easy and affordable access to data. In September 2022, Denmark launched a new national data portal, 'datavejviseren', to complement the existing landscape of high-quality data distribution by providing a single point of access to data. Metadata is added to the portal in an ongoing, demand-driven process. Priority is given to describing and linking to data that can be useful for solving societal challenges such as the green transition, labour-saving efforts and continued economic growth. In line with the ambitions of the Open Data Directive, the goal is to provide all potential data users with easy access to high-quality public-sector data at low or no cost. The development of the portal is funded in part through the Recovery and Resilience Facility.⁶⁴

Best practice: "Nordic Smart Government and Business" initiative

The "Nordic Smart Government and Business" initiative is a collaboration between 14 Nordic organisations led by the five business registries in Denmark, Sweden, Finland, Norway and Iceland. Its purpose is to promote the sharing of data between organisations and authorities for the purpose of developing a simpler reporting framework.⁶⁵ The project is focused on aligning semantics, reporting taxonomies and data governance and will potentially also include green data.

Access to and use of energy data is increasingly important both for the transition to a climate neutral society and for a green economy. Two relevant initiatives should be highlighted. Energinet, the Danish energy transmission system operator, operates an energy data hub that facilitates and automates the execution of market processes and business transactions in the Danish energy retail market. Meter readings from around 3.3 million metering points (consumption and production) are registered and managed in the Datahub for settlement purposes. Energinet's data services have been running since 2017.⁶⁶ CenterDenmarks Digital Energy Hub, runs a data platform for smart energy consumption and production. The project is funded by the European Commission through Smart Systems Energy ERA-NET and it participates in the Smart Energy Digital Innovation Hub funded by the Digital Europe -programme. The project also receives funding from Industries Fond and the regional development funds.⁶⁷

As the digital transformation progresses, ever more and more areas of core business activities are being digitised in companies. A recent example is the Danish Bookkeeping Act adopted on 24 May 2022, which sets out basic requirements for digital bookkeeping by companies. More specifically, the Act sets out the basic requirements for digital bookkeeping systems in three areas: (i) records and

⁶² [Denmark's recovery and resilience plan \(europa.eu\)](https://denmark.europa.eu/recovery-and-resilience-plan/)

⁶³ <https://aidenmark.dk/>

⁶⁴ <https://datavejviser.dk/>

⁶⁵ <https://nordicsmartgovernment.org>

⁶⁶ <https://en.energinet.dk/energy-data/>

⁶⁷ <https://www.centerdenmark.com/en/>

document storage, (ii) IT security and (iii) automation. The Act helps companies to prepare for and benefit from further implementation of digital public reporting standards and other technological developments in the market for bookkeeping and accounting solutions over the coming years. It enables companies to significantly reduce the amount of time needed for bookkeeping processes and all their public reporting burden. At the same time, it ensures higher quality. More uniform data quality makes for more effective checks by the public authorities. The Act will eventually lead on to automatic reporting to the public business registry. The requirements for digital bookkeeping and digital bookkeeping systems will be implemented by decrees over the next 3-4 years. Together, they are expected to ease the administrative burdens on business by some DKK 2.9 billion annually (net).

Denmark has a vivid start-up ecosystem with 17 scale-ups worth between 100 million and 1 billion USD and eight unicorns. In the start-up area, Digital Hub Denmark has been actively matching potential foreign investors with Danish tech start-ups. In addition, in 2022, Denmark set up the Danish Export & Investment Fund. Danish companies enjoy access to state financed risk capital from when they are small start-ups through the growth phase, where they need acceleration capital, and up to the point when they become global exporters. Providing EUR 539 million in additional capital to Denmark's Export and Investment Fund specifically to increase the capacity to invest in scale-up companies with unicorn potential and anchor these high-growth companies in Denmark.

Furthermore, in June 2022, a letter of commitment was signed marking Denmark's accession to the NATO Innovation Fund. The Fund is to serve as a venture capital fund with a total investment of around DKK 7.5 billion from allies joining the Fund. The Fund must make long-term and strategic investments in start-up companies that develop solutions in new and disruptive technologies that are critical to the alliance's security.

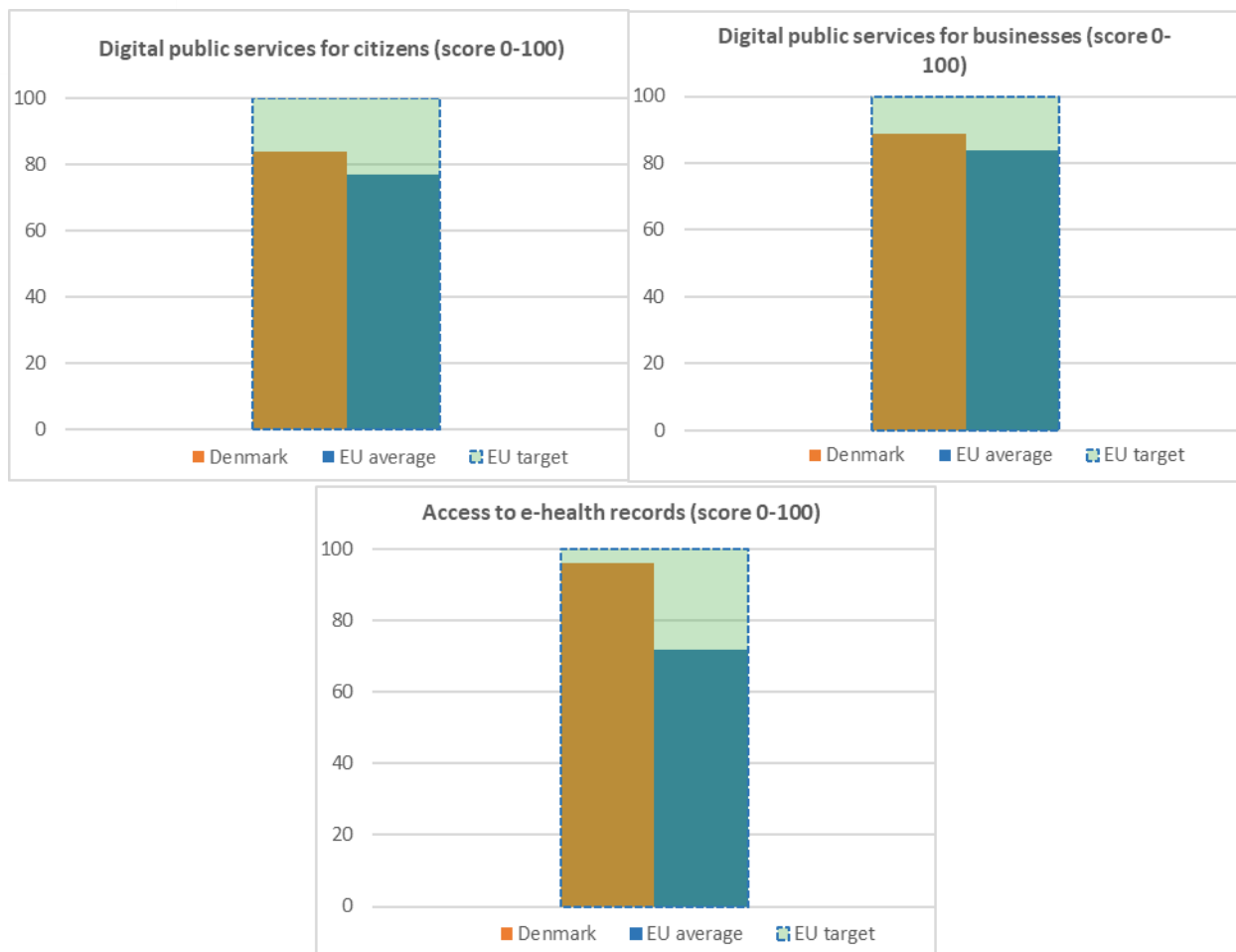
In April 2022, Vaekstfonden (now Denmark's Export and Investment Fund) together with four other public investment banks and institutions from France, Germany, Greece and Finland signed a cooperation protocol to accelerate European Tech. To support the emergence of European global tech leaders, the banks and institutions decided to **work together to develop the European growth-stage fund market**. They signed a cooperation protocol providing for a joint investment of EUR 3.3 billion over the next 3-5 years.

Denmark should continue implementing its policies in the area of the digitalisation of businesses. In particular, Denmark should develop and continue to strengthen the incentives to foster the digitalisation of businesses, notably as regards the uptake of advanced technologies.

4 Digitalisation of public services

Denmark makes a very strong contribution to the collective efforts to achieve the Digital Decade targets. The country has consistently focused on developing more effective and reliable digital public services and is on track to reach the Digital Decade target of 100% availability.

	Denmark			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	99% 2022	74% 2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	83 2021	84 2022	77 2022	100
4a3 Digital public services for businesses Score (0 to 100)	NA	89 2021	89 2022	84 2022	100
4a4 pre-filled forms Score (0 to 100)	NA	86 2021	87 2022	68 2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	76 2021	78 2022	65 2022	
4a6 User support Score (0 to 100)	NA	85 2021	85 2022	84 2022	
4a7 Mobile friendliness Score (0 to 100)	NA	99 2021	99 2022	93 2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	96 2023	72 2023	100



Denmark scores above the EU average on all indicators. The percentage of e-Government users has increased significantly, to an impressive 99% in 2022, and remains considerably above the EU average of 74%. Denmark also scores significantly above the EU average on pre-filled forms (87 compared to 68). Moreover, the scores for digital public services for individuals (score of 84) and businesses (89) are above the EU averages of 77 and 84 respectively. Access to health data scores 96%, which is close to reaching the digital decade target of 100% before 2030. To function well, a digital society depends on inclusive user-friendly access to all public services.

The national eIDAS node has been operational since June 2018 and there are currently over 70 national e-services connected to the node. All currently notified EU eID-schemes in other Member States are available through the node. It is now possible for Danish citizens to use their national eID across EU-borders and to access self-service solutions in those EU-countries in line with Digital Decade rights and principles.

All key public self-service solutions that can be digitized are provided online via the “MitID” scheme (for private individuals) and the “MitID erhverv” scheme (for legal and natural persons representing a legal person). All individuals and companies in Denmark have access to the ‘MitID’ schemes, which give access not just to all public digital services but more than 700, many private digital services such as banks, insurance companies and other private companies that validate payment transactions. Each person and each company can use this single ID solution on their pc, laptop or mobile device. Denmark built on the well-established iNemID infrastructure which has now migrated to the new ‘MitID’ eID scheme called ‘MitID’. MitID is a single secure ID solution for all sectors, compatible with new technologies and capable of responding to future needs.

Digital identity management. Denmark continues to develop and implement new human inclusive digital solutions in line with Digital Decade rights and principles, to ensure that all key public self-service solutions that can be digitised are provided online. **Digital Identity management solutions are increasingly important in a digital transformed society.** Work in this field includes maintenance and development of existing digitised solutions. In October 2022, the new eID for businesses, MitID Erhverv, was launched. Building on NemID, the new MitID Erhverv offers businesses a single secure ID solution across sectors, as well as a more user-friendly management of users and user-rights.

Best practice: Semi-automatic identity matching system

In 2022, the Danish Digital Government Agency started to develop a semi-automatic identity matching system to ease the current manual workload. In the development process, the Agency was in contact with other Member States that already have an actively automatic identity management process, to gather insights on best practice. The system is expected to be running by the end of 2023.

The Danish government launched a new Joint Government Digital Strategy for 2022-2025, which was agreed on by the central, regional, and local authorities in May 2022. One of the initiatives is better access to healthcare data for patients and health professionals. Also in 2022, in a political healthcare, it was agreed that parents should be given better digital access to their children's health data, through sundhed.dk for example.

Danish health authorities are committed to providing patients with better and more inclusive access to their health data in line with Digital Decade principles. One example of action taken is the development of a digital infrastructure with a unified patient overview. This has made it possible for patients and healthcare professionals to view a patient's healthcare appointments with general practitioners and across regional and local healthcare sectors. This is linked to the Danish Recovery and Resilience Plan component 1 under e-health.⁶⁸

Another very promising and recent major initiative concerns genomic data. The Danish National Genome Centre is actively participating in The Genomic Data Infrastructure project funded by the Digital Europe-programme, taking part in the 1+ Million Genomes Initiative and collaborating with other Member States on a proposal for a Genome European Digital Infrastructure Consortium. This interesting initiative might develop to become Denmark's first involvement in a genuine multi-country EU project.

Denmark is also participating in a joint EU action **within the European Health Data Space (TEHDAS)**, which seeks to help Member States and the European Commission to develop and promote concepts for the secondary use of health data to benefit public health and health research and innovation in Europe.

A fully digital society is becoming more and more vulnerable to cyber-attacks. It is therefore important to create a safe and secure digital environment. Denmark adopted a new national strategy for cyber and information security for 2022-2024 in line with digital rights and principles. This strategy is included under the Danish Recovery Plan milestone 61⁶⁹. EUR 36 million has been allocated to 34 new initiatives. The strategy aims to ensure a high common level of security in the public sector. IT security in critical sectors (health, finance, telecom, transportation, energy) is

⁶⁸ [Denmark's recovery and resilience plan \(europa.eu\)](https://europa.eu)

⁶⁹ [Denmark's recovery and resilience plan \(europa.eu\)](https://europa.eu)

coordinated through decentralised cyber and information security units. Sector-specific security strategies are developed by central bodies in each sector. The government also appointed a National Cyber Security Council, comprising experts from the public and private sector, to advise it on cyber security issues⁷⁰. In addition, the new Ministry of Digital Government and Gender Equality, together with organisations representing different industries have set up a **public/private collaboration arrangement known as the Cyber Security Alliance**. The aim of the Alliance is to initiate a range of concrete projects that seek to make Danish small and medium sized companies the most cyber secure in Europe. Moreover, higher education institutions are involving both public and private sector partners in projects to raise awareness on risks and the need to prioritise cyber security among decision makers in the industry. The initiative is a part of the New Danish National Strategy for Cyber and Information Security.⁷¹

Under the new Digital Strategy, funding has been prioritised for several measures that help promote the exhibition and wider use of public data. These include making language technology resources available, better use of utility data, a digital platform for data on building materials, and better access to health data for patients and health professionals. Easy access to public data remains a critical focus area for Denmark so that the EU can regain its role as a digital leader.

Standardised product data on labels were implemented for e-procurement in late 2022. When sending e-invoices to public and private procurers, suppliers can now provide information about their labelled products and services in a digitally structured manner. At the same time, public and private procurers can – through their contracts with suppliers – require that suppliers inform them about their labelled products and services. **The overall aim is to improve the quality of data on labelled products and services in procurement** and move towards specific goals for labelled procurement in the public and private sector. This is an important step towards more standardized product data, which will help create a greener sustainable circular and climate-neutral economy and society. It is in line with the European Green Deal and reduces administrative burdens on businesses. Denmark also adopted new green and sustainable data reporting requirements.

Denmark should continue implementing its policies to digitalise public services. In particular, it should continue to support the sharing of data in a secure and trusted manner, including by contributing to the common European data spaces and supporting wider deployment of big data solutions.

⁷⁰ <https://digst.dk/sikkerhed/udvalg-og-fora/cybersikkerhedsraadet/>

⁷¹ https://digst.dk/media/27024/digst_ncis_2022-2024_uk.pdf



Digital Decade Country Report 2023

Estonia

Introduction

Estonia is expected to make a positive contribution to the collective efforts to achieve the Digital Decade targets. The country is at the forefront of the digitalisation of public services. However, further efforts are needed to ensure that the country's digital infrastructure is improved, especially the connectivity infrastructure, which is a critical enabler for all components of the Digital Decade policy programme.

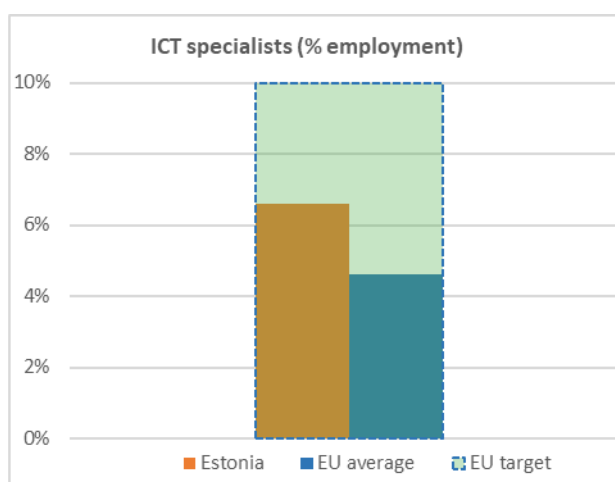
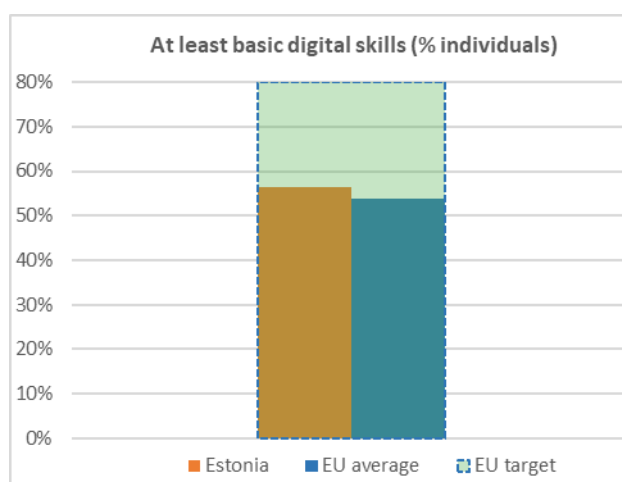
Digital in Estonia's Recovery and Resilience Plan (RRP)

The Estonian RRP devotes EUR 208 million (24%) to the digital transformation. The entire amount is expected to be spent on the efforts to achieve the Digital Decade targets.⁷² Substantial digital investments include EUR 93 million to upgrade digital government services drawing on the latest technologies, EUR 58 million to support 230 SMEs in their digital transition and EUR 24 million to deploy very high capacity networks in rural areas. Estonia's amended RRP was adopted by the Council in June 2023. On 30 June 2023, Estonia submitted a first payment request of EUR 286 million in grants.

⁷² Each Recovery and Resilience Plan must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plans had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or has no impact (0%) on digital objectives, using Annex VII of the RRF Regulation. Combining the coefficients with the cost estimates of each measure allows assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to allow for an estimation of the possible contribution of RRF measure to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice to potential ongoing revisions of the plan.

1 Digital skills

	Estonia			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	88%	90%	90%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	56%	56%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	28%	28%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	66%	66%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	17%	17%	19%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	6.2%	6.2%	6.6%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	8.0%	8.4%	10.1%	4.2%	
% graduates	2019	2020	2021	2021	



Estonia scores just above the EU average on basic and above basic digital skills. In 2021, 56% of individuals had at least basic digital skills, which is slightly above the EU average of 54%. In 2021, 28% of individuals in Estonia had above basic digital skills which is two percentage points above the EU average of 26%. In 2021, the percentage of individuals with at least basic level skills in using software for digital content creation was 66%, the same as the EU average.

Estonia is currently implementing several measures that can help increase the level of digital skills to contribute to the collective efforts to meet the Digital Decade target of at least 80% of the population having at least basic digital skills.

First, a programme was launched to empower public libraries to improve the digital skills of citizens living in their local area and enable them to use digital public services. The programme is supported by funding from the European Social Fund. As a first step, training is provided to librarians and

municipality officials who will provide counselling services to local inhabitants with a low level of digital skills.

Second, the Ministry of Education and Research launched an initiative to offer “in-service training courses” for adults. These courses are offered by vocational schools, universities, and other higher education institutions and are free of charge for the participants. Around a third of these courses focus on ICT skills.

Third, training on digital skills is also funded by the Unemployment Insurance Fund. Around 10% of the total training budget is allocated to ICT training. To date, around 5 000 people have participated in these training courses.

The percentage of employed ICT specialists is higher than the EU average. With 6.6% of ICT specialists in the workforce in 2021, Estonia was two percentage points above the EU average. Given the high percentage of ICT graduates in recent years (10.1% in 2021 which is more than the double the EU average of 4.2%), the percentage of ICT specialists is likely to increase over the next seven years. This would further contribute to the Digital Decade target of having at least 20 million (around 10%) employed ICT specialists in the workforce within the EU by 2030. The share of female ICT specialists in Estonia, at 24.5% is also well above the EU average of 18.9% and among the highest in the EU.

Estonia has launched several programmes and initiatives to address the growing demand for ICT specialists⁷³ and ICT graduates in the labour market, and to promote women’s access to the field.

First, recently launched retraining and upskilling programmes are expected to train another 7 000 ICT specialists between 2021 and 2027. These initiatives include three pilot programmes aimed at creating alternative paths into the ICT sector for people without previous training or work experience. Second, to reduce the gender imbalance in the ICT sector, the Estonian Ministry of Social Affairs has developed projects, supported by EU funding, to promote women’s access to the ICT sector and to reduce the current gender imbalance. This is in line with Digital Decade targets and objectives to reduce the digital divide and promote convergence between genders. The design and implementation of these projects builds on the findings of an 18-month research project on “Glass Walls and Ceilings in the Estonian ICT Sector”. Third, an e-services development training programme will be piloted and launched in 2023. This programme is aimed at equipping service owners with the right skill set to develop new services and to re-think existing offerings, applying design thinking methods and a user-centric and problem-oriented approach. Estonia’s ambition to make a significant contribution to the collective efforts to achieve the 2030 Digital Decade targets for ICT specialists is also underlined by the fact that Tallinn University of Technology (TalTech) is a leading partner in the international consortium Digital4Business which aims to create a commercially sustainable 100% online European master’s study programme.

Enterprises increasingly provide ICT training and thereby contribute to improving the digital skills of their employees. The percentage of enterprises providing ICT training is with 19% still below the EU average of 22%. However, the gap between Estonia and the EU average is decreasing, from 8 percentage points in 2017 to 3 percentage points in 2022. This shows the positive impact of the measures taken by Estonia. The development between 2020 and 2022 was very similar to the EU average (which saw an increase of around 10%).

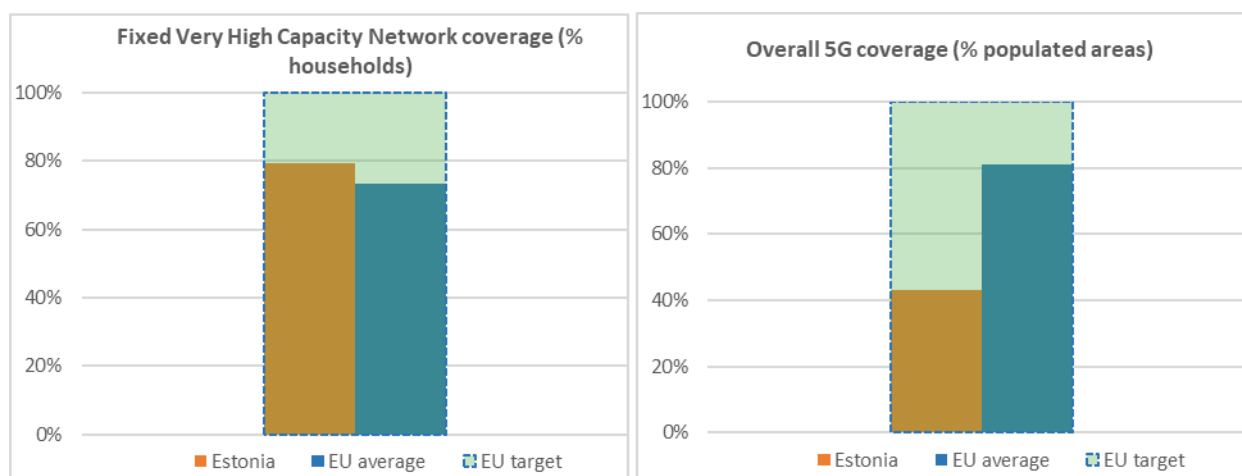
⁷³ According to a recently completed OSKA IT survey, employment in the ICT sector in Estonia is expected to increase 1.5 times by 2027. The ICT sector and all other sectors of the economy need at least 2600 new ICT professionals each year, which is more than 18 000 people over the next seven years.

Estonia should accelerate its efforts in the area of digital skills. In particular, it should strengthen the action on improving basic digital skills, e.g. by encouraging employers to upskill and reskill employees during working time⁷⁴.

⁷⁴ The recommended policies, measures, and actions in this document reflect the Commission Communication 'Report on the state of the Digital Decade' COM(2023) 570.

2 Digital infrastructures

	Estonia			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up	21%	22%	29%	55%	
% households	2020	2021	2022	2022	
2a2 At least 1 Gbps broadband take-up	<0.1%	<0.1%	<0.1%	13.8%	
% households	2020	2021	2022	2022	
2a3 Fixed Very High Capacity Network (VHCN) coverage	71%	73%	79%	73%	100%
% households	2020	2021	2022	2022	
2a4 Fibre to the Premises (FTTP) coverage	71%	73%	79%	56%	
% households	2020	2021	2022	2022	
2b1 Mobile broadband take-up	84%	87%	87%	87%	
% individuals	2018	2021	2021	2021	
2b2 Overall 5G coverage	0%	18%	43%	81%	100%
% populated areas	2020	2021	2022	2022	
2b3 5G spectrum	0%	0%	66%	68%	
Assigned spectrum as a % of total harmonised 5G spectrum	2021	2022	2023	2023	



There is room for improvement with regard to Estonia's contribution to the Digital Decade targets on connectivity. In particular, Estonia's 5G coverage and the take-up of fixed broadband of at least 100 Mbps are low. There is a clear need to act in order to be able to contribute to the collective efforts to achieve the Digital Decade connectivity targets.

Estonia is in the upper half of Member States when it comes to fixed very high-capacity network (VHCN) coverage. 79% of households are covered by a fixed VHCN, which is above the EU average of 73%. The increase of 6 percentage points compared to the 2021 figures is also above the EU average. Looking at the development over the last five years, the gap between the EU average and Estonia is even increasing. Coverage of fibre to premises (FTTP) is in the top third of Member States. 79% of households covered is significantly above the EU average of 56%. The growth rate from 2021 to 2022 is, however, slightly below the EU average. Significant efforts are needed to meet the Digital Decade

goal of ensuring all end users at a fixed location are covered by a gigabit network up to the network termination point.

Estonia is in the bottom five Member States for take-up of fixed broadband of at least 100 Mbps.

With 29% of households subscribed to fixed broadband of at least 100 Mbps, Estonia is significantly below the EU average of 55%. Since 2021, the at least 100 Mbps take-up of fixed broadband take-up has increased by seven percentage points, which is above the average growth rate in the EU. Based on the information provided by Estonia, this is mainly due to private investments to upgrade old copper networks and public investments in rural areas. However, over the last five years, the gap between Estonia's scores and the EU average has increased. The take-up of fixed broadband of at least 1 Gbps remains at 0% of households. This is significantly below the (fast growing) EU average of 14%. The take-up of mobile broadband was the same as the EU average of 87% in 2021.

Estonia's weak performance on 5G coverage shows that further efforts are needed to contribute to the Digital Decade target of having full coverage of all populated areas by 2030. Overall, 5G coverage in Estonia has reached 43% of populated areas, which is significantly below the EU average of 81%. Regarding 5G coverage on the 3.4-3.8 spectrum band, which is necessary for advanced applications that need large spectrum bandwidth, Estonia has only achieved 15%. This is again significantly below the 41% in the EU overall. Estonia has emphasised, however, that recent improvements in 5G spectrum assignment would improve the 5G coverage over the coming years.

Estonia has taken several measures to improve its connectivity infrastructure to contribute to the collective efforts to achieve the Digital Decade targets in this area. These include support measures to finance the construction of VHNC networks in rural areas. Around EUR 24 million from the RRF and EUR 45 million from the ERDF have been allocated to build VHCN in rural areas between 2023 and 2027. Regarding 5G, based on the most recent information provided by Estonia, the 700 MHz, 3400-3800 MHz, and 26 GHz bands have been assigned. Mobile operators are continuing to roll out 5G networks.

Estonia reported no developments in **semiconductors and edge nodes** during the reporting period.

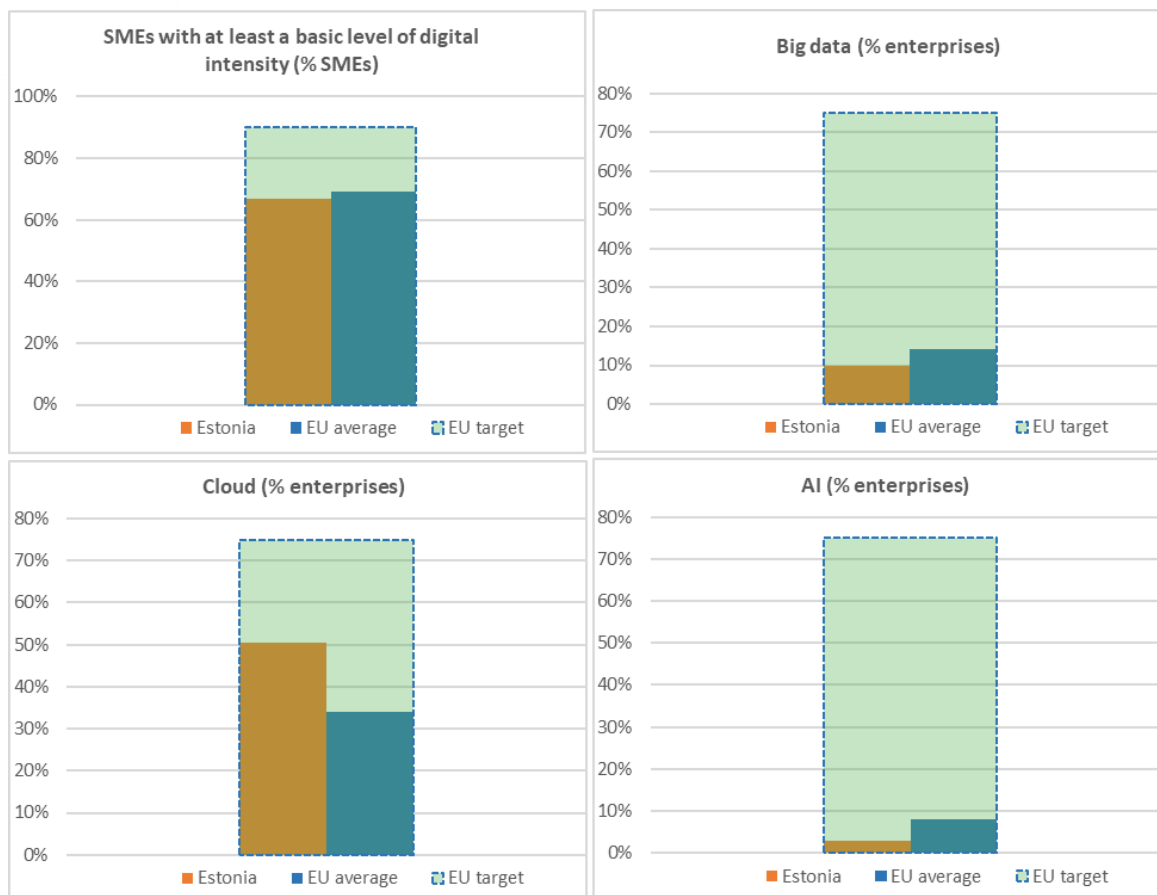
Estonia contributes to the collective efforts in the area of high-performance computing mainly through the Estonian Scientific Computing Infrastructure (ETAIS) project. The project is run by a consortium of the University of Tartu, Tallinn University of Technology, the National Institute of Chemical Physics and Biophysics, and The Education and Youth Board (Harno). ETAIS aims to increase the competitiveness of Estonia's computing and data-intensive research disciplines by providing access to a new and modern scientific computing infrastructure. Estonia is also part of the EuroQCI initiative to build a pan-European quantum infrastructure and a partner in the Nordic-Estonian Quantum Computing e-Infrastructure Quest (NordQuEst). The purpose of this project (which runs from April 2022 until May 2025) is to create a Nordic ecosystem that combines high-performance computing and quantum computing.

Estonia should accelerate its efforts in the area of digital infrastructure. In particular, it should take measures to foster the development of 5G connectivity and incentivise the take up of gigabit and 5G connectivity. The ongoing activities on quantum computing should be continued with an increased coordination and collaboration to foster a quantum community across the whole EU.

3 Digitalisation of businesses

	Estonia			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	67%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	26%	23%	23%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	16%	22%	22%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	10%	10%	10%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud⁷⁵	NA	51%	51%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	3%	3%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	62%	62%	62%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	16%	18%	19%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	12%	12%	12%	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	9%	9%	9%	9%	
% SMEs	2019	2021	2021	2021	

⁷⁵ Enterprises buying sophisticated or intermediate cloud computing services indicator, see [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).



Estonia shows a mixed picture regarding the uptake of digital technologies by enterprises: In 2021, 51% of enterprises in Estonia used cloud services, which is significantly above the EU average of 34%. By contrast, **only 10% of enterprises in Estonia used big data in 2020, and even fewer (3%) used AI in 2021.** Both figures are below the EU average. The total percentage of enterprises using one of the three technologies remains below the Digital Decade target of at least 75%. Only 3% of enterprises were reported to be using AI technology in 2021, which is significantly below the EU average of 8%.

Estonia has taken several measures to increase the percentage of enterprises using big data, AI, and modern technology more broadly. For example, an AI development programme has been created focusing on industrial companies and start-ups in the areas of green, health, and energy. The 'Digitalisation Roadmap' programme is intended to provide funding for SMEs for dedicated three-year action plans and services to improve their digitisation. Estonian enterprises can also apply for support for automation and the deployment of digital technologies and robots under a programme using RRF resources. The latest addition (March 2023) is a programme providing support to SMEs for cyber security measures, based on methodology developed by Estonia's Information System Authority (responsible for applying information security standards in the public sector).

The Estonian Digital Innovation Hub 'AI and Robotics Estonia' (AIRE)⁷⁶ also focuses on improving the AI capabilities of Estonian companies and developing their digital maturity. It is part of the network of European Digital Innovation Hubs (EDIH). The EDIHs are one-stop shops supporting companies and the public administration to respond to digital challenges and to become more competitive. The EDIH network is co-financed by the European Commission and by the relevant

⁷⁶ [AIRE \(europa.eu\)](https://europa.eu)

Member States of the EU, in this case Estonia. AIRE in Estonia focuses mainly on the manufacturing sector (90% of the hub's work), but some resources are allocated to the health and tourism sectors. AIRE has been fully operational since 1 July 2022, after a 12-month pre-launch testing and pilot phase.

Estonian enterprises also present a mixed picture on the uptake of other digital technologies.

Electronic information sharing in enterprises is low compared to other Member States. Only 23% of enterprises reported using an ERP (enterprise resource planning) software package to share information between different functional areas. This is significantly below the EU average of 38%. The use of social media is also below the EU average. Only 22% of enterprises reported to use two or more of the social media tools considered as part of the assessment. This is again significantly below the EU average of 29% of enterprises. By contrast, the uptake of e-invoicing for automated processing is very high in Estonia and has almost doubled between 2018 and 2020. 62% of enterprises in Estonia reported to be sending e-invoices.

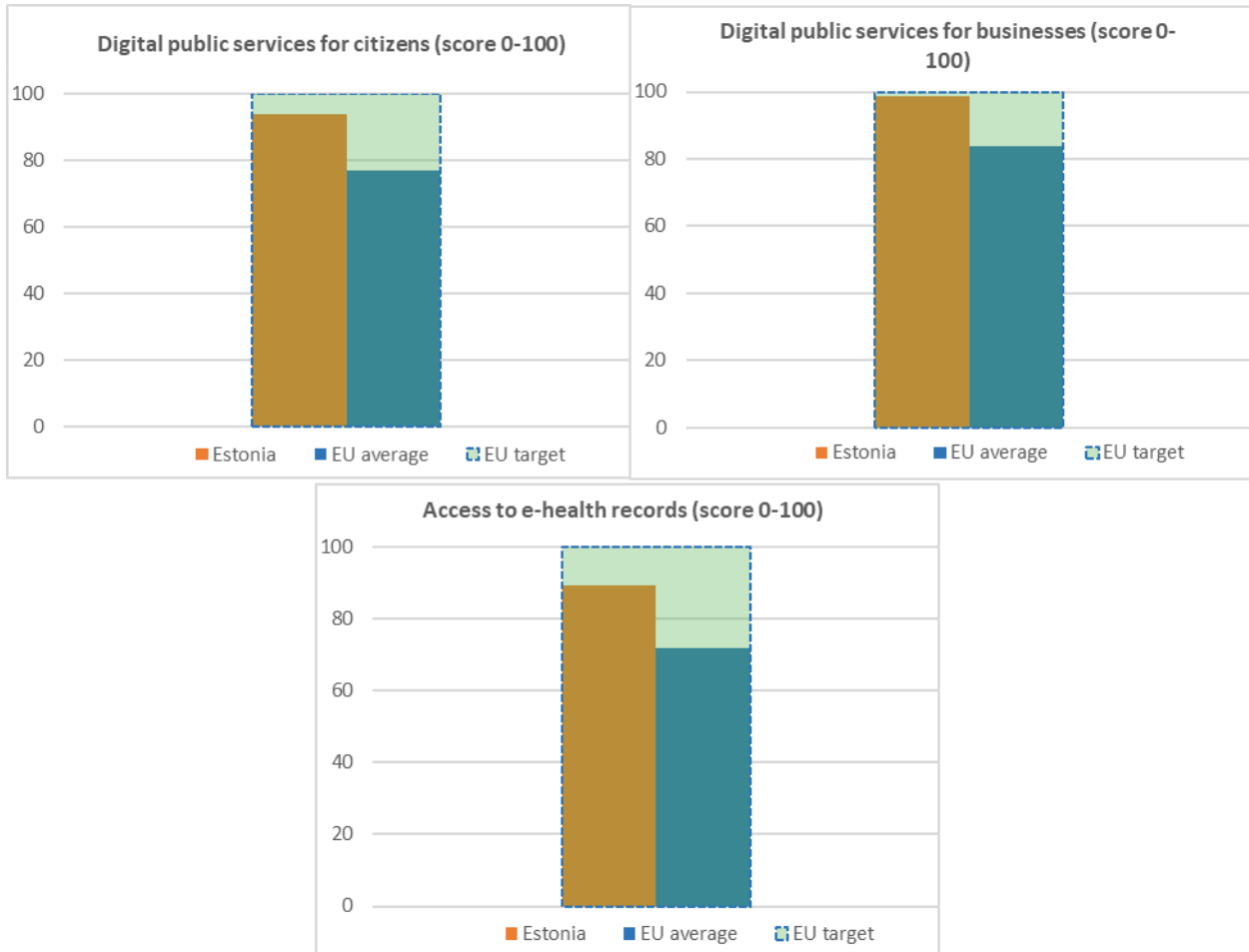
In Estonia, 67% of SMEs had at least a basic level of digital intensity in 2022. This score is close to the EU average of 69%. The percentage of SMEs in Estonia selling online is 19%, the same as the EU average. The growth rate since 2017 has also been similar to that of the EU average. Estonian SMEs' total turnover from e-commerce is 12%, slightly above the EU average of 11%. The percentage of SMEs in Estonia carrying out electronic sales to other Member States is 9%, the same as the EU average.

The Estonian business ecosystem includes many innovative and growing start-ups and scale-ups that are driving the country's growth and modernisation. There are currently two unicorns based in Estonia. Two potential unicorns with a current market valuation between EUR 100 million and EUR 1 billion have been identified.

Estonia should accelerate its efforts in the area of the digitalisation of businesses. In particular, Estonia should increase the uptake of advanced digital technologies by enterprises, and support SMEs in using digital technologies to become more competitive and sustainable.

4 Digitalisation of public services

	Estonia			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	93% 2022	74% 2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	92 2021	94 2022	77 2022	100
4a3 Digital public services for businesses Score (0 to 100)	NA	98 2021	99 2022	84 2022	100
4a4 Pre-filled forms Score (0 to 100)	NA	87 2021	88 2022	68 2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	86 2021	87 2022	65 2022	
4a6 User support Score (0 to 100)	NA	93 2021	98 2022	84 2022	
4a7 Mobile friendliness Score (0 to 100)	NA	97 2021	97 2022	93 2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	89 2023	72 2023	100



Estonia is at the forefront of the digitalisation of public services and is expected to make a very strong contribution to the collective efforts to achieve the Digital Decade targets for the digitalisation of public services.

The country can serve as an example to other Member States. Estonia has shared its experience and best practices with other countries, including Ukraine as a candidate country, as part of the Estonian e-Governance Academy, a foundation-based international development cooperation programme. Further advancements in digital public services remain one of the priorities under Estonia's national Digital Agenda 2030.

Estonian citizen and businesses can access a wide range of public services online: With a score of 94, Estonia is one of the very advanced Member States in terms of the proportion of administrative steps that people can carry out online for their major life events (the EU average score is 77). Estonia's score of 99 is significantly above the EU average score of 84. This indicator broadly reflects the share of public services needed to start and run a business that are available online for domestic and foreign users. Estonia's score for the amount of data that is pre-filled in online forms for public services is 88, which is also significantly above the EU average of 68.

Internet users in Estonia make good use of the user-friendly services provided: 93% of internet users in Estonia used the internet to interact with public authorities in the last twelve months. This is significantly above the EU average of 74%. Online public services in Estonia are generally considered to be particularly transparent and designed with user involvement. Users have a high degree of control over how they manage their personal data. With a score of 87, Estonia is significantly above the EU average score of 65. In terms of user support Estonia is also one of the highest-ranking

countries. The score of 98 indicates excellent online support, help features, and feedback mechanisms. The EU average score is 84. User support was at a level well above the EU average when it was first measured in 2021 (with a score of 93 compared with an EU average of 82).

Estonia is committed to further improving and developing its online public services, as one of the three priorities set out in the national Digital Agenda 2030. The focus is currently on linking services to life events and developing features that automatically suggest further steps that are typically linked to other services or a particular life event (e.g. marriage may lead to changing the surname which triggers the need to update several documents). Another priority is providing the user interface and allowing for a seamless interaction with public services, irrespective of when and where, or from which device, the services are being accessed. With a score of 97, the 'mobile friendliness' of online public services in Estonia is already above the EU average of 93, and Estonia is committed to improving it further. To further strengthen e-governance, Estonia created a centre of excellence for data governance and open data. This centre improves the quality of the data collected and held by the Estonian public authorities, increasing its usability for decision-making and its availability as open data to other stakeholders.

Estonia is at the forefront of providing access to electronic health records, and currently ranks 4th among the Member States. 89% of Estonians have access to their electronic health records, which is significantly above the EU average of 72%. This is a significant contribution to the collective efforts to reach the Digital Decade target of 100% access. Citizens have full access to all their electronic health data (including medical images in digital format) through a national online access service (using eID authentication). A mobile application is not available. The data is updated after each healthcare encounter. Real-time remote assistance is available in case of problems accessing the data. The service is offered to the whole population and supplied with relevant health data from the entire care sector, including both public and private providers.

Accessibility can be improved. The electronic access service in Estonia is not compliant with the Web Content Accessibility Guidelines v2.1 (WCAG), as required by the European Commission's Web Accessibility Directive. Estonia reported that monitoring at national level shows that digital health records are largely accessible, but older people and people with disabilities may experience some difficulties. These difficulties are expected to be addressed when a new health portal will be rolled out.

Most of the Estonian population has access to an eID scheme notified under the eIDAS Regulation which provides access to a wide range of digital public services. Currently, Estonia has six eID means notified under the Estonian eID scheme. The ID card, the RP card, the Digi-ID, the e-Residency, the Digi-ID, the Mobiil-ID, and the Diplomatic identity card have all been notified at a 'high' level of assurance. Estonia therefore makes a significant contribution to the collective efforts within the EU to achieve this target. Estonia has not reported any specific actions taken at national level to further increase the percentage of citizens with access to an eID scheme.

Estonia is collaborating with other Member States in exploring the possibility to set up two **European Digital Infrastructure Consortia (EDICs)** in the area of digital public services. The Networked Local Digital Twins Towards CitiVerse is intended to help build carbon neutral, resilient, inclusive, sustainable, and more beautiful cities that are closer to people. The Genome EDIC aims to provide an infrastructure supporting genome-based medicine, research and innovation, and a better healthcare system for personalised medicine. Estonia is also working with other Member States on the possibility of setting up the Copyright Infrastructure EDIC to define and promote the rules governing data management practices in creative industries.

Estonia's national digital strategy already encourages the public sector to use innovation procurement as a strategic tool to accelerate the uptake of innovative digital solutions in public services. A national roadmap setting out ambitious initiatives in the digital sector could help to reinforce the country's investments and contribute significantly to the target on digitalisation of public services and the Digital Decade objective on innovation.

Estonia should continue implementing its policies to digitalise public services. In particular, Estonia should continue its investments in innovation procurement of digital solutions to further accelerate the adoption of innovative digital solutions for all public services. It should also address accessibility of health data to enable access for all people (including people with disabilities) and ensure accessibility of all relevant portals from mobile devices.



Digital Decade Country Report 2023

Finland

Introduction

Finland has been at the forefront of the digital transformation for many years and is expected to make a very strong contribution to the collective efforts to achieve the Digital Decade targets. It has rolled out comprehensive digital policies with early adoption of 5G, has well-developed e-Government services, and has a highly skilled workforce. Further measures are needed to reach the gigabit connectivity target.

To guide its digital transformation over the coming years, in October 2022, the Finnish Government submitted a report called Finland's Digital Compass to the country's Parliament. Based on the EU Digital Compass and the EU Digital Decade Policy Programme, this Compass is a national strategic roadmap extending to 2030, providing an overview of Finland's digital transformation and steering the direction for national development. Based on European values, the Digital Compass includes a national vision for 2030 and key objectives in four areas: digital skills, infrastructure, businesses, and public services. Furthermore, it sets the objective of developing and strengthening cross-sectoral management of digitalisation. The Digital Compass was prepared in close cooperation with various stakeholders.

Overall, Finland has run very balanced and comprehensive ICT policies over the years. These policies contributed significantly to the country's excellent performance in digital. The efficient coordination of Finnish ICT policies has also facilitated the early adoption of 5G thanks to an efficient process for assigning the dedicated spectrum bands; well-developed e-government services; and a highly skilled workforce. The implementation of Finland's Digital Compass is important to continue this process. In particular, it will be a very good basis for the upcoming national roadmaps to be submitted within the Digital Decade Policy Program (DDPP) policy process, after consultations with stakeholders in Finland.

Finland is collaborating with other Member States in exploring the possibility to set up European Digital Infrastructure Consortia (EDICs) on: (i) Genome, to enable the effective and secure cross-border access to repositories of personal genomic datasets; (ii) Copyright Infrastructure, to release the potential of EU's creative sectors; (iii) Mobility and Logistics Data, to enable access, sharing and reuse of data in these areas; and (iv) Innovative Massive Public Administration inter-Connected Transformation Service, to develop a new generation of advanced cross-border services.

Finland has been taking various measures supporting the Digital Decade objectives. For example, the [Climate and Environment strategy for the ICT sector](#) was published in 2021. Also, Finland kept increasing the preparedness in cybersecurity with assigning the relevant tasks to various entities in the government, and also with creating good coordination mechanisms within. The ministerial *Working Group on developing the digital transformation, the data economy and public administration* has surveyed and prioritised needs for actions and investments on cybersecurity, resulting in a Government Report on Changes in the Security Environment, which was published in April 2022.

Digital in Finland's Recovery and Resilience Plan (RRP)

The contribution to digital objectives in Finland's RRP amounts to EUR 525.7 million, representing 28.9% of the total RRP allocation. Out of this amount, 379 million is expected to contribute to the Digital Decade targets⁷⁷. The RRP focuses on reforms and investments in digital public services,

⁷⁷ Each recovery and resilience plan must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plans had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or has no impact (0%) on digital objectives, using Annex VII of the RRF Regulation.

digital skills and the digital transition of the economy to exploit the full potential of the digital transformation. The plan sets out support measures for the digital transition with investments of EUR 32 million in high-speed broadband infrastructure across Finland, and of EUR 85 million in the Digirail project to roll out the new automatic train protection system on the entire national railway network by 2040, along with the 4G and 5G-based Future Railway Mobile Communication System. The plan allocates EUR 100 million to digital innovation in social welfare and healthcare services; EUR 32 million to invest in the digitalisation of continuous learning and EUR 25 million to invest in accelerating key technologies (microelectronics, 6G, artificial intelligence and quantum computing). Another EUR 20 million are allocated to streamline the work and education-based immigration process to facilitate international labour recruitment.

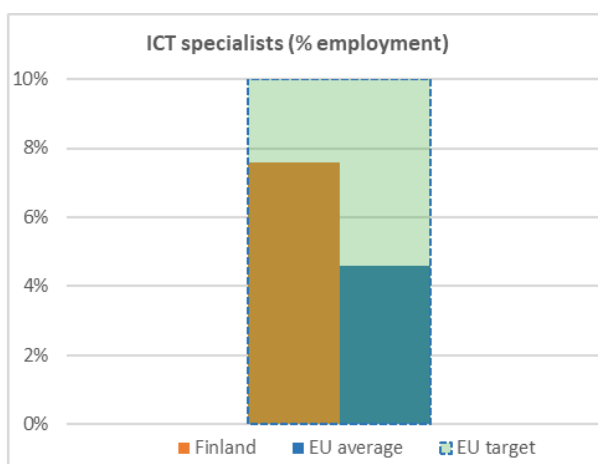
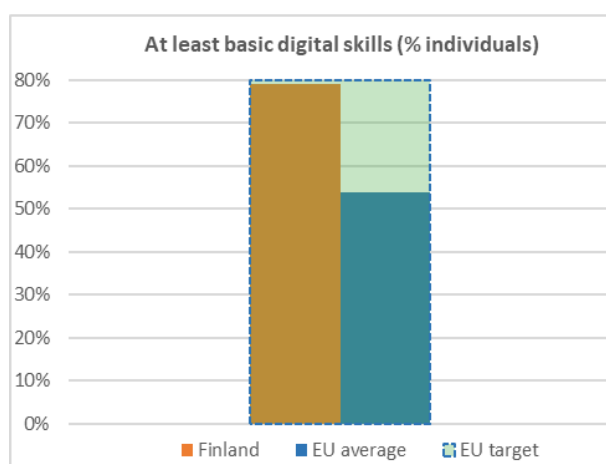
Implementation of the RRP started after its adoption in October 2021. A Council decision on the amended RRP was adopted in March 2023. Implementation of the digital projects is underway, with the launch of calls for proposals for the Microelectronics Important Projects of Common European Interest (IPCEI) in 2021.

Finland has not yet requested a payment from the RRF.

Combining the coefficients with the cost estimates of each measure allows assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to allow for an estimation of the possible contribution of RRF measure to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice to potential ongoing revisions of the plan.

1 Digital skills

	Finland			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	95%	95%	95%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	79%	79%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	48%	48%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	83%	83%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	38%	38%	40%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	7.6%	7.4%	7.6%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	7.4%	7.5%	7.6%	4.2%	
% graduates	2019	2020	2021	2021	



Finland performs very well on digital skills.

Finland has a highly digitally skilled population. In 2022, the share of the population with at least basic digital skills (79%) was very close to the EU Digital Decade target of 80% and much higher than the EU average of 54%. Moreover, the share of population with above basic digital skills (48%) reported in 2021 also exceeded the EU average of 26% in that year.

The share of ICT specialists of total employment (7.6% in 2022) is very high, compared with both the EU Digital Decade target (10%) and the EU average in 2022 (4.6%). In education, the share of ICT graduates among all graduates is 7.6%, and the share of companies providing ICT training is 40%. The figures show that Finland is continuing its efforts to maintain the high number of ICT specialists in the workforce, while emphasising convergence between the number of men and women in these jobs.

Over the last year, the Ministry of Education and Culture continued the [New Literacies Programme 2020-2023](#) to stimulate the development of targeted competences in ICT, media literacy and

programming skills. Based on this programme, grants to 46 development projects to upgrade competence descriptions were concluded in 2022. Grants were also awarded to 22 providers of early childhood education and to 24 providers of pre-primary, primary and lower secondary education.

The [LUMA centre](#) (an organisation boosting cooperation between schools, universities, and businesses) continued to encourage children to study STEM subjects (Science, Technology, Engineering, and Mathematics) by using the most recent pedagogical methods. It also supported lifelong learning for teachers and strengthened research-based teaching. Finland participated in the [2022 edition of EU Code Week](#), organising a few events.

In higher education, implementation of the [Digivisio 2030 programme](#) continued. A platform that pooled the continuous learning opportunities from all higher education institutions in one place has been developed with the involvement of all Finland's higher education institutions. In 2022, the Ministry of Education and Culture agreed with higher education institutions to increase the intake of students between mid-2022 and early 2023. In the digital-related field, this increase is estimated to be about 10%, and occurring in particular in the universities of applied sciences.

Digital skills feature in the [continuous learning reform](#) that started to be implemented in 2021. The reform promotes opportunities for working-age people to develop their competences and ensures the availability of skilled labour. In line with the plan, Finland launched a digital service combining education and training, guidance and information on the labour market, and a set of intelligent e-services operating as a platform for a continuous learning system. Digital skills and competences were also addressed at the [Do Digi Forum](#), linking with the efforts of the national coalition on digital skills and jobs initiated by the European Commission. There are already many initiatives to promote digital skills, including beyond the education system, such as the Digital Support Service to promote everyone's access to digital public services ([Digituki](#)), or the [WORK2030 programme for work and well-being at work, which](#) accelerate the reform of current practices and boost the use of new technology in Finnish workplaces, fostering a work culture based on cooperation and trust.

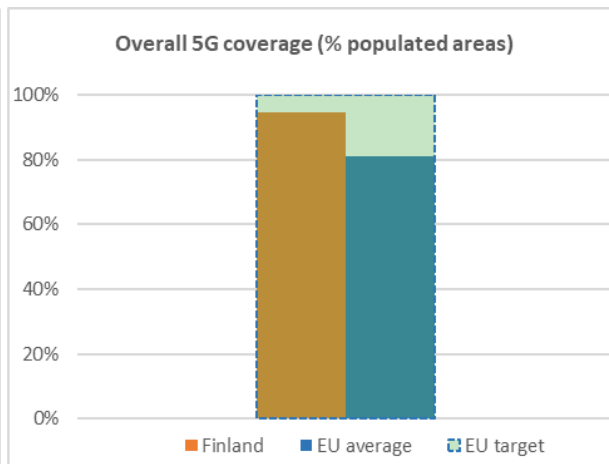
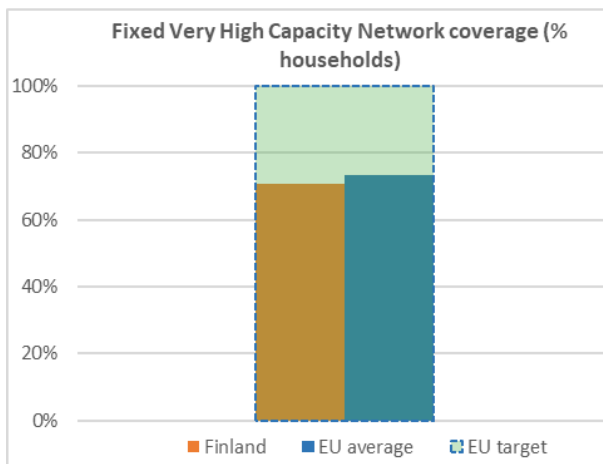
Finland has created [workinfinland.com](#) as the official website for international talent to simplify the recruitment, job search, and relocation process for people seeking work in Finland. For employers the website provided information about the different stages and services of international recruitment. Finland is developing the online service of the Finnish Immigration Service (Enter Finland) to improve the registration and processing of residence permit applications. The Virtual Finland project will continue to outline steps for a digital service path for moving to the country according to the Finland's Digital Compass.

Finland should continue implementing its policies in the area of digital skills. Notably, it should implement the announced policies to further increase the number of ICT specialists⁷⁸.

⁷⁸ The recommended policies, measures, and actions in this document reflect the Commission Communication 'Report on the state of the Digital Decade' COM(2023) 570.

2 Digital infrastructures

	Finland			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up	44%	46%	49%	55%	
% households	2020	2021	2022	2022	
2a2 At least 1 Gbps broadband take-up	1.6%	2.3%	3.1%	13.8%	
% households	2020	2021	2022	2022	
2a3 Fixed Very High Capacity Network (VHCN) coverage	67%	68%	71%	73%	100%
% households	2020	2021	2022	2022	
2a4 Fibre to the Premises (FTTP) coverage	38%	40%	50%	56%	
% households	2020	2021	2022	2022	
2b1 Mobile broadband take-up	92%	96%	96%	87%	
% individuals	2018	2021	2021	2021	
2b2 Overall 5G coverage	12%	72%	95%	81%	100%
% populated areas	2020	2021	2022	2022	
2b3 5G spectrum	99%	99%	99%	68%	
Assigned spectrum as a % of total harmonised 5G spectrum	2021	2022	2023	2023	



Finland performs very well on digital infrastructure.

Coverage of households by fixed VHCN (71%) in Finland is close to the EU average (73%). Substantial efforts will be needed to help achieve the Digital Decade target for gigabit connectivity. There is also a noticeable divide across the country due to the lack of economic incentives to roll out the network in sparsely populated areas. The government intends to extend VHCN coverage by implementing its National Broadband Plan and the digital infrastructure strategy.

Take-up of at least 100 Mbps fixed broadband in Finland (49% of households) is close to the EU average (55% of households), but the gap with the EU average is much bigger in the take-up of at least 1 Gbps fixed broadband (3.1% of households in Finland compared with the EU average of 13.8%). One explanation of this phenomenon is based on geography, as the distances in Finland are

huge and population density is low. Alternatively, the low take-up of fixed broadband may also be explained by a considerable number of users choosing to switch to mobile broadband instead.

The Finnish market is characterised by the high take-up of mobile broadband in general (96% of the population in 2021). Moreover, 95% of populated areas in Finland is covered by a 5G network and 84% by the high-quality 3.4-3.8GHz band. The high coverage of 5G is thought to be the consequence of the early availability of the 5G pioneer bands: the 700 MHz band was auctioned in 2016, the 3.6 GHz band in 2018, and the 26 GHz band in 2020. With regards to the use of the 3.6 GHz band in areas that neighbour Russia, the licence holders in that frequency band can use 130 MHz each in the 3410-3800 MHz band they obtained from the auction with smaller coordination distances than those stipulated under the applicable radio regulations.

From the consumer perspective, competition in the mobile market seems to be effective, providing choice to consumers. Users can choose between subscriptions with unlimited or limited monthly data plan. The unlimited subscriptions usually include unlimited voice calls and texts.

The three main operators in Finland compete in both the fixed and the mobile markets. All three are also investing intensely in fibre networks. Several national and regional players have invested in fibre networks given that there are around 120 telecom companies that own regional or local networks. In 2022, a few acquisitions took place in this market. This reflects the fact that in recent years, the companies that aim to expand into areas where they operate fibre networks, have acquired some small local fibre network companies.

The Finnish government intends to achieve wider connectivity and coverage by implementing its National Broadband Plan. Implementation of the plan began in 2022. Part of the funding of the National Broadband Plan, EUR 32 million, comes from the Recovery and Resilience Facility. Within the RRF, the target is to achieve very high capacity connectivity for at least 6 400 dwellings before the second half of 2024 and for 16 000 dwellings in commercially challenging areas by mid-2026. In the second quarter of 2022 the Finnish Transport and Communications Agency (Traficom) granted the first eight state aid decisions amounting to almost EUR 5 million. The next decisions are to be made in 2023.

To develop the infrastructure further, Traficom and the Finnish Ministry of Transport and Communications encourage applicants to apply for funding from the Connecting Europe Facility (CEF). In the regulatory sphere, Finland is applying the EU 5G toolbox that it implemented into the law in 2021. Advisory Board for Network Security meets regularly to assess the situation. An evaluation of the possible update of the definition of critical networks was conducted in 2022.

Finland is a member of the EuroHPC Joint Undertaking that is developing LUMI (Large Unified Modern Infrastructure), one of the three pre-exascale [supercomputers](#). It was officially inaugurated in June 2022 and will reach full capacity in 2023. It will deliver computational power in interdisciplinary and data-intensive research areas. Also, 20% of the LUMI's capacity is reserved for businesses which opens up new opportunities for companies to innovate and develop new data-based business forms such as the platform economy and artificial intelligence. Finland also participates in the Microelectronics and Communication Technologies IPCEI (ME-CT IPCEI).

Finland is at the forefront of European quantum computing. IQM Quantum Computers has invested in building Europe's first quantum-dedicated semiconductor production facilities in Espoo, funded by a European Investment Bank (EIB) loan of EUR 35 million. Furthermore, the VTT's quantum computer HELMI ("pearl") has been connected to the LUMI. The connection to Europe's most powerful classical supercomputer enables the best possible use of the quantum computer's computing power. This is the first time in Europe that this kind of hybrid service connecting a supercomputer and a general-purpose quantum computer has been opened for researchers.

Finland's [Climate and Environment strategy for the ICT sector](#) was published in 2021. Based on this, every year there is a forum with stakeholders to discuss the possible actions for the environment and how to mainstream these into other policies. The 2022 forum focused on solutions managing energy consumption and the priorities for implementing the strategy in the future.

As one of the actions related to the strategy, Traficom has developed pilot environmental indicators for electronic communications networks. The first pilot collection of data, based on these indicators, was carried out in spring 2022, and the next round was followed in spring 2023. These pilot rounds of data collection focus on the energy consumption of networks and involve telecom companies in Finland.

Finland should continue implementing its policies in the area of digital infrastructure. It should pay even more attention to very high-capacity network coverage, delivering broadband to the rural areas, including fibre to the premises throughout the country.

Measures taken by Finland in the field of semiconductors and quantum computing should continue in order to help the EU to become a strong market player in these areas.

3 Digitalisation of businesses

	Finland			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	90%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	43%	48%	48%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	44%	51%	51%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	22%	22%	22%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud⁷⁹	NA	66%	66%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	16%	16%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	83%	83%	83%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	18%	23%	27%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	NA	NA	NA	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	9%	8%	8%	9%	
% SMEs	2019	2021	2021	2021	

Finland performs very well on the digitalisation of businesses, scoring well above the EU average on most indicators.

Already in 2022, the percentage of SMEs in Finland that had reached at least a basic level of digital intensity, was equal to the Digital Decade target (90%) and far above the EU average of 55%.

Advanced technologies continued to be at the heart of Finnish businesses, with 66% of them using sophisticated or intermediate cloud solutions, 22% using big data analysis and 16% integrating AI technology in their operations. In the cases of cloud and AI, the percentages reported in Finland were almost twice as high as those in the whole EU on average.

The proportion of companies that share information electronically is 48% compared to the EU average of 38%. More than half of Finnish companies use social media (51%) while the average for the whole EU is 29%. The most recent data show that in 2020, SMEs used e-Invoices very often (83% of them) and in 2021 the share of SMEs selling online was almost equal to the EU average.

In 2022, Finland continued to implement its [Digital progress programme adopted in 2020](#). The main governmental organisation supporting businesses in line with this policy is [Business Finland](#). Fulfilling

⁷⁹ Enterprises buying sophisticated or intermediate cloud computing services indicator, see [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).

its mission, it has funded many research and development activities in SMEs. In addition, Finland also funded innovation projects under the programme *Kasvumoottorit* (growth engines) on the use of data and the development of digital platforms. In the field of smart mobility, leading companies in digital ecosystems received funding as well.

The development of a vibrant start-up and scale-up ecosystem is also the goal of digital policies in Finland. Government funding has been an important enabler for many Finnish start-ups, making it possible to reduce the risks related to their R&D activities. The programmes that aim to accelerate the early-stage growth of innovative start-ups provided EUR 130 million in funding each year. Finland also supported the digital transformation of local businesses and communities via the VTT Technical Research Centre and Business Finland under the multiannual 2018-2022 [Digital Finland framework](#).

In the selection process for European Digital Innovation Hubs (EDIHs), four Finnish EDIH proposals have been successful and three other proposals have received a Seal of Excellence. The EU funding (50% of costs) is well on track, the funds necessary for the national co-funding (EUR 3.7 million over the first three years, covering 30% of costs) has been approved nationally and the remaining 20% originates from other sources. Despite some administrative burdens that were expected, such as following the national state aid rules and carrying out the EDIH activities with a substantial number of SMEs to be supported, the challenges are well understood and are being addressed. The projects have begun and normal operations can be expected to take place soon.

In the [AI strategy](#), the government has encouraged the development and introduction of AI to help run businesses and provide services to customers. With a budget of over EUR 100 million in 2019-2022, the AI business programme and the Finnish Centre for Artificial Intelligence (which received EUR 8.3 million in funding) were in the final stages of implementation.

The hallmark of the Finnish way of integrating of digital technologies into the economy is the cooperation between universities, specialised government agencies, and businesses. This process is based on various documents that are being implemented over time. Many projects ended in 2022 while future initiatives were already being prepared as part of the Finnish Digital Compass process.

Best practice: Business Finland's 6G Bridge programme

5G technology was already deployed in Finland several years ago. However, work continues on the next generation of connectivity with the 6G Bridge programme. It aims to make Finland the global leader in providing new value with 5G Advanced (5GA) and 6G technologies for sustainable industries and societies for example, smart cities, smart energy, smart ports, and smart factories with different industry players.

The program encourages top-notch Finnish researchers and companies to radically increase both national and international collaboration, including outside the EU. The programme's goals will be met, for example, by:

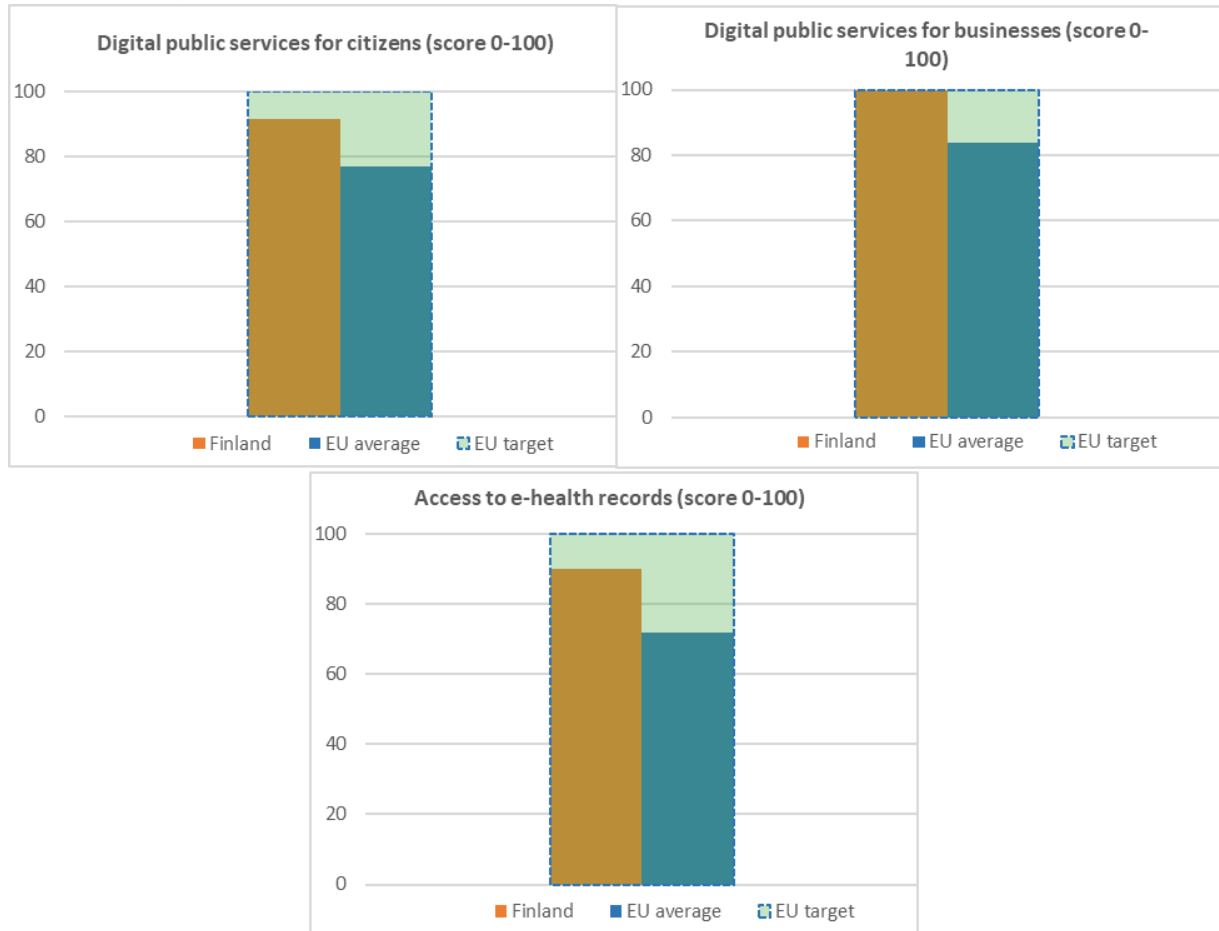
- increasing ecosystem-driven collaboration in research and innovation for 5GA and 6G;
- building business ecosystems in 5GA and 6G and attracting international investments;
- strengthening key capabilities in 5GA and 6G;
- developing testing and experimentation facilities in 6G.

The program will run from January 2023 until the end of 2026 with a planned budget of EUR 130 million to fund innovation. It will help Finland to maintain its leadership in future connectivity, thus providing business opportunities for Finnish companies.

Finland should continue implementing its policies in the area of digitalisation of businesses. In particular, it should continue boosting the take up of advanced digital technologies by businesses, particularly in the area of AI and big data, by providing incentives for investment.

4 Digitalisation of public services

	Finland			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	97% 2022	74% 2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	90 2021	92 2022	77 2022	100
4a3 Digital public services for businesses Score (0 to 100)	NA	93 2021	100 2022	84 2022	100
4a4 Pre-filled forms Score (0 to 100)	NA	90 2021	90 2022	68 2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	71 2021	72 2022	65 2022	
4a6 User support Score (0 to 100)	NA	96 2021	96 2022	84 2022	
4a7 Mobile friendliness Score (0 to 100)	NA	100 2021	100 2022	93 2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	90 2022	72 2022	100



In Digital public services, Finland performs very well, scoring well above the EU average. Finland is expected to make a significant contribution to the Digital Decade targets on digital public services for citizens and businesses. In 2022, the key performance indicator on services for citizens was 92, compared with the target of 100 and the EU average of 77. The key performance indicator for businesses was 100, which means that Finland has reached the Digital Decade target, and is well above the EU average of 84. The proportion of internet users who use e-Government services is 97%, which is very high in comparison to the EU average of 74%.

Finland performs very well on the extent to which data that is already known to the public administration is pre-filled in forms presented to users (scoring 90 out of 100, compared to the EU average of 68). The efforts of its public administration to make sure that service processes are transparent, that services are designed with user involvement and that users can manage their personal data also puts Finland above the EU average (scoring 72 out of 100, compared to the EU average of 65).

Several programmes, which started in the last few years, were implemented in 2022. In particular, the country continued to upgrade e-government services. Several registration services were functionally integrated after merging them into the [Digital and Population Data Services Agency](#). The Valtori [ICT centre](#) continued providing ICT services for central government and facilitating intergovernmental tasks. New legislation allowing automatic administrative decisions came into power in May 2023. It is planned to be implemented by the end of 2023. The AuroraAI network which aims to provide services to citizens that help them go through administrative procedures related to life events (accidents declarations, certificates etc.), is being implemented.

The [Ministerial Working Group on Digitalisation, Data Economy and Public Administration](#) has worked extensively on the traditional themes related to the economic issues, but increasingly also on cybersecurity and education after cybersecurity was added to the group's tasks in March 2022. The purpose of the working group is to guide the development of the public administration, digitalisation, the data economy, information policy, and cybersecurity.

In e-health, Finland scores 90, more than mid-way between the EU average of 72 and the Digital Decade target of 100. This is thanks to the My [Kanta](#) portal, where the citizens can access their online electronic documents. This includes health records, prescriptions, allergy data, current diagnoses, procedures, medicines, ePrescription, and eDispensation, and various reports provided to them in electronic format (laboratory test results, medical imaging reports, hospital discharge reports). The My Kanta portal can be accessed with a national eID-scheme based on two-factor authentication. Currently, between 60% and 79% of citizens are technically able to view relevant health data supplied by all care providers (both public and private). Besides providing access to documents, My Kanta lets users do many other things, such as managing consent, requesting a prescription renewal or saving a living will and organ donation testament. Additionally, through My Kanta, it is possible to store personal welfare data and share it with the authorities.

Finland is not far from achieving the Digital Decade target on access to electronic health records. Full access to a minimum set of health data will be achieved by implementing standards on presenting of medical images and information on medical devices in citizens' electronic health records. The nationally notified eID-scheme currently lacks eIDAS compliance.

The [national open data portal](#) continued to provide data in open formats for companies and the public. Following previous observations that Finland is underachieving given its ambitions, the government ran a programme in 2020-2022 to encourage wider and more efficient use of public data for societal and economic purposes over the period. In the 'Open Data Maturity 2022', the quality of the portal and the data was ranked seventh.

Finland has continued to increase its cybersecurity preparedness by assigning the relevant tasks to various bodies in the government, and by creating good coordination mechanisms. The ministerial Working Group on developing the digital transformation, the data economy and public administration has surveyed and prioritised the needs for actions and investments on cybersecurity. The Government Report on Changes in the Security Environment was published in April 2022. The Report assesses changes in the operating and security environment and the effects of the changed environment from various viewpoints, including cybersecurity. In spring 2022, the Government allocated EUR 230 million to increase cybersecurity in the society in 2022-2026. The difficult international situation has also led to the implementation of various initiatives.

In 2022, the report of the Development Needs in Cybersecurity Education⁸⁰ project was published. The report examined the cybersecurity development needs and comprehensively explored the quantitative and qualitative development of cybersecurity competencies to map out the measures needed to improve Finland's cybersecurity expertise. The conclusions of the report have been included in the work of the Ministerial Working Group and are being introduced into the educational system by the Ministry of Education and Culture.

In 2022 the Ministry of Education and Culture launched a call for proposals for higher education institutions to develop courses in the field of cybersecurity. The Ministry was looking for one higher education institution to coordinate all the institutions providing courses in this field, to avoid overlapping and strengthen overall knowledge and skills in cybersecurity. All relevant higher

⁸⁰ <http://urn.fi/URN:ISBN:978-951-39-9469-3>

education institutions are taking part in developing both courses that lead to a degree and modules that can be used for upskilling and reskilling. A special fund of EUR 3.4 million has been envisaged for this initiative. Also, the Ministry of Transport and Communications together with the director for cybersecurity provide the government with the situational picture and coordinate actions horizontally if there are severe cybersecurity disruptions.

Finland should continue implementing its policies to digitalise public services. In particular, cybersecurity should stay at the forefront of governmental policies.



Digital Decade Country Report 2023

France

Introduction

France has untapped digital potential to contribute further to the collective efforts to achieve the EU's Digital Decade targets. Given the size of the French economy and its population, current and future actions are expected to contribute significantly to such efforts. France has several digital strategies, broadly aligned with the objective of the Digital Decade Policy Programme. France is doing well on connectivity and start-ups and shows positive trends in digital public services and human capital. However, the digital transformation of the economy is uneven. In particular, whilst the top innovating companies use and deliver advanced digital technologies, there is not widespread use of basic technologies by small and medium enterprises (SMEs).

France is collaborating with other Member States in exploring the possibility to set up a **European Digital Infrastructure Consortium (EDIC)** on an Alliance for Language Technologies, to develop a common infrastructure in the field of natural language processing and large multi-language models.

Digital in France's Recovery and Resilience Plan (RRP)

The French Recovery and Resilience Plan amounts to EUR 40.3 billion. 22% of it (i.e. EUR 8.1 billion) is devoted to digital transformation. A mapping of the funded actions to the Digital Decade targets shows that EUR 7.7 billion out of the EUR 8.1 billion contribute to them directly⁸¹.

On 19th August 2021, the Commission disbursed the pre-financing of EUR 5.1 billion. For the first payment request, France has achieved 38 milestones and targets, leading the Commission to disburse 7.4 billion in Q1 2022. Some milestones were related to measures in digital, such as:

- Innovating for the resilience of business models: accelerating 6 key digital technologies: quantum, cybersecurity, education, and digital, cultural and creative industries, 5G and cloud.
- Increase in the resources of France Compétences (which includes also digital skills).

Based on the Council Implementing Decision on the French Recovery and Resilience Plan, other reforms and investments that are associated to milestones and targets include measures to:

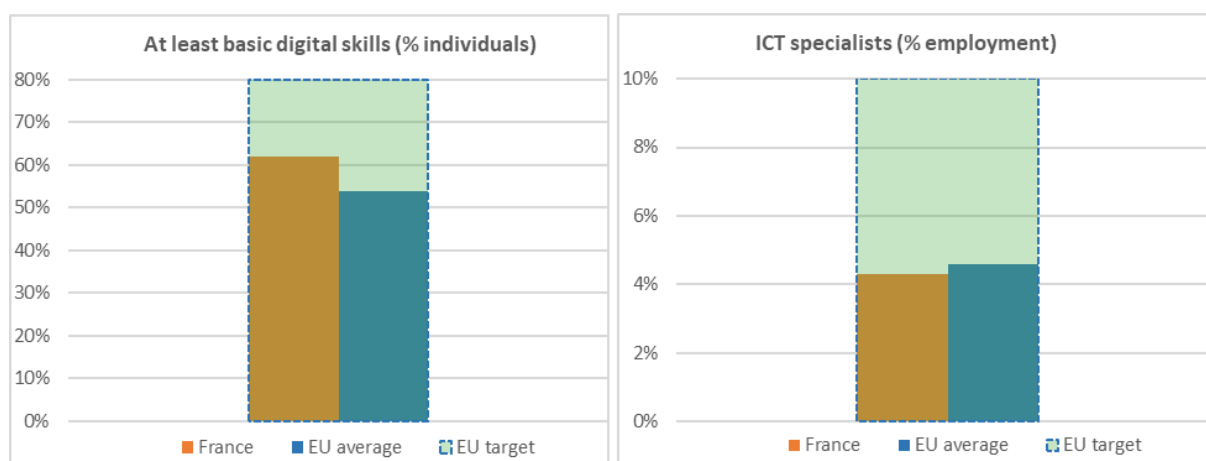
- modernise the public health sector (EUR 2 billion) with employee workstations, collaborative and nomadic tools, dematerialisation of State services.
- increase training and education with 330 000 extra apprentice contracts, training for digital skills (for 20 000 persons with a EUR 25 million budget), digital learning contents (15 000 training bodies using remote platforms with a EUR 304 million budget), and a plan for remote learning (30 000 extra trained persons with a budget of EUR 160 million).
- increase digital public services (EUR 500 million).
- Increase the 'France Très Haut Débit' plan by EUR 240 million to boost connectivity in rural areas.

⁸¹ Each Recovery and Resilience Plan must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plans had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or has no impact (0%) on digital objectives, using Annex VII of the RRF Regulation. Combining the coefficients with the cost estimates of each measure allows assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to allow for an estimation of the possible contribution of RRF measures to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice to potential ongoing revisions of the plan.

- Equip schools with digital devices.

1 Digital skills

	France			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	NA	89%	90%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	62%	62%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	31%	31%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	76%	76%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	15%	15%	15%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	4.5%	4.5%	4.3%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	3.6%	3.6%	3.5%	4.2%	
% graduates	2019	2020	2021	2021	



In France, 62% of people have at least basic digital skills, which is above the EU average of 54%. France is also above the EU average for individuals with above basic digital skills (31% in France versus 26% in the EU) and at least basic skills for digital content creation (76% compared to 66% at EU level).

France is currently implementing several measures that can contribute to increase the level of basic digital skills.

The Skills and Jobs of the Future initiative has a total budget of EUR 2.5 billion and aims to meet employment or skills needs and to accelerate the implementation of training related to national R&D strategies in key sectors. Successful projects will assess skills and training needs in 2021-2025, they will support curriculum development and the delivery of training. Projects focus on training in upper secondary schools, in higher education and via long life learning, according to the training needs identified by the France 2030 strategy. The first wave of initiative has started (with EUR 320 million)

and supports 7 projects in digital areas, in particular education and digital, cybersecurity, digital greening, artificial intelligence, quantum, and digital health.

Scientific, digital and media literacy in all subjects at all levels of formal education needs particular attention. The overall performance of pupils in mathematics is poor⁸², even that of top performers could be improved, which makes further acquisition of scientific knowledge difficult in a professional context. A report by the European Commission Directorate-General for Education and Culture raised concerns about the performance of students in mathematics in France⁸³. Efforts to train teachers in digital skills and to empower them to use digital tools in teaching, such as the initiative “Territoires Numériques Educatifs”, should be continued. Currently, there are several initiatives to address digital education: “Education and Digital” and “Skills and Professions of the Future”. A centralised service of the Prime Minister’s Office⁸⁴ is responsible for oversight and coordination to ensure synergies between different activities. However, effective monitoring and evaluation of large-scale digital projects would be useful.

As part of its Digital Education strategy, France is investing in the development of advanced digital skills, in line with the research priorities supported in the key digital sector. Measures address the entire education cycle, from primary to tertiary level. The number of specialised Master’s courses in AI has increased significantly in the last years, thanks to additional funding and increased focus. In addition to the investment in ICT specialists, there is a growing need to upskill and reskill the workforce in all sectors of the economy to harness the potential of digital solutions.

Significant investments have been mobilised to equip schools with digital tools and infrastructure and to digitalise pedagogical content, and the targets are ambitious. However, the results of these investments will take time to materialise, and meticulous implementation is key to achieving the objectives. While the reaction to the pandemic was to invest in digital equipment under time pressure, schools often did not have time to develop a digital strategy before receiving funding.

As regards professional training, the Ministry of Labour has several contracts with professional organisations and social partners (EDEC) to anticipate the impacts on jobs and skills of economic, social and demographic changes, including the green and digital transition. It creates action plans with professional organizations and social partners to adapt and develop professional training. A recent poll shows that 55% of employees consider that they need to develop skills linked to their career development and that business leaders believe that their profession is going to change profoundly due to digitalisation (55% in enterprises with fewer than 50 employees and 75% in enterprises with more than 50 employees)⁸⁵.

To address these gaps, the Compte Personnel de Formation (CPF) entitles employees to a virtual individual account in which training rights are accumulated over time. The resources are only mobilised if training is actually undertaken. This system aims to facilitate access to upskilling and reskilling opportunities. With the support of the RRF, an extra allowance is provided to people who choose training in digital areas. This measure has so far benefited 22 500 people and is planned to continue until 2024, however, the participation of female candidates should be encouraged.

⁸² Trends in International Mathematics and Science Study, 2019: overall performance in mathematics was the lowest in all participating 22 Member states

⁸³ The Education and Training Monitor 2022 Country report for France by DG EAC of the European Commission raises concerns over performance in maths in France.

⁸⁴ *The Secretariat General pour l’Investissement*.

⁸⁵ Les Français face à la transformation numérique (lefigaro.fr).

The country has an average share of ICT specialists: the percentage of ICT specialists is 4.3% of total employment, almost the same as the EU average (4.6%) but the gap increased slightly compared with the previous year. The proportion of graduates that study ICT subjects is 3.5%, which is below the EU average of 4.2% and is in a downward trend. These negative trends may be related to a recent reform in scientific secondary education which led to fewer students studying sciences. In parallel, only 15% of enterprises provide ICT training to their employees, far below the EU average of 22%. France's performance is just above the EU average as regards the presence of women in the digital sector at 19% of ICT specialists, compared with an EU average of 18.9%.

The government set the objective of training 400 000 digital experts by 2027 in an action plan that is financed by the France 2030 future investments. It sets priority cutting-edge fields: AI, cloud, quantum, 5G and cybersecurity. France will also improve its training offer for technicians and engineers, and add a new feature in terms of equality: the overall support of 10 000 young women to enter the digital and tech professions.

It is important that France implements measures to address all cycles of education: primary, secondary, tertiary, in particular to address the fundamental level **in mathematics**. In addition to reinforce the investment for ICT specialists notably ICT graduates, there is an increasingly growing need to **upskill and reskill the workforce**. In this view, a whole-government approach to coordinate more effectively digital education policies and strengthen the involvement of relevant stakeholders is relevant.

Best practice: the Pix project for education in digital competences

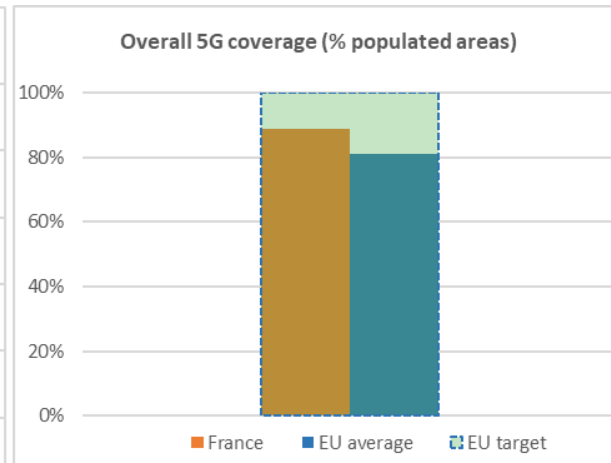
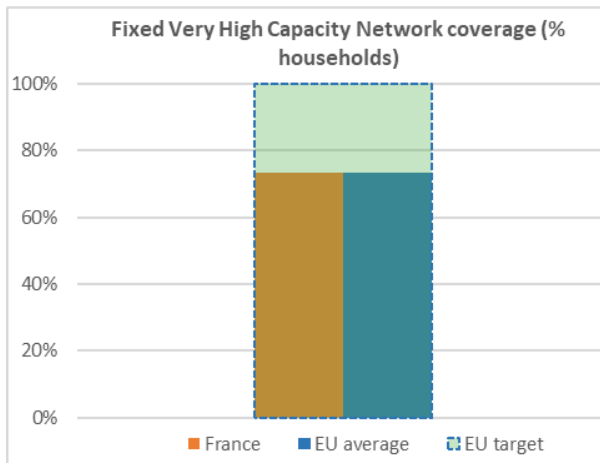
The PIX project is a user-friendly online testing tool for digital skills and competences that provides a certification based on DigComp. Pix is a French public initiative, based on open-source software. It combines challenge-based and knowledge-based tests, and is aimed at a wide audience of pupils, teachers, professionals etc. PIX is widely used with more than 8.5 million accounts created and 2 million certifications provided. It is used as an assessment tool by 97% of secondary schools in France and 80 universities. International partnerships are being set up with Belgium and other countries. Pupils and teachers can also use the tool to develop their digital skills.

France should accelerate its efforts in the area of digital skills. In particular, France should implement measures to address all levels of education, especially the fundamental level in mathematics. In addition to boosting the investment for ICT specialists, particularly ICT graduates, France should continue to upskill and reskill the workforce⁸⁶.

⁸⁶ The recommended policies, measures, and actions in this document reflect the Commission Communication 'Report on the state of the Digital Decade' COM(2023) 570.

2 Digital infrastructures

	France			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up	NA	41%	51%	55%	
% households	2020	2021	2022	2022	
2a2 At least 1 Gbps broadband take-up	NA	31.4%	39.9%	13.8%	
% households	2020	2021	2022	2022	
2a3 Fixed Very High Capacity Network (VHCN) coverage	53%	63%	73%	73%	100%
% households	2020	2021	2022	2022	
2a4 Fibre to the Premises (FTTP) coverage	53%	63%	73%	56%	
% households	2020	2021	2022	2022	
2b1 Mobile broadband take-up	82%	88%	88%	87%	
% individuals	2018	2021	2021	2021	
2b2 Overall 5G coverage	0%	74%	89%	81%	100%
% populated areas	2020	2021	2022	2022	
2b3 5G spectrum	59%	59%	59%	68%	
Assigned spectrum as a % of total harmonised 5G spectrum	2021	2022	2023	2023	



France is on track to achieve the Gigabit coverage 2030 target. FTTP coverage (“fibre to the premises”) increased substantially by 10 percentage points, standing at 73% in 2022 (compared to 56% in the EU). This network provides high performance. The expansion of the fixed network in France is linked to the continuation of its National Broadband Plan (France Très Haut Débit), which is partially funded by the RRF. The rural/urban divide is narrowing down: FTTP coverage in rural areas jumped by 16.9 percentage points reaching 45.7%, or 2 million households. However, the pace of deployment of fibre to the home (FTTH) has slowed down in some regions, including in some densely populated areas. The outermost regions require particular attention.

The wide availability of fibre networks goes hand in hand with a very high take-up of 1 Gbps services which amounts to 26.75% compared to an EU average of 7.58%. A majority of customers are now fiber users, which allows the incumbent operator to consider shutting down its copper network in areas where deployment and customer migration are the most advanced.

On mobile connectivity, the French telecommunications market has a relatively high 5G coverage, reaching 74%, with a progress of 15 percentage points on last year (the EU average is 66%). This figure is partly due to the completion of the award procedure for frequencies in the 3.4-3.8 GHz band in the fourth quarter of 2020, enabling all four mobile networks, and certain mobile virtual network operators, to offer the commercial 5G for this band. Three operators out of four focused their 5G deployment on this band (rather than dynamic sharing of the 700 MHz band with 4G), which creates the conditions to deliver high quality of service. **Nevertheless, France's 5G spectrum readiness should be further improved.** Indeed, as far as spectrum resources are concerned, France had assigned the entire 700 MHz¹⁵ band, 77.50% of the 3.6 GHz band and none of the 26 GHz band. For the 26 GHz band, 15 experimental platforms are currently in use until 30 September 2023, however telecom operators have not yet expressed demand.

As regards 4G broadband, the mobile market has total coverage (more than 99% households are covered). The quality of service is measured by the regulator Arcep⁸⁷: the average download speed is between 29 and 50 Mbit/s in rural zones, between 56 and 96 Mbit/s in interim zones, and between 52 and 125 Mbit/s in high-density zones. The take-up of mobile broadband was high, at 88% (against: 87% for the EU). This percentage can be explained by the fact that mobile broadband prices in France are relatively good value, with an index of 76 compared to the EU average of 73.

The Regulator, Arcep, has new powers to investigate environmental questions for networks and devices and has published first studies and recommendations. Arcep mentions results that estimate that digital represents between 3% and 4% of greenhouse gas emissions in the world, and 2.7% in France, with a potential upside risk to be mitigated. The Ademe/Arcep on the environmental footprint of the digital sector finds that terminal equipment account for between 65% and 92% of the environmental footprint, followed by data centres (4% to 20%) and networks (4% to 13%). In particular, studies showed that terminal devices leave a high footprint especially when they need to be renewed to follow an update of network technology. Electronic communication operators are collecting mobile phones to recycle them at the end of their life cycle. A total of 870 000 have been collected, which amounts to 11% of the total sales.

Edge cloud is addressed as part of the cloud strategy industrial strand (described in part 3 "digital transformation of businesses"). France supports research and development projects and is one of the EU MS that are planning an *Important Project of Common European Interest* on Next Generation Cloud Infrastructure and Services (IPCEI-CIS) to equip the European Union with next generation of advanced, distributed, secure, sustainable and innovative cloud-to-edge capabilities.

Reinforcing the semiconductor sector is a key priority for France. In July 2022, the government presented a strategic investment plan of over EUR 5 billion under the France 2030 plan and in line with the European ambition of the Chips Act and the Digital Decade target (EU representing 20% of global value in this sector). The plan aims to strengthen industrial and technological capabilities in electronics by focusing on the most important needs of European industries in order to respond to future economic and societal challenges.

This plan should primarily support ambitious research, technological development and first industrialisation projects in the framework of the Important Project of Common European Interest

⁸⁷ Mobile Quality of Service, Arcep, 20 Oct 2022.

(IPCEI) Electronics and Communication Technologies, representing around EUR 7 billion of investments. These projects aim to involve around 150 industrial and academic partners.

The projects identified in the electronics part of the IPCEI aim to strengthen the EU technological and industrial position in lead application markets, in particular on-board AI for autonomous vehicles, mobility components and modules and 5G/6G components.

France also plans to support projects on new semiconductor production capacities, as part of the France 2030 plan and the legislative package of the European Chips Act.

In addition to the industrial component, the France 2030 plan for electronics aims to promote the emergence of disruptive players and technologies by 2030. It will do this through support for emerging industrial players (with EUR 86 million in funding), for advanced research (also EUR 86 million) and with a roadmap, piloted at this stage to develop low-energy technology 10 nm FD-SOI through a pilot line (with a EUR 100 million budget). In April 2023, France and the Netherlands signed a pact for innovation and sustainable growth, with the aim of boosting public-private partnerships in fields such as chip design and manufacturing.

A strategy to develop cybersecurity is in place with a budget of EUR 1 billion until 2025, of which EUR 62 million was available in 2022. The aim of this cyber acceleration strategy is to create an industrial framework in the field of cybersecurity, making it possible to have control and sovereignty over key technological building blocks.

The objectives for the sector include: (i) reaching EUR 25 billion in turnover (up from EUR 7.3 billion in 2019); (ii) creating three cyber unicorns; (iii) doubling the number of jobs to 75 000; (iv) an overall improvement in the culture of cyber in businesses; (v) increasing the number of patents and research partnerships.

In 2022, EUR 14 million were allocated to support companies especially in the field of innovative technologies. As regards training, a plan to train 9 250 specialists in cybersecurity and 3 050 000 non-specialists in 5 years has been put in place. While these efforts are important, private companies, especially small ones, continue to signal that they have important needs that should be addressed to reach a good level of preparedness and improve their ability to respond to incidents quickly. The annual measurement of progress in this area will be a critical element in monitoring France's trajectory in the cybersecurity domain until 2030.

France has the ambition to become a key player in quantum computing and has an ongoing quantum strategy financed by an investment of EUR 1.8 billion from the public and private sectors, which is part of the France 2030 investment plan.

Investment in training is also planned, funding 100 thesis fellowships, 50 post-doctoral fellowships and 10 young talent grants per year for at least the next 5 years.

The seven pillars of the quantum strategy are:

- develop and disseminate the use of noisy intermediate-scale quantum (NISQ) simulators and accelerators (EUR 352 million);
- develop the quantum computer at the LSQ scale (EUR 432 million);
- develop technologies and applications for quantum sensors (EUR 258 million);
- develop post-quantum cryptography (EUR 156 million);
- develop quantum communication systems (EUR 325 million);
- develop a competitive range of enabling technologies (EUR 292 million);
- cross-cutting structuring of the ecosystem.

The national quantum strategy includes the provision of added resources for researchers (including training, but also for start-ups and industrialists) and investments in all quantum technologies: communications, sensors and cryptography.

The strategy should enable France to be among the first countries to master critical quantum technologies, including quantum accelerators and simulators, quantum computing business software, quantum sensors, quantum communications, post-quantum cryptography and enabling technologies.

In the area of IT, the central theme of the strategy, France aims to become the first country to have a complete prototype of a first-generation general quantum computer by 2023. It also plans to be the first country with a complete Silicon-28 industrial production line to produce qubits on silicon.

The aim is to create 16 000 jobs directly by 2030 and to account for 1 - 2% of French exports. France's quantum strategy is part of a European dynamic: the ambition is to make Europe the main centre of gravity of quantum technologies. The quantum strategy's first projects have already been launched: on research (EUR 150 million), accelerators to prepare large-scale quantum computers, and industrial technologies that are at the close-to-market development level.

At European level, France participates in the European programme for high-performance computing (EuroHPC) and has co-financed the French part of the R&D projects selected by EuroHPC. France is also participating in the European Quantum Communication Infrastructure (EuroQCI) initiative.

Best practice: "acceleration strategy" for 5G and future networks

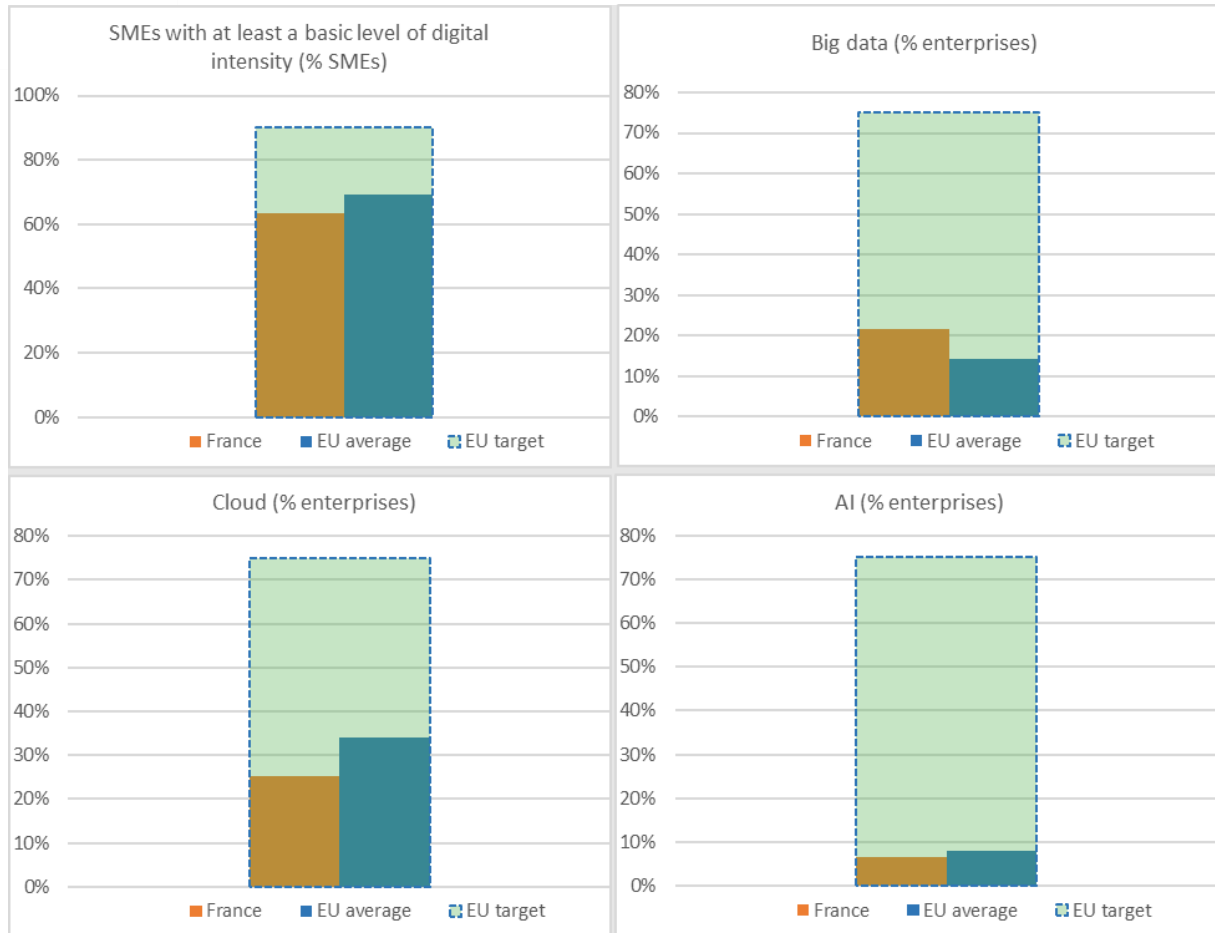
France has adopted an "acceleration strategy" for 5G and future networks. The authorities lowered the price of 5G licenses for industrial application and launched Franco-German joint calls for projects since 2020, including one on 5G in March 2022: in that call, four projects were selected in July 2022 to deploy of concrete 5G use cases dedicated to Industry 4.0. A total of 32 partners (16 German, 16 French) will be supported. France has also launched 21 projects worth EUR 163 million for experimental 5G use cases and 6 major Campus FabLabs are upcoming. Industrial 5G has started in France with 30 deployments and 750 experimental facilities as estimated by Arcep. Operators have announced several major deployments. For example, one operator deployed 5G for a very large factory of Submarine Networks in Calais, the incumbent deployed 5G for a Steel company in Dunkerque while another operator announced a partnership with key industrial players. Small enterprises are also active: for example, in Toulouse, a company participated in an Arcep experimental project and started a European project of 5G for Smart Communities, funded at 75% by the Connecting Europe Facility EU programme.

France should continue implementing its policies on digital infrastructures. In particular France should further improve its 5G spectrum readiness making the remaining priority bands available. France is also encouraged to continue its activities regarding the environmental aspect of digital sectors, as well as in the areas of quantum and semiconductors in order to help the EU become a strong market player in these areas.

3 Digitalisation of businesses

	France			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	64%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	48%	45%	45%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	22%	26%	26%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	22%	22%	22%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud⁸⁸	NA	25%	25%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	7%	7%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	23%	23%	23%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	13%	12%	13%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	12%	13%	5%	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	6%	6%	6%	9%	
% SMEs	2019	2021	2021	2021	

⁸⁸ Enterprises buying sophisticated or intermediate cloud computing services indicator, see [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).



The uptake of digital technology in France is uneven and varies according to the size of the companies. 22% of enterprises declared that they use big data (versus 14% on average in the EU in 2020) and 7% use AI (vs. 8% on average in the EU in 2021). French enterprises make less use of cloud services (25%) than the EU average (34%) with a gap of 9 percentage points in 2021. Surveys suggest that this may be due to lack of advanced skills to use cloud services or/ and due to a lack of trust in where data will be stored in the cloud⁸⁹. France is still far from the Digital Decade target for 2030, i.e. 75% of EU enterprises using cloud, AI or big data analysis.

To support the offer of AI for enterprises, the EUR 25 million project called “IA Booster” implemented by the Banque Publique d’Investissement (BPI) has already helped 30 SMEs on how to value their data with AI. Furthermore, the setup of European large-scale reference Testing and Experimentation Facilities (TEFs) will offer a combination of physical and virtual facilities, where technology providers can obtain technical support to test their latest AI-based software and hardware technologies (including AI-powered robotics) in real-world environments.

The call for proposals for TEFs was launched in February 2022 and closed in May 2022. The candidate TEFs were notified in August 2022. The Commission finances 50% of the TEFs and the Member State the other 50%. EU funding of EUR 30 million is planned for each of the following sectors: agri-food, healthcare, and manufacturing. For smart cities and communities, the call budget is EUR 20 million in EU funding.

⁸⁹ [Baromètre France Num 2022 : le numérique dans les TPE PME \(0 à 249 salariés\) - francenum.gouv.fr](https://francenum.gouv.fr)

SMEs in France use fewer digital technologies than the EU average: the proportion of French SMEs with at least a basic level of digital intensity (64%) is slightly below the EU average (69%), although the gap is narrowing compared to 2021. The 2030 Digital Decade objective is 90%. In 2020, enterprises in France made less use of electronic invoices (23% vs 32% in the EU).

The FranceNum initiative, in place since 2018, continued to support the digital transformation of SMEs and more specifically of micro-SMEs, which are companies with fewer than 10 employees. FranceNum is a national partnership with more than 70 members, including regions and professional organisations, coordinated by the Direction Générale des Entreprises. It also involves about 1 500 digital transformation experts. FranceNum promotes the adoption and of digital technology and improvements in how it is used by the managers of 1.7 million small businesses in France, to facilitate their growth.

FranceNum helps to demonstrate how technologies can benefit the French economy by offering small SMEs digital diagnostics and training free of charge, promoting good practices, and by making available loan guarantees and practical resources. In 2022, FranceNum implemented a new website to raise awareness of SMEs, training courses, a new MOOC (“Ma TPE gagne avec le numérique”) and digital tourism diagnostics. Measures that had been successful in the past were discontinued due to lack of budget: in particular, cheques FranceNum closed in July 2021 and the individualised diagnoses with an action plan stopped in 2022, to refocus priorities on tourism diagnostics. The following actions are being carried out:

- A series of training courses series was planned as part of the EU Recovery and Resilience Plan with a budget of EUR 33.1 million targeting 100 000 courses until 2025. At the end 2022, 20 849 training courses were delivered through BPI France.
- FranceNum dedicated a scheme to SMEs in the tourism sector: it aims to support 10 000 small SMEs with an individual diagnosis of digital maturity. The scheme has a budget of EUR 3 million until the end of 2023 and is carried out by chambers of commerce and chambers of crafts. At the end of 2022, 758 enterprises had benefitted from a diagnostic.
- The FranceNum loan guarantee aims to help small SMEs (<50 employees) obtain a bank loan to finance their digital transition. It provides a guarantee fund financed by the Future Investment Programme (PIA) and a counter-guarantee by the European Investment Fund (EIF).
- The scheme is being run by BPI France with a guarantee fund of EUR 30 m. As of end 2022, 75 loans had been granted.

An annual survey(“barometer”) shows that SMEs have a positive perception of digital technologies. For example, 81% of executives of small or very small companies polled considered it a benefit. In addition, a more precise impact assessment of each FranceNum action is planned to be available in the future to evaluate their efficiency.

As of 2023, 16 European Digital Innovation Hubs (EDIH) will provide businesses with digital expertise and technical and experimental facilities. EDIHs are co-funded by the European Union and by the regions. Regions have been key to identify the technology and sectorial opportunities.

It is important that France accelerates the adoption of digital technologies by SMEs in order to make sure that all of them get access to them and are able to find digital solutions that benefit their activity. In this view, collecting the needs of SMEs and engaging with them to provide extensive support for their use of digital technologies is equally important. Expanding the resources and objectives of FranceNum would be useful. In this expansion, measures that worked well in the past could be considered again (e.g., the voucher or fiscal incentives for digitisation, or the individual

diagnoses and action plans). Building on the EDIHs would also complement the FranceNum initiative and target a broader range of SMEs as well as bring in good practises from other Member States.

France has succeeded in becoming a very favourable ecosystem for the development of start-ups and scale-ups. 36 companies are considered “unicorns” in France (i.e. companies founded after 1990 that have had an initial public offering (IPO) or trade sale above USD 1 billion): it is a sharp increase as compared to 22 the year before. In addition, 82 companies reached a market valuation between EUR 100 million and EUR 1 billion⁹⁰. A recent OECD study⁹¹ found that France ranked third in the world in terms of attractiveness for potential founders of start-ups after Canada and the USA.

Many channels are available in France to support scale-ups in their access to finance. While the link to the Digital Decade target of doubling the number of unicorns by 2030 is necessarily not automatic, these activities foster right conditions in this direction.

The French government is launching several financial actions to ensure that the investment climate is start-up-friendly:

- France, together with Germany, Spain, Italy, Belgium, and the EIB (European Investment Bank) Group, launched a pan-European fund of funds, the European Technology Champions Initiative (ETCI) to channel late-growth capital for promising European innovators (mostly companies seeking to raise funds above EUR 100 million). Managed by the EIF, ETCI obtained commitments totalling EUR 3.75 billion during the initial subscription period. The first investment is planned in 2023.
- BPI France manages a fund of funds called MC4, which was set up in December 2022 with a target size of EUR 1.1 billion to strengthen investment funds active in private equity (including the digital sector).

In addition to these public funds, the private “Tibi Initiative” was launched in 2019 to mobilise EUR 30 billion to finance French start-ups. Tibi claimed that in 2022, investments in tech capital in France were superior to the ones in other Member States. It also helped stimulate the listing process of medium-sized technology companies, with a guide of good practices, and by encouraging the recruitment of specialised teams to determine a fair valuation and the assistance to be provided to the company in its preparation and the matching of the company with investors.

As regards non-financial support from the government, in June 2022, the Mission French Tech, responsible for supporting the growth of the French start-up ecosystem within the Direction Générale des Entreprises, began to offer support to French start-ups that are members of Euronext Tech Leaders.

Support for companies specialised in advanced digital technologies in France is strong and relies on many thematic initiatives. Innovative enterprises in the digital sector receive support to scale-up and access finance for their development. The wider take-up of basic technologies by all enterprises especially SMEs still requires particular attention.

A Public Interest Grouping called ACYMA was created in 2017 to carry out prevention, awareness-raising, and support measures for victims of cyberattacks. It assists victims, and prevents and monitors cyber risks by targeting help on individuals and VSEs/SMEs and small local and regional authorities (lacking IT skills). It runs the cybermarket.gouv.fr website, which connects victims with

⁹⁰ source Dealroom (date of extraction 16/01/2023 for the number of unicorns and 24/03/2023 for the number of potential unicorns).

⁹¹ [What are the top OECD destinations for start-up talents? \(oecd.org\)](https://www.oecd.org/fr/entrepreneurs-et-entreprises/le-top-10-destinations-oe.cd-pour-les-talents-2023/) March 2023 – “France has the most favourable policies for international start-up entrepreneurs, with funding opportunities and pathways for start-up staff attached to the start-up visa.”

cybersecurity providers. In 2022, there were 2.5 million visitors to ACYMA's platform, including 173 000 people seeking assistance. Several European Digital Innovation Hubs (e.g. EDIH Bretagne, CYBIAH, EDIH La Réunion) were launched to provide cybersecurity expertise to SMEs.

End 2021, France launched its first [national cloud strategy](#). Its objective is twofold: to increase strategic autonomy in the use of cloud services in the public sector public while boosting the global competitiveness of French cloud service providers. The plan has three main elements: fostering the emergence of a market for trusted cloud services (*Cloud de Confiance*) with the set-up of a SecNumCloud cybersecurity certification, establishing a “cloud at the centre” guiding principle within public bodies; and crafting an industrial policy aimed at fostering the emergence of French cloud champions. For instance, the Numcloud⁹² joint initiative led by large industry players aims to provide the foundations for a Trusted Cloud in France.

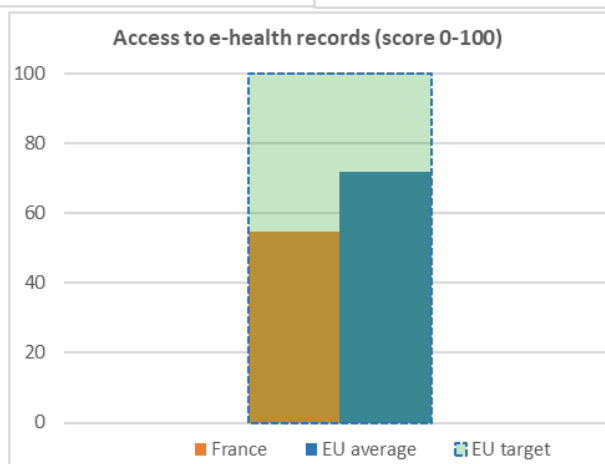
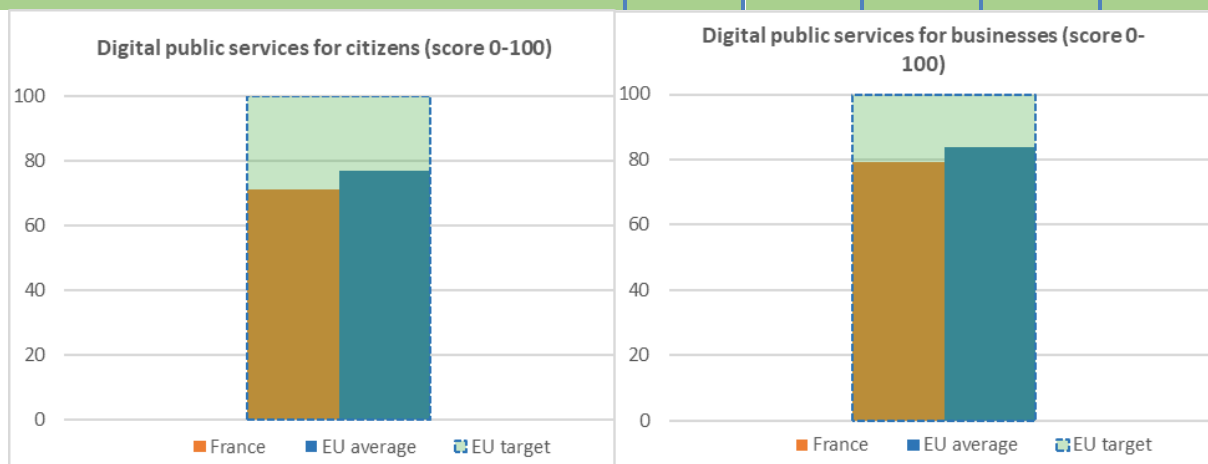
The cloud industrial strand, which will be implemented under the “France Relance” plan with the support of the RRF, will mobilise EUR 667 million over between 2022 and 2025. It will support the cloud industry in France by accelerating the multiplication of French players in highly sought-after critical technologies, by developing disruptive technologies such as edge computing by 2025, and by supporting research and development projects. Some of these R&D and industrial projects will also be part of the IPCEI on Next Generation Cloud Infrastructure and Services (IPCEI-CIS) that directly contributes to the roll-out of the industrial pillar of the French cloud strategy. The IPCEI-CIS aims at equipping the European Union with the next generation of advanced, distributed, secure, sustainable, and innovative cloud-to-edge capabilities needed by citizens and businesses. It forms part of the Multi-Country Project on a *Common Data Infrastructure and Services* and benefits from financing under the RRF. Additionally, the IPCEI-CIS provides support with the deployment of edge nodes by considering technological advancements in the area and certain deployment, helping to meet France's declared goal of having 1 520 node share goal by 2030. France is one of the two coordinators of this project which brings together 12 Member States and more than hundreds of European companies. France is also taking part in other European cloud initiatives announced in the European Data Strategy including the European Alliance on Cloud, Edge, and Data. It also supports the Gaia-X initiative.

France should step up its efforts in the area of digitalisation of businesses. In particular, it should take specific action to improve SME rate of digitalisation, including in advanced technologies.

⁹² The announcement adds that the project is pending authorisation from relevant competition authorities if applicable, and to the labour representative bodies.

4 Digitalisation of public services

	France			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	90% 2022	74% 2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	69 2021	71 2022	77 2022	100
4a3 Digital public services for businesses Score (0 to 100)	NA	80 2021	79 2022	84 2022	100
4a4 Pre-filled forms Score (0 to 100)	NA	47 2021	47 2022	68 2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	65 2021	65 2022	65 2022	
4a6 User support Score (0 to 100)	NA	70 2021	70 2022	84 2022	
4a7 Mobile friendliness Score (0 to 100)	NA	97 2021	97 2022	93 2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	54 2022	72 2022	100



The share of e-government users is high in France: 90% compared with the EU average of 74%.

The Observatoire.numerique.gouv.fr, is a key tool that steers and monitors the digitalisation of public services on a quarterly basis. This includes monitoring user satisfaction, the application of the 'once-only' principle, and accessibility. For example, 40% of the services monitored achieve 75% compliance with the General Accessibility Improvement Framework (RGAA) (compared to 12% in 2020). The Inter-ministerial Direction of Digital (DINUM) provides a platform for open data (data.gouv.fr) and follows concrete actions in 15 ministries.

The State deploys resources such as product management, design, user research to support government ministries and operators in improving the quality of their services. In addition, new public procurement contracts have been introduced, and RRF-funded FranceRelance invests EUR 17 million on the quality of public services and communication.

The government carried out a first test of a digital identity based on e-ID (notified under the FranceConnect+/ the Digital Identity scheme). It is planned for it to become generally available at the end of 2023 and to have a substantial level of safety. France has led the POTENTIAL project funded by the European Commission in this area. France is involved via public and private entities in three of the large-scale pilot projects testing the European Digital Identity Wallet in several everyday use cases. This is funded by the Digital Europe Programme, with an overall grant request of over EUR 3.7 million. France is the technical coordinator of one of these proposals and is leading the work on mobile driving licences.

The government supported 20 projects on using AI to serve public policies in environmental protection, employment, health and social protection, and the fight against fraud. The projects target for example: support for targeting controls, or the improvement of user relationship or of a business process. Users included the Departmental Directorate of Territories and Sea, the Nuclear Safety Authority, and a hospital.

In May 2021, France adopted principles on the use of cloud computing technology by the French State, called 'Cloud au Centre'. Applying the principles, cloud computing becomes the default mode of hosting and producing state digital services, for all new digital products and for evolving products. The government also launched a plan for acquiring skills, public procurement facilitate access to cloud computing services, and a programme to manage cloud computing resources.

Relationships with partners in the European ecosystem are promoted locally and through the European Alliance for Industrial Data, Edge and cloud of the European Commission. Since the 'Cloud au Centre' doctrine came into force in May 2021, cloud computing increased by 88% over the past 12 months.

In February 2020, a cross-ministerial approach was launched to support eco-responsible public services, with a digital component. In addition, the government adopted a roadmap for the convergence of the digital and green transitions in February 2021. A dedicated Green Tech team has been created within the DINUM. Together with the Ministry of Ecological Transition, this team is responsible, among other things, for steering and monitoring the work of an eco-responsible digital inter-ministerial mission. The first actions it delivered were:

- a guide to responsible digital purchasing;
- a good practice guide for responsible digitalisation;
- an eco-design benchmark for digital services;
- action plans of the French ministries to reduce the environmental footprint of their digital activities (digital equipment and services).

France also adopted a law against waste and for the circular economy in February 2020, which introduced a reparability index for household and electronic appliances, which must be taken into account in public procurement. France also adopted a law on reducing the environmental footprint of the digital sector in November 2021.

Despite the above progress on digitalisation of public services, France is below the EU average (17th position) in the EU wide benchmarking of national investments on innovation procurement of digital solutions. In particular, investments in adopting transformative digital technologies, including those that are new to the market, is well below the European average. Tackling this challenge is key to offering top quality public services with a rich set of functionalities that enable to interact in a more efficient and personalised way with citizens, businesses, and other administrations. Furthermore, increasing investments in R&D procurement and in public procurements that focus on the adoption of innovative ICT solutions would also help further accelerate the wider adoption of advanced digital solutions into the public sector.

As regards e-health, France's score on facilitating citizens with full access to their electronic health records is 54. The national online access mechanism to electronic health records is 'Mon espace Santé' which is fully operational since February 2022. Since mid-July 2022, 67.5 million citizens have access to an electronic health record, representing more than 90% of the population⁹³. So far, 8.8 million (11%) have accessed their account proactively, a number which is gradually growing. As of 2022, the service provides access to citizens' administrative information, current and relevant past medicines, laboratory reports, medical imaging reports and hospital discharge reports. All information except the data on medicines is being frequently updated within hours or a few days after each care episode.

A nationally notified eID-scheme based on two-factor authentication is used by citizens to access the 'Mon espace Santé' online service via a portal or mobile application. 80-100% of the population can access parts of their electronic health data, but this is limited to data originating from public and private secondary and tertiary healthcare providers only. Since 2021, a large investment program, "Ségur du numérique", has been funding software solutions in order to facilitate the exchange of healthcare data between healthcare professionals and patients, and providing incentives to professionals and healthcare structures to use new digital technologies.

The law has also been modified to make it compulsory for healthcare professionals to send health data to their patient's e-health record. Citizen's access to electronic health records is further strengthened by legal provisions allowing legal guardians to access them as well. Such a functionality is however not yet fully realised from a technical point of view. Disadvantaged groups can seek assistance when trying to make use of their access rights in the form of real-time remote assistance on the phone or via online, face-to-face assistance in an office and FAQs and guidelines. In terms of web accessibility, the 'MonEspaceSanté' service is compliant with the Web Content Accessibility Guidelines v2.1 (WCAG), as required by the European Commission's Web Accessibility Directive since end 2022.

The degree to which people in France can access public services online shows that there are areas where a lot of progress has been made, while there is still room for improvement in the coming years. The range of accessible and frequently updated health information is still too limited, but it is growing fast, as is the list of the types of healthcare providers that can connect to the system and

⁹³ 2% opposed its creation and around 5% could not be contacted as the government did not have their contact details and there was a compulsory information to the citizens in the opt-out policy.

give people relevant health information. Widespread access can only be achieved if all users can get dedicated support when needed.

France should accelerate its efforts to digitalise public services. In particular, it should complement the RRP funding of hardware equipment in hospitals with measures to involve users and adapt the organisation to the new data flows. Public authorities should take measures to further strengthen the alignment of the different administrative levels involved and to improve the interoperability, effectiveness and availability of online public services, in particular in the healthcare sector.



Digital Decade Country Report 2023

Germany

Introduction

Germany has untapped potential to contribute further to the collective efforts to achieve the EU's Digital Decade targets. Given the size of the German economy and its population, current and future efforts will contribute significantly to such efforts. Germany's digital transformation is advancing steadily. However, significant efforts are needed to achieve the country's aim of being a front runner. While coverage of gigabit connectivity is slightly below the EU average, Germany is second last in the EU regarding fibre coverage. There have been some more positive developments in the take-up of gigabit connections and 5G coverage. Significant gaps remain in digital public services, in human capital and in digitalisation of businesses, but the country's sustained efforts covering all these areas are delivering progress. In recent years, digital issues have gained political traction, notably with the adoption of several key strategies, such as the Federal Government's [Digital Strategy](#), the [Gigabit Strategy](#) and the inclusion of several digital measures in the German Recovery and Resilience Plan (RRP) that account for more than 53% of the total budget.

The Federal Government's Digital Strategy was adopted on 31 August 2022. It gathers the country's policy priorities for digital transformation in one strategy across all sectors. It defines the overarching framework for digital policy in Germany up to 2025. Germany aligns itself with the Digital Decade Policy Programme, its digital targets and general objectives for 2030. The strategy furthers the digital development of the country and formulates measurable goals supported by regular measurement and evaluation. It prioritises projects related to: (1) modern, high capacity and sustainable networks and the availability of data and data tools; (2) international uniform technical norms and standards that enable interoperability; and (3) secure and user-friendly digital identities and modern registers. Additionally, the following strategic topics will be prioritised: digital sovereignty, development of key technologies, artificial intelligence, advancing cybersecurity, combating disinformation, and improving platform regulation.

Germany is collaborating with other Member States in exploring the possibility to set up European Digital Infrastructure Consortia (EDICs) on: (i) Mobility and Logistics Data, to enable access, sharing and reuse of data in these areas; and (ii) the 'Networked Local Digital Twins Towards CitiVerse' project, using disruptive and immersive technologies for future city-related projects.

Digital in Germany's Recovery and Resilience Plan (RRP)

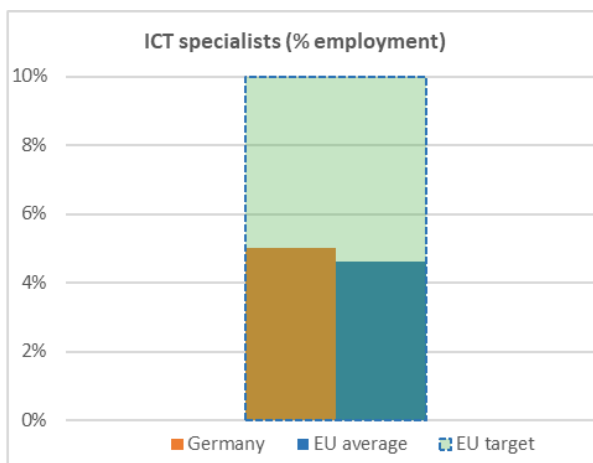
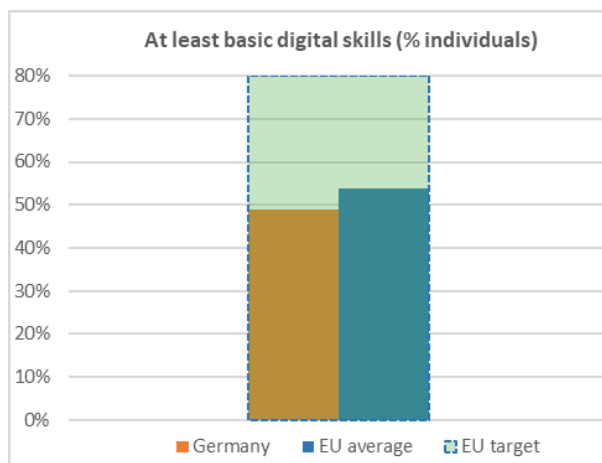
The German RRP focuses on digital investments. From a total budget of EUR 26.4 billion, more than 50% is allocated to digitalisation. Of this, EUR 11 995 million is expected to contribute to the Digital Decade targets⁹⁴. The plan features two major IPCEIs on digitalisation: Microelectronics and Communication Technologies and the Next Generation Cloud Infrastructure and Services. The first payment request, amounting to EUR 4.5 billion and not yet formally submitted, includes milestones and targets related to the IPCEI on Microelectronics and Communication Technologies, the

⁹⁴ Each Recovery and Resilience Plan must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plans had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or has no impact (0%) on digital objectives, using Annex VII of the RRF Regulation. Combining the coefficients with the cost estimates of each measure allows assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to allow for an estimation of the possible contribution of RRF measures to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice to potential ongoing revisions of the plan.

investment programme for teacher devices and the Online Access Act. After a first plan amendment in February 2023 with very limited relevance for the digital part, Germany is currently working on revising its RRP again to take into account the increased financial allocation (increase of EUR 2.4 billion) and the integration of a REPowerEU chapter to decrease the dependence on Russian fossil fuels and to support the green transition.

1 Digital skills

	Germany			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	93%	89%	90%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	49%	49%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	19%	19%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	65%	65%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	24%	24%	27%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	4.7%	4.9%	5.0%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	4.5%	4.9%	5.1%	4.2%	
% graduates	2019	2020	2021	2021	



Germany recognises the importance of skills and new skills and qualification profiles in the process of digitalisation. This is mirrored in one of the three action areas of the Federal Government's Digital Strategy of August 2022, which sets out its vision of a connected and digitally sovereign society that requires lifelong learning. The strategy sets out benchmarks for 2025, encompassing the agreement on the Digital Pact 2.0, the STEM Action Plan 2.0, YouCodeGirls, an interoperable education ecosystem and regular monitoring of improvements.

However, only 49% of people have at least basic digital skills, which is below the EU average of 54%. Germany's poor performance in this regard hinders the EU's progress towards the 2030 Digital Decade target of at least 80% of the population having at least basic digital skills, while achieving gender convergence. The level of at least basic digital content creation skills is at 65%, which is also slightly below the EU average of 66%. Moreover, the country scores below the EU average for individuals with above basic digital skills (19% in Germany versus 26% in the EU).

Germany is currently implementing several measures that can help increase the level of basic digital skills. The digitalisation of education is one of the six priority areas of the German RRP. The COVID-19 crisis revealed shortcomings in the field of digital literacy. This concerns device infrastructure and platforms as well as the competences required to use them. Therefore, the GRRP's Component 3.1: Digitalisation of Education focuses on providing financial support for investments in the digital transition in education. The aim is to ensure more and better digital teaching and learning throughout the different education and training systems.

The aim of the 2019-2024 Digital Pact for Schools ([DigitalPakt Schule](#)), is to create a modern digital infrastructure in all general and vocational schools. The Federal Government and the *Länder* agreed the pact in 2019, with EUR 5 billion in federal funding until 2024 and a funding contribution of at least 10% by the *Länder*, as well as other measures financed by them. In addition to establishing a modern digital infrastructure, the *Länder* will ensure the further training of teachers, the adaptation of educational plans and the further development of teaching methods. Furthermore, EUR 250 million from the general funding is reserved for collaborative digital projects between the *Länder*, which aim to develop central online-based services, e.g. platforms for managing electronic IDs, adaptive learning and databases. Reacting to the pandemic that caused a shift to distance schooling, another EUR 1.5 billion in federal funds were added to the Digital Pact's budget, for mobile devices and IT administration.

The Digital Pact for Schools supports the 2016 'Education in the Digital World' strategy agreed by the Standing Conference of the Ministers of Education and Cultural Affairs of the *Länder* (KMK), and the relevant KMK resolutions for teacher training. With this strategy as well as the subsequently formulated recommendations, the *Länder* aim to ensure the self-determined, active and independent participation of all students in today's digital society.

With its 2021 recommendation 'Teaching and Learning in the Digital World', the KMK continued to expand and update its strategy on 'Education in the Digital World' to focus on learning and teaching in a constantly changing digital reality. The supplementary recommendation deepens individual aspects of the strategy, reflects on experiences from the COVID-19 pandemic and emphasises the importance of the quality of teaching as well as developing schools.

For the area of [general continuing education and adult education](#), the KMK proposed the '[Digital Continuing Education Initiative](#)' to complement measures in the area of formal education by reaching target groups that otherwise have little contact with educational institutions. The main areas of action are: (i) providing digital equipment to adult education institutions; (ii) expanding the range of digital and digitally supported education and quality development; (iii) providing further training and qualifications for teaching staff.

Several initiatives were launched recently to support the digital participation of older people. The programme '[Strengthening the participation of older people - countering loneliness and social isolation \(2022-2027\)](#)', the project *Digitaler Engel PLUS* (2022-2025) and the project *DigitalPakt Alter* (2023-2025) aim to promote the inclusion of older adults in a digitalised world.

The programme 'Safeguarding the Future of Non-statutory Welfare through Digitalisation' (2022) aims to support welfare umbrella organisations to orient the digital transformation towards the common good and strengthen social cohesion through digitalisation. The development of digital skills has been one of the main goals of the projects funded. Projects have developed and implemented different training and educational formats including workshops, webinars, tutorials, support tools, websites, manuals and brochures, e-learning-platforms and whole competence centres.

The [YouCodeGirls](#) initiative promotes digital skills among girls and young women. It aims to stimulate the interest of girls and young women in coding and to support and strengthen their untapped potential on the way to working in this area. The creation of an internet platform to bundle learning opportunities that fit well together is the focus of the project. The platform was activated in June 2022.

Girls' Future Day has been taking place in Germany since 2001 with the aim of introducing female students from the 5th grade onward to a stereotype-free approach to careers and studies. To this end, the girls gain insights into professions that have so far been male dominated, for example in the ICT sector.

Some private sector initiatives provide additional support to increase the level of basic digital skills in Germany. Young people registered with the Federal Employment Agency or a jobcentre have access to a database of initial and continuing vocational education and training (CVET) programmes. Many services are offered by private schools and initiatives, on subjects such as AI, secure data handling and programming. Since September 2022, the German Federal Employment Agency has been developing the '[mein NOW - National Online Portal for Further Education](#)' as part of the National Skills Strategy. The 'mein NOW' portal aims to offer professionals, employers and further education providers a central and low-threshold entry point to further education online. It provides orientation and makes the ecosystem of further education accessible for the target groups by centralising the relevant information on the web.

Although Germany has a comparatively high share of ICT specialists of total employment, the country faces a lack of ICT specialists in several areas. ICT specialists account for 5.0% of total employment, above the EU average of 4.6%. Additionally, 5.1% of all graduates are ICT graduates, well above the EU average of 4.2%. 27% of German enterprises offered specialised ICT training to their employees in 2022, above the EU average of 22%. Nevertheless, there is a lack of ICT specialists in several areas and some ICT students quit their studies, having an impact on the number of ICT graduates. Germany's performance is just above the EU average as regards the presence of women in the digital sector: 19.0% of ICT specialists are female, against an EU average of 18.9%. Given the positive trends in recent years, Germany is expected to make a good contribution to reaching the 2030 EU target of 20 million ICT specialists, which represents about 10% of total employment. However, further efforts are still needed to increase the gender balance among ICT specialists.

In higher education, Germany is increasing the level of digital competences of students and teachers. The *Länder* and the Federal Government support higher education institutions in the programme 'AI in higher education' ([KI in der Hochschulbildung](#)) to increase the study of AI as a subject and its use as tool in academic teaching and learning. Furthermore, the federal and state (*Länder*) governments jointly support national high-performance computing in universities (*Nationales Hochleistungsrechnen an Hochschulen (NHR)*) with funding of EUR 62.5 million per year. The main aims of the funding include the nationwide and needs-based provision of high-performance computing capacities for scientific research at universities, the strengthening of the users' methodological competence of users, training and further education, and as well as the promotion and further development of scientific computing. The funding is initially set to run for ten years.

The AI Junior Research Groups funding programme supports the creation of research groups led by outstanding young scientists. The interdisciplinary groups are expected to do research on innovative topics in the field of AI. The funding enables young scientists to build up their own research group and to pursue independent research questions. The programme began in September 2021, funding started in 2022 and is expected to run until 2025. The programme's total budget is EUR 18.6 million, which could fund 22 junior researcher groups.

The Microelectronics Academy improves the existing range of training and continuing education programmes. It aims to promote young talent, upskill professionals and to reduce the time it takes to train and avoid skills mismatches. It was founded in December 2022 and is to be based in the Research Fab Microelectronics Germany (*Forschungsfabrik Mikroelektronik Deutschland, FMD*). The academy develops and tests new training modules in cooperation with educational institutions and industry partners across Germany. The budget to create the Academy amounts to EUR 7.5 million. The pilot phase of the Academy starts in 2024.

On joint commitments with other countries, the ‘Quantum Future Academy (QFA)’ is an important cooperation project between Germany and Israel. This prominent one week-event for students of STEM subjects is a core component of the ‘Quantum Future Programme’ of the German Federal Ministry of Education and Research (BMBF). With the Quantum Future Academy, the BMBF aims to address young talents at an early stage of their education to intensify their interest in quantum technologies. To celebrate Israeli-German friendship and strengthen scientific exchange between the two countries, [QFA 2023](#) took place for one week in Germany and one week in Israel. The QFA has been held on an annual basis since 2018 with a budget of around EUR 80 000 per year.

In addition, several measures have been launched to tackle the lack of ICT specialists, notably with upskilling and reskilling efforts of the workforce. The Citizen's Benefit Act improves further training support for people with a low level of skills, making it easier to catch up on reading, maths or IT skills. An additional allowance of EUR 150 per month will be introduced for continuing education and training (CET) that results in a qualification. For measures that are particularly important for sustainable integration, there is a citizen's benefit bonus of EUR 75 per month.

Germany does not have a national Digital Skills and Jobs Coalition. The country participated actively in the [2022 EU Code Week](#), organising 1 126 activities, involving 29 824 participants, of whom 47% were girls or women. Some 15% of the activities involved schools.

Best practice: INVITE

Embedded into the National Skills Strategy, the Federal Government launched the INVITE innovation competition. INVITE aims at innovative solutions that – with the help of AI – enable everyone to find the right continuing professional training on demand.

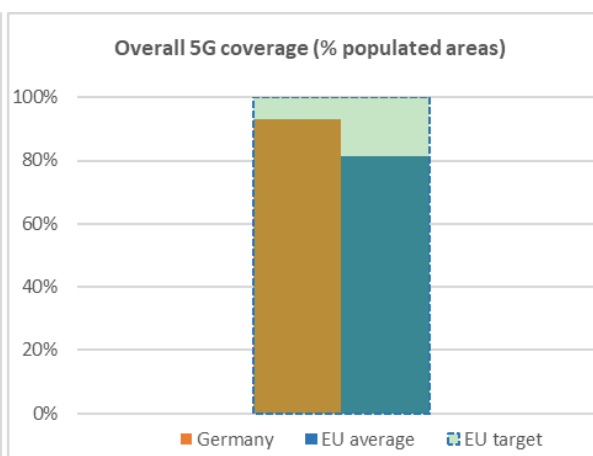
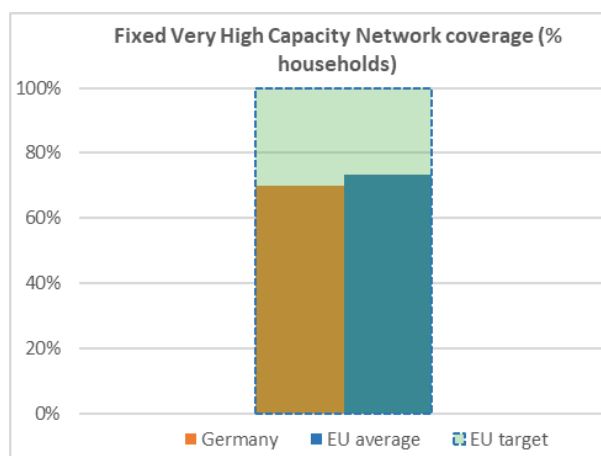
The INVITE funding is directed to enabling and realising the connection and interoperability of platforms; to encouraging platforms to be more user-orientated and to using AI technologies to design individualised learning processes. In addition, standards for the design of an innovative digital ecosystem for continuing education and training are set out.

Germany should accelerate its efforts in the area of digital skills. Germany should develop courses in digital skills across all levels and disciplines in formal and informal learning for the whole population and step-up upskilling and reskilling in the field of digital skills in the labour market⁹⁵.

⁹⁵ The recommended policies, measures, and actions in this document reflect the Commission Communication ‘Report on the state of the Digital Decade’ COM(2023) 570.

2 Digital infrastructures

	Germany			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up	29%	33%	38%	55%	
% households	2020	2021	2022	2022	
2a2 At least 1 Gbps broadband take-up	1.2%	2.8%	4.2%	13.8%	
% households	2020	2021	2022	2022	
2a3 Fixed Very High Capacity Network (VHCN) coverage	56%	75%	70%⁹⁶	73%	100%
% households	2020	2021	2022	2022	
2a4 Fibre to the Premises (FTTP) coverage	14%	15%	19%	56%	
% households	2020	2021	2022	2022	
2b1 Mobile broadband take-up	89%	87%⁹⁷	87%	87%	
% individuals	2018	2021	2021	2021	
2b2 Overall 5G coverage	18%	87%	93%	81%	100%
% populated areas	2020	2021	2022	2022	
2b3 5G spectrum	100%	100%	100%	68%	
Assigned spectrum as a % of total harmonised 5G spectrum	2021	2022	2023	2023	



On connectivity, Germany has untapped digital potential to contribute further to the collective efforts to achieve the EU's Digital Decade targets, having been performing below the EU average until now. However, in its recent Gigabit Strategy, adopted in July 2022, and the Digital Strategy, adopted in August 2022, the country set out ambitious targets in this regard and **agreed on several measures to accelerate the roll-out of digital infrastructure in Germany.** Half of German households and businesses should benefit from a fibre-optic connection by the end of 2025. The German 2030 targets mirror the Digital Decade targets set out by the EU, i.e. the nationwide deployment of a fibre-

⁹⁶ The decline in VHCN coverage from DESI 2022 to DESI 2023 can be explained by major refinements in data collection in Germany: The requirements for data provision have been redefined and deviate in part from the standards previously recorded. Furthermore, since 2022 data collection has been carried out on an address-by-address basis for the first time and includes a larger number of telecommunications companies.

⁹⁷ Break in series in 2021 for this indicator in Germany.

optic infrastructure and the latest mobile communications standards for everyone. As of mid-2022, Germany lags behind other Member States as regards fibre to the premises (FTTP) coverage, being second last in the EU with 19%.

Germany has made limited progress on most connectivity indicators in 2022. 70% of German households are covered by fixed very high-capacity networks (VHCN), below the EU average of 73%. The biggest part of this, however, is through cable networks. Although rural VHCN coverage has significantly improved since 2019, from 10% to 30%, it is still significantly below the EU average of 45%, and an important digital divide between urban and rural areas remains. Germany is also below the EU average in the take-up of at least 100 Mbps fixed broadband (38% versus 55%). Germany performs particularly well on overall 5G coverage. However, on 5G coverage on the 3.4-3.8 GHz spectrum band, which are bands that enable advanced applications that need large spectrum bandwidth, it is below the EU average (36% compared with 41% in the EU).

Further roll-out of fibre will have a crucial role to play in meeting the ‘gigabit for everyone’ target, as most cable networks have already been upgraded to the DOCSIS 3.1 standard allowing for gigabit capacities⁹⁸ and no significant increase in cable network territorial coverage can be expected. Further upgrade of cable networks will be accompanied with additional fibre deepening. The *Bundesnetzagentur (BNetzA)* has estimated that investment in fixed and mobile network assets totalled EUR 11.5 billion in 2021 (EUR 4.5 billion from the incumbent and EUR 7 billion from its competitors)⁹⁹.

While 81% of the fibre operators surveyed by BREKO offer open access, only 23% of fibre connections are marketed through open access partners and only around 14% of operators report a significant demand, making open access part of their core business. Given the major importance of bundled offers in the end user market, facilitating more widespread VHCN access on commercial terms, including to lines operated by large players, could facilitate the switchover from copper-based broadband offers to offers based on VHCNs. Further challenges mentioned by market players – and addressed within the Gigabit Strategy – are limited civil engineering capacities, difficulties in making use of cheaper deployment methods such as micro-trenching and the need to speed up the procedures to grant permits.

According to a [recent study](#) commissioned by BNetzA, [57.7% of end-users](#) do not get the maximum data speeds contracted with their providers. Even end-users with gigabit subscriptions suffer to a considerable extent from the deficiencies that are accentuated in the early evening hours and in semi-urban and rural areas.

Next to ubiquitous coverage, the spatial and daytime distribution and quantity of demand for mobile data must be met by operators to have ‘at least 5G everywhere’. Operators expect the [exponential growth in total mobile data](#) to continue until 2030, but statistics on peak mobile data growth, which is most relevant for capacity planning, is not publicly available. *BNetzA* is currently in the process of determining the conditions for open, transparent and non-discriminatory award proceedings for the assignment of the spectrum, which will become available by the end 2025 (800 MHz, 1.8 GHz and 2.6 GHz). The procedure is intended to give certainty to the market so it can plan early. The support that the public mobile infrastructure undertaking (*Mobilfunk-*

⁹⁸ and further technology upgrades to standards such as DOCSIS 4.0 are considered.

⁹⁹ Investment in fixed and mobile network assets in 2021 ("Investitionen in Sachanlagen auf dem Telekommunikationsmarkt"), according to BNetzA Jahresbericht (page 10): https://www.bundesnetzagentur.de/SharedDocs/Mediathek/Berichte/2023/JB_TK_2022.pdf?__blob=publicationFile&v=4

Infrastrukturgesellschaft) provides to operators to facilitate the identification and acquisition of new sites should be continued.

The Federal Ministry for Digital and Transport and BNetzA have created the Gigabit Register ([Gigabit-Grundbuch](#)) as a central point to collect, prepare and make available all key information on telecommunications infrastructure in Germany. The vision is a fully online data platform with additional applications to increase transparency on network roll-out and to facilitate faster and more targeted investment decisions. In addition to a public version, which is available to everyone, network operators, municipalities and public authorities have access to an advanced database for infrastructure planning and coverage analysis by way of user-specific platforms. The Gigabit Register also includes information tools of the single information point, e.g. the infrastructure atlas. The first version of the Gigabit Register has been online since 13 December 2022, with updated data for fixed-network and mobile expansion in the German broadband atlas¹⁰⁰. The Gigabit Register will be further developed in the coming years.

Best practice: Analysis of potential for future roll-out (Potenzialanalyse)

A nation-wide analysis (Potenzialanalyse) was conducted to ensure greater transparency regarding the potential for future roll-out of fibre networks at local level and for the targeted and efficient funding of broadband. The analysis quantitatively estimates the scope of private roll-out and is intended to provide valuable information for private investors and municipalities. The analysis was carried out in coordination with the federal states and high-level municipal authorities and was supported by the telecommunications industry by providing data. The results were published in February 2023. The analysis is continuously updated and is being further developed.

Germany is also contributing to the Digital Decade target on the production of cutting-edge semiconductors in the EU, at least 20% of the world production in value by 2030. In this context, Germany is leading the IPCEI Microelectronics und Communication Technologies multi-country project. In December 2021, 112 projects from 16 Member States were pre-notified to the European Commission, 32 of them from Germany, ranging from large to small enterprises along the whole value chain. In June 2023, the European Commission approved 23 projects. The Federal Government has pooled funds of EUR 1.5 billion from the German RRP and allocated substantial national funds to strengthen the whole microelectronics sector. The funding is expected to stimulate private investment of EUR 10 billion. Additionally, on 19 June 2023, a considerable foreign direct investment of EUR 30 million was announced that will boost the European semiconductors industry. The plant in Magdeburg is planned to be operational in 2027 or 2028. It is expected to significantly increase Europe's share of the global microchips value chain, which currently stands at around 9%.

Another Digital Decade target is to deploy at least 10 000 climate-neutral highly secure edge nodes in the EU by 2030. In this context, Germany is coordinating the IPCEI Next Generation Cloud Infrastructure and Services (IPCEI-CIS). Although the deployment of edge nodes is not the focus of this IPCEI, it will contribute to this target by incentivising the use and developing use cases for edge

¹⁰⁰ Press release: <https://bmdv.bund.de/SharedDocs/EN/PressRelease/2022/096-wissing-new-gigabit-register-for-germany.html>;
https://www.bundesnetzagentur.de/SharedDocs/Pressemitteilungen/EN/2022/20221221_Gigabitgrundbuch.html

computing. Twelve Member States are participating in this IPCEI and projects were expected to be notified and begin in Q2 2023. Germany is receiving funding via its RRP of up to EUR 750 million.

Germany recently launched several measures in the field of quantum computing. The Quantum Computing Initiative (QCI) of the German Aerospace Centre (DLR) aims mainly to provide novel quantum computing capabilities to the DLR by means of innovation tenders and tendered development projects. The Initiative is a EUR 740 million add-on to the DLR's basic funding over five years. 80% of the QCI's budget is earmarked for private sector contracts and 20% for the application and further development of quantum technology within the DLR. The tenders are EU-wide, but the site where work will be carried out is the DLR innovation centre in Hamburg or in Ulm, depending on the qubit technology. The QCI is expected to run until December 2025.

The 'Quantum Systems' research programme sets the framework for funding activities of the German Federal Ministry of Education and Research (BMBF) in the field of quantum technologies and photonics over the next ten years. It provides the basis for funding activities with a special focus on quantum computing (hardware and software). However, the budget for the programme has not been fixed for the entire ten years. Currently, the BMBF is running projects on quantum computing with a total value of more than EUR 500 million. Supporting research to achieve a quantum advantage is one of the central goals of the programme. By 2026, an internationally competitive quantum computer with at least 100 individually controllable qubits, scalable to 500 qubits should be built.

Another major focus of the research programme is to support start-ups and young companies. To this end, the BMBF launched the funding measure 'Enabling Start-up - Start-ups in Quantum Technologies and Photonics' in March 2022. It pursues the goal of transferring innovative ideas in quantum technologies and photonics from universities and research institutions via spin-offs towards application and commercial exploitation.

In April 2023, Germany launched its quantum technologies action plan. It forms the government's strategic framework for establishing Germany as a front-runner in quantum technologies. Funds of around EUR 3 billion have been earmarked for this until 2026. The BMBF is in charge; the other ministries involved are the Federal Ministry of Economics and Climate Protection (BMWK), the Federal Ministry of Finance (BMF), the Federal Ministry of the Interior and Home Affairs (BMI), the Federal Ministry of Defense (BMVg) and the Federal Chancellery.

The European High Performance Computing Joint Undertaking (EuroHPC JU) has selected six sites across the EU to host and operate the first EuroHPC quantum computers, among them Germany.¹⁰¹ The entities have been selected as a result of a call for expression of interest, launched in [March 2022](#). As decided in October 2022, the Leibniz Super-computing Centre (LRZ) of the Bavarian Academy of Sciences and Humanities will become a European centre for a quantum computer.

The Federal Ministry for Education and Research has started funding R&D projects in the framework of the EuroHPC Joint Undertaking as well as in the GreenHPC and SCALEXA initiatives. GreenHPC addresses energy efficiency in high-performance computing and SCALEXA works on the scalability of applications for upcoming exascale supercomputers. In addition, funding has been provided for the exascale-upgrade of the Gauss Centre for Supercomputing. The Jülich Research Centre, part of the Gauss Centre, was selected by EuroHPC to host the first European exascale supercomputer.

¹⁰¹ [Selection of six sites to host the first European quantum computers \(europa.eu\)](#)

On joint commitments in quantum, the German Ministry of Education and Research (BMBF) participates as funding authority in the QuantERA II ERA NET. The aim of the ERA-NET is to strengthen the European Research Area by promoting pan-European research projects that address fundamental and applied research in quantum technologies. Projects consist of partners from at least three Member States. All projects related to QuantERA II started in the course of 2022. [Another call](#) for proposal to be funded by QuantERA II was published in February 2023; the selected projects are expected to start in early 2024. The BMBF is supporting the QuantERA II with more than EUR 3.5 million in funding for three years. A comparable amount is available for the projects in the current call.

Germany is also participating in the [EuroQCI initiative](#) to build a European quantum communication infrastructure. EuroQCI's first implementation phase began in January 2023. The aim is for it to be fully operational by 2027.

The Quantum Ecosystem Deutschland (Q.E.D.) project, funded by the BMBF, analyses the quantum computing ecosystem in Germany and helps to build and strengthen network competencies. This project is developing new methods and tools to analyse ecosystems and explores questions on the limits of transferability of ecosystem analysis. At the same time, new networking formats will be created. The five-year project started in August 2022 and has a budget of EUR 2.9 million.

On blockchain, BNetzA has been supporting the 'European Blockchain Services Infrastructure (EBSI)' by operating a blockchain node until 2023.

In several areas of digital infrastructure, such as investments in semiconductors, cloud and quantum, Germany is one of the leaders in the EU and contributes greatly to Europe's technological sovereignty. Germany is making a significant contribution to the Digital Decade targets by having its first computer with quantum acceleration by 2025, and to the EU being at the cutting edge of quantum technologies.

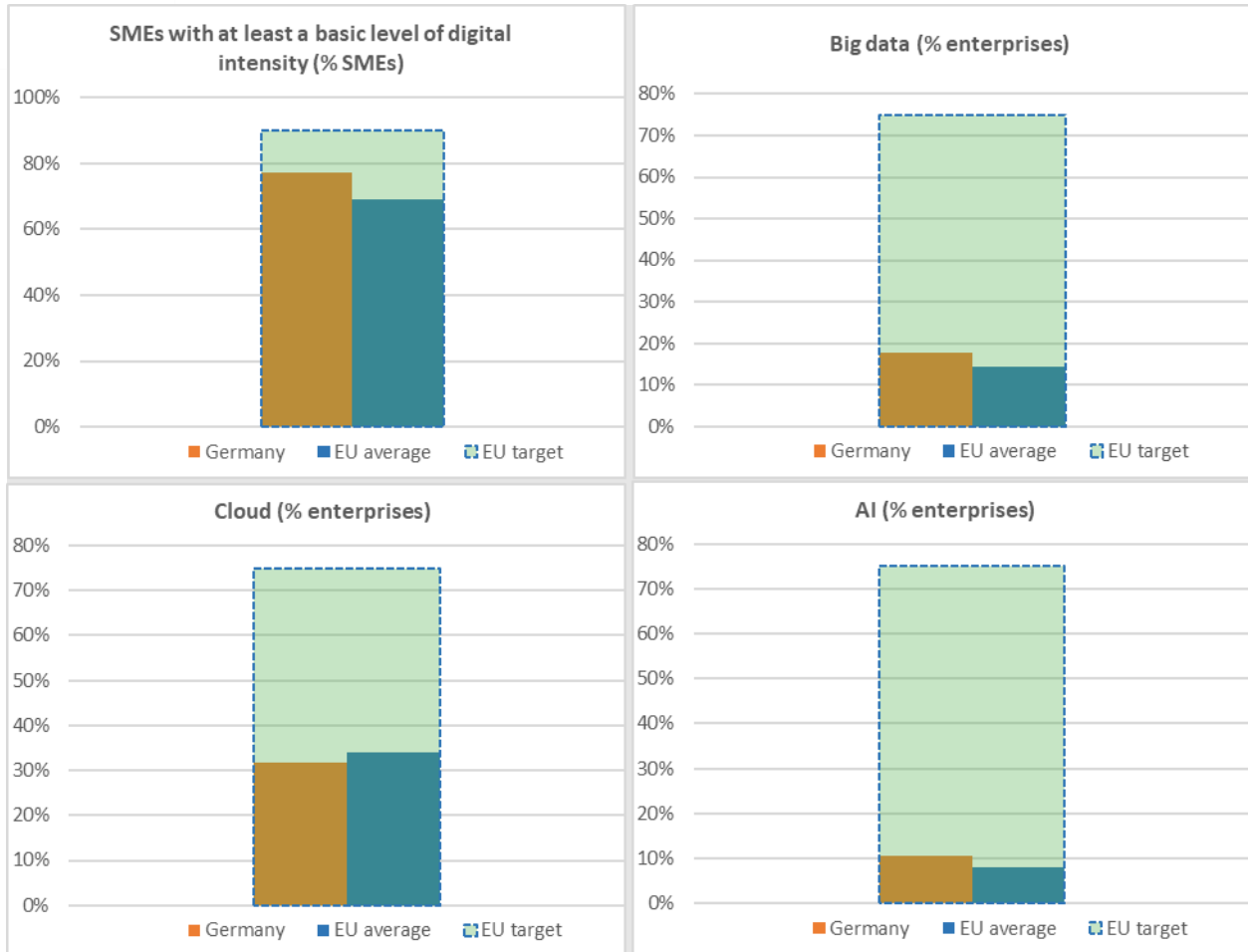
Germany should accelerate its efforts on connectivity infrastructure, on gigabit connectivity and especially fibre-to-the-premises. It is important that Germany removes obstacles and boosts investment in very high-capacity networks.

Measures taken by Germany in the field of semiconductors and quantum computing should continue in order to help the EU to become a strong market player in these areas.

3 Digitalisation of businesses

	Germany			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	77%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	29%	38%	38%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	23%	30%	30%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	18%	18%	18%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud¹⁰²	NA	32%	32%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	11%	11%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	18%	18%	18%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	17%	19%	19%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	11%	10%	12%	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	10%	10%	10%	9%	
% SMEs	2019	2021	2021	2021	

¹⁰² Enterprises buying sophisticated or intermediate cloud computing services indicator, see [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).



In Germany's 2022 Digital Strategy, the country's technological and digital sovereignty is the guiding principle for its digital and innovation policy. Before this, Germany had already introduced several strategies, initiatives and activities to support the digital transformation of companies and the deployment and uptake of advanced technologies. Several measures are specifically tailored to SMEs. The current focus is mainly on the continuation or further development of existing measures. In the coalition agreement, the newly elected government pledged to create a friendlier environment for (digital) start-ups. To this end, the Federal Government passed a [start-up strategy](#) in summer 2022. The strategy aims to strengthen start-up ecosystems in Germany and the EU. In it, the government has presented a specific roadmap of how it intends to achieve this goal during this legislative period. The Federal Government groups the measures contained in the strategy into ten fields of action.

Germany performs well in the EU on integration of digital technology in business activities. Germany's performance for most indicators in this dimension is above or at the EU average, except for two indicators: e-Invoices and cloud. E-Invoices are used by only 18% of enterprises, well below the EU average of 32%. Cloud usage, however, is close to the EU average (32% vs. 34%). The uptake of advanced technologies by enterprises such as big data and artificial intelligence is above the EU average (18% vs. 14% and 11% vs. 8% respectively). The proportion of SMEs with at least a basic level of digital intensity is at 77%, well above the EU average, thus Germany makes an important contribution to the Digital Decade target of 90% in this respect.

The Federal Ministry for Economic Affairs and Climate Action is continuing to support businesses, and SMEs especially in their digital transformation with the initiative 'SME digital' (*Mittelstand-*

Digital). This approach consists of three pillars, one of which is the Network of *Mittelstand-Digital* Innovation Hubs (*Mittelstand-Digital Zentren*). There are 29 of these hubs, most of which are successors to the *Mittelstand 4.0* Centres of Excellence (*Mittelstand 4.0-Kompetenzzentren*) with a regional or industry-specific focus that give free support to SMEs to identify and implement suitable digital solutions. The hubs in the nationwide network provide expert knowledge, workshops and training sessions; demonstration centres; discussion, networking and information events; and practical examples on the topic of digitalisation. The network has been updated since 2021. Nine new hubs were launched in 2022, while three new hubs were launched in Q1 2023. The new hubs replace their respective predecessors (*Mittelstand 4.0 Kompetenzzentren*) and aim to provide updated support activities, also adding support for SMEs on new aspects of digitalisation such as the sustainability of the network. Depending on the renewal of individual hubs, the network is expected to run until October 2026. The budget for 2022 was EUR 57 million and EUR 57.6 million for 2023.

Furthermore, via the **Digital Hub Initiative** (de:hub), the Federal Government is connecting SMEs and large companies with the newest innovators from the research and start-up scene.

The Digital Now investment grant programme offers SMEs and small mid-caps (3 – 499 employees) financial support for investments in digital technology and applications as well as digital skills in their workforce. The funding rate varies between 30% and 60% according to the size of the company. Up to EUR 50 000 in funding can be awarded per company. Investments made by companies in value chains or networks can receive grants of up to EUR 100 000. Companies that invest in internal or external network-building (value chain) or IT-security, or which are located in structurally weak regions receive higher rates of support. The programme offers direct, tailored and easily accessible support for SMEs and small mid-caps. Investments addressing such topics as diverse as cloud, big data and AI can receive support. The programme was launched in September 2020 and will end on 31. December 2023. The budget amounted to EUR 120 million in 2022 and EUR 98 million in 2023. In 2022 SMEs and small mid-caps received EUR 46 million in support.

To increase transparency on the availability of supporting measures and to facilitate the funding process for SMEs, BNetzA has developed a comprehensive database with over 250 (mostly publicly financed) stakeholders at national and regional level. These stakeholders offer a wide range of support measures to accompany the digitalisation process in SMEs, including financial funding, expert knowledge, training courses, demonstration centres, networking and matching events, as well as examples of best practice.

The funding initiative AI4SME (KI4KMU) supports collaborations between SMEs and scientists with the goal of developing and using AI systems in SMEs. This nationwide programme is available in all the *Länder*. The goal is to empower SMEs to develop and implement new AI methods, which will lead to new innovative products and services. The programme started in February 2020, the funding started in the same year and is expected to run until 2026. The total budget for this initiative is EUR 88 million. By July 2023, 107 SMEs in 61 collaborative projects had been funded, promoting cooperation between SMEs and research institutions.

The funding programme AI Service Centres supports the establishment of centres that provide access to high-performance AI computing infrastructure for research in industry, especially SMEs. With the creation of low-threshold flexible offers for SMEs, access to computing resources and know-how is simplified. This enables new ideas to be implemented that result in new AI solutions and the opening up of new fields of application. The programme started in September 2021, while funding started in 2022 and is expected to run until 2025. The total budget for this measure amounts to EUR 55.5 million. Four projects have been funded.

By giving funding to the Gaia-X Hub Germany, the country is helping to build an open, transparent and secure digital ecosystem, where data and services can be made available, collated and shared in an environment of trust. All types of companies and organisations can be beneficiaries, as well as private individuals. The programme began in August 2020 and is currently expected to run until December 2025. The total budget is EUR 5.9 million. With the Gaia-X Funding Competition, the Federal Ministry for Economic Affairs and Climate Action is supporting 11 flagship projects within the German Gaia-X Hub. The programme started at the beginning of 2021, and the funding is expected to run until 2025, with a budget of around EUR 117 million.

On market developments, since the beginning of 2021 BNetzA has been investigating the use of AI in the electricity, gas, telecommunications, post and railways network sectors. In 2022, BNetzA began an in-depth analysis of the use of AI in the telecommunications sector, particularly in planning and expanding networks. Expert interviews with the relevant German network operators showed that AI is already being used or at least intended to be used in various areas by all the telecommunications companies surveyed (e.g. in the areas of customer care, predictive maintenance and anomaly detection). In addition, AI in network planning and expansion is also used by some network operators.

The Commission has recently started the Network of 'European Digital Innovation Hubs' (EDIHs) within the Digital Europe Programme. The aim of the programme is to advise SMEs on how to integrate digital innovations into their products, business models and processes, and to improve digital skills. The activities of the EDIHs to achieve this aim include skills and training, testing before investing, support in finding investment, innovation ecosystems and networking. EDIHs will address future core technologies such as high-performance computing, AI, service cybersecurity and improved digital skills as a basis for its work. The German part of the network consists of 17 EDIHs. Most of them are also consortium partners of the German Network of Mittelstand-Digital Innovation Hubs or consortium partners of the German Digital Hub Initiative (de:hub). Networking between European and national initiatives on digitalisation and cybersecurity for SMEs will make it possible to create synergies. The project started in Q3 2022. The budget attributed by the EU for the German EDIHs (50% of total costs) amounts to EUR 42.39 million for the three-year funding period. The national co-funding (50%) comes from different sources.

Several measures are in place in Germany to improve cyber-resilience and protect against cyberattacks. Cybersecurity is the subject of several EU and national legislative acts. This includes, first and foremost, the IT Security Acts 1.0 and 2.0, as well as the national implementation of the EU [NIS directive](#). Looking at the national scope, the national cybersecurity strategy is currently being refined according to the goals set out in the coalition agreement of the Federal Government. The Cybersecurity for SMEs initiative (*Initiative IT-Sicherheit in der Wirtschaft*) helps SMEs to increase their IT security. The initiative has been refined since 2022 to meet SMEs' current and future cybersecurity needs even better.

Best practice: IPCEI Next Generation Cloud Infrastructure and Services (IPCEI-CIS)

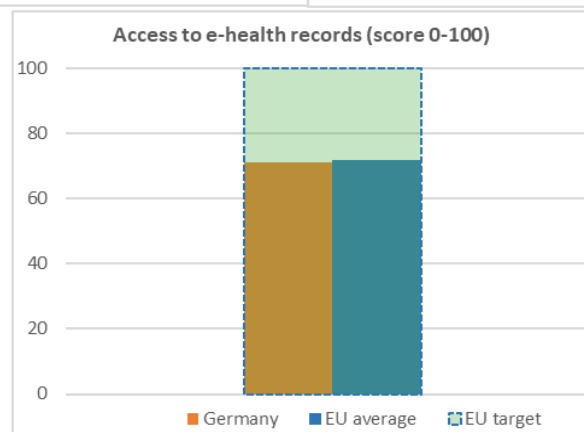
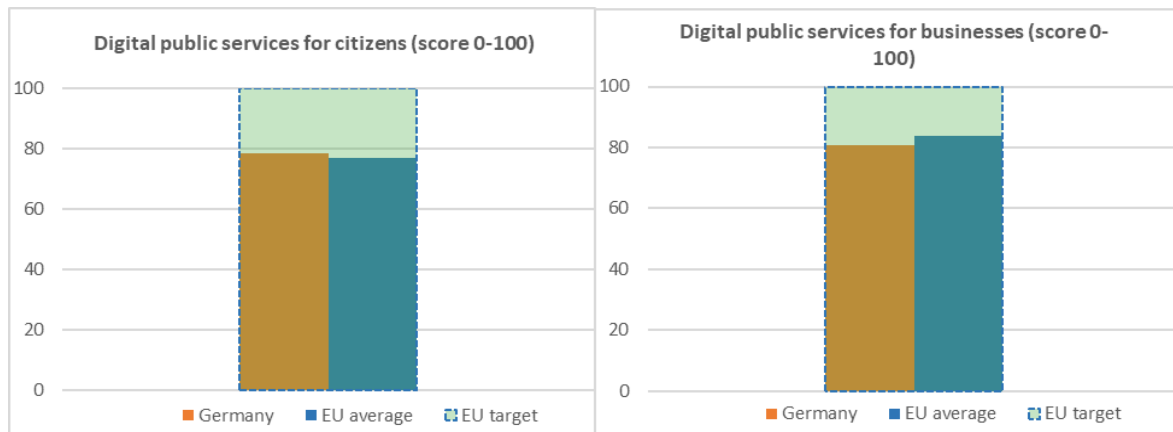
Germany is coordinating the IPCEI Next Generation Cloud Infrastructure and Services (IPCEI-CIS). This IPCEI will lay the foundation for a multi-provider cloud edge continuum that will enable ultra-low latency data exchange between centralised cloud and decentralised edge capacities. It will make the use of cloud computing services and big data more sustainable, more secure and easier for companies by developing open-source technologies. Many companies fear vendor lock-in effects when using cloud solutions. To target this issue the interoperability within the IPCEI-CIS will reduce the costs of switching between different providers or combining solutions from different providers.

Projects will be funded until the end of 2026. The total budget for this measure in Germany amounts to EUR 750 million from RRF funds.

Germany should continue implementing its policies in the area of digitalisation of businesses. A swift implementation of planned measures is needed to further drive the digitalisation of businesses. In particular, it should further strengthen data economy, science and research in key technologies, including in actions to protect the climate.

4 Digitalisation of public services

	Germany			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	55%	74%	
			2022	2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	76	78	77	100
		2021	2022	2022	
4a3 Digital public services for businesses Score (0 to 100)	NA	80	81	84	100
		2021	2022	2022	
4a4 Pre-filled forms Score (0 to 100)	NA	42	43	68	
		2021	2022	2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	49	49	65	
		2021	2022	2022	
4a6 User support Score (0 to 100)	NA	78	81	84	
		2021	2022	2022	
4a7 Mobile friendliness Score (0 to 100)	NA	95	96	93	
		2021	2022	2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	71	72	100
			2022	2022	



Digitalisation of public services has remained a key challenge for Germany for several years. While significant efforts have been made, such as actions taken to implement the Online Access Act (*Onlinezugangsgesetz (OZG)*) and including relevant measures in the German RRP, the country is still lagging behind. The main problems are that there few public services have been digitalised, there is a lack of services available nationwide and the eID is complicated to use. To illustrate this, on 31 January 2023 there were 122¹⁰³ services available on a nationwide basis out of the 575 public services that it had been proposed to digitalise by the end of 2022 based on the Online Access Act. In August 2022, Germany reiterated its commitment to the digitalisation of public services in the third action area of its Digital Strategy, 'Learning, digital government'.

On digital public services for citizens the country is just above the EU average with a score of 78, whereas on digital public services for businesses, Germany is slightly below the EU average with a score of 81. Therefore, Germany is on track towards the Digital Decade target of 100 for both indicators. Germany performs well below the EU average, however, on several other indicators, such as e-Government users, pre-filled forms and transparency of service delivery, design and personal data.

Germany's primary piece of e-government legislation is the Online Access Act (OZG). The economic stimulus package for the OZG expired at the end of 2022. In 2023, the Federal Government continues the central funding for the German RRP-refinanced implementation of the OZG, and provides funds of up to around EUR 750 million for this purpose.

The '[Draft Act to Amend the Online Access Act and Other Regulations](#)' (OZGÄndG) of May 2023 is intended to provide the legal framework for the further expansion of administrative digitalisation. Based on previous experience from the implementation of the OZG, administrative digitalisation is understood now as a permanent task. Furthermore, the provisions of Regulation (EU) 2018/1724¹⁰⁴ that aim to simplify and streamline data exchange between national and EU-level systems are incorporated into the implementation of all major digitalisation efforts by the German government.

In 2021, the German Federal Academy for Public Administration (BAköV) launched its new Digital Academy, a free platform that offers online and offline courses for German federal employees to promote digital skills, support cultural change and stimulate networking. The Academy aims to prepare federal employees to adapt to an increasingly digital environment. The training on offer is designed to upskill the public sector employees for future challenges by teaching both technical competences and new ways of working enabled by new technology, such as agile project management, digital leadership, remote collaboration and teamwork and tech-enabled service delivery and policymaking. BAKöV is supporting digital awareness campaigns through training courses, simulations, talks, conferences, workshops and tools, e.g. on cybersecurity and data protection. Also increasing requests of providing digital accessible and user-friendly services are served by BAKöV. The Academy's work represents one of the most forward-thinking experiments in public sector upskilling.

[GovTech Campus Deutschland](#) officially opened in March 2022 and is a public/private non-profit venture. Its aim is to make digital innovations and technologies accessible, scalable and useful for public administration in Germany. The founding members include the German Federal Government,

¹⁰³ [Dashboard Digitale Verwaltung \(ozg-umsetzung.de\)](#)

¹⁰⁴ Regulation (EU) 2018/1724 of the European Parliament and of the Council of 2 October 2018 establishing a single digital gateway to provide access to information, to procedures and to assistance and problem-solving services and amending Regulation (EU) No 1024/2012 (Text with EEA relevance.)

ten *Länder* and over 50 leading tech innovators from Germany, Europe and the United States. New ideas and solutions are developed and tested to help make them available for widespread use across all levels of the German administration.

Germany scores 71 out of 100 on the Digital Decade target of 100% of EU citizens having access to their electronic health records. Based on the applicable law, an electronic patient record (*elektronische Patientenakte, ePA*) based on consent (opting in) is already used by the statutory health insurances within the German telematics infrastructure for the healthcare sector and is currently being rolled out. A coverage of 100% of the people insured by the German statutory health insurance is possible. Despite substantial legal pressure and development efforts, less than one in five people are currently able to make use of the access services in Germany and the actual uptake is only at 1%. Patients are not aware of it and many doctors are not offering it at all. Several problems must be overcome, such as nationwide coverage, acceptance and technical conversion. Even when an electronic patient record exists, in most cases the content available is in pdf format, which makes it less user friendly, and only their personal information, e-prescription and e-dispensation data are frequently updated. The further development of the ePA to an individual health platform for the insured persons is one of the key topics of Germany's Digitalisation Strategy for Health and Care that was published in March 2023.

The Hospital Care Relief Act (*Krankenhauspflegeentlastungsgesetz*), which entered into force at the end of 2022, introduced lower-threshold identification procedures, which are currently being implemented and which **will facilitate the insured persons' access to their electronic patient records.**

Usability of these electronic records will be improved in line with the Federal Ministry of Health's Digitalization Strategy, which lays down that an electronic patient record will soon be automatically provided to every person insured under the German statutory health insurance, unless they file an objection (opting out). It is planned that, by 2025, 80% of persons insured in the German statutory health insurance will have an electronic patient record. Details will be regulated by law during 2023. Germany underperforms due to the low level of population coverage of the electronic access service and the relatively few healthcare provider categories that are connected. As the roll-out of the German Electronic Health Record service is still ongoing, and, given the fact that the current government plans to switch to an opt-out system, Germany's score is likely to improve in the coming years in terms of updated data categories, population coverage and connected healthcare provider categories.

On cross-border healthcare, the Federal Ministry of Health represents Germany in the European e-Health network (eHN). This is a voluntary network of the Member states that aims at fostering and supporting the creation of a European e-Health infrastructure (eHDSI/MyHealth@EU), partnership building, regular exchanges of information and the dissemination of knowledge and expertise on issues related to e-health. Moreover, the Member States are developing common guideline documents and recommendations to support harmonisation of e-health policies and standards, formulation of joint initiatives and the sharing expertise with partner countries.

Despite the progress mentioned above on digitalisation of public services, the quality of public services in Germany could benefit by increasing investments in R&D procurements and public procurements that focus on adopting innovative ICT solutions. This would help to further accelerate the wider adoption of advanced digital solutions in the public sector (such as AI/big data, virtual reality/metaverse, robotics, HPC, blockchain etc). The current national digital strategy sees 'giving public procurement a more innovative focus' as a key principle to implement the digital transformation of the sector, but does not yet identify concrete innovation procurement initiatives in the digital sector to make this happen.

Best practice: 'State Blindness Benefit' and 'State Fund for the Blind'

The digitalisation of two online services in particular, the 'State Blindness Benefit' and the 'State Fund for the Blind', is focused specifically on accessibility for people with a visual impairment. These services, piloted as a 'minimal viable product' in September 2021 in the state of Lower Saxony, are centred on user-friendliness, ease of operation and application, and have relied heavily on user testing with the target group.

Germany should accelerate its efforts to digitalise public services. In particular, it should take measures to further strengthen the collaboration and alignment of the different administrative levels to further improve the interoperability, effectiveness and availability of online public services. Moreover, Germany should implement planned measures swiftly and speed up the digitalisation of the entire service chain for public services.



Digital Decade Country Report 2023

Greece

Introduction

Greece has scope to improve its performance in the digital transition and to contribute to the collective efforts to achieve the EU's Digital Decade targets. Greece has embraced the digital transformation as a strategic opportunity to build a more competitive and resilient economy and society with its [Digital Transformation Bible](#) for 2020-2025 which is aligned with the Digital Decade Policy Programme.

While Greece has made rapid and tangible progress in digitalising public services over the past years (e.g., in less than 3 years more than 1 500 public services became available online for people and businesses, reducing drastically the time to obtain services), it needs to address significant gaps in the other dimensions, such as the low coverage of very high capacity networks and the low number of ICT specialists employed.

In the last 12 months, Greece has put in place several legislative reforms, a new strategy for very high-speed connectivity networks and many investment programmes to modernise and digitally transform the economy for growth and increase the resilience of the society. In 2022, Greece also reinforced its whole-government approach to its digital transformation strategy by activating the 'digital transformation executive network', under the lead of the Ministry of Digital Governance, to align the work of different ministries towards the Digital Decade targets and jointly develop the Digital Decade roadmap.

Greece is collaborating with other Member States in exploring the possibility to set up **European Digital Infrastructure Consortia (EDICs)** on: (i) establishing the European Cybersecurity Skills Academy; (ii) establishing an Alliance for Language Technologies, to develop a common infrastructure in the field of natural language processing and to develop large multi-language models; and (iii) Innovative Massive Public Administration inter-Connected Transformation Services, to develop a new generation of advanced cross-border public services.

Digital in Greece's Recovery and Resilience Plan (RRP)

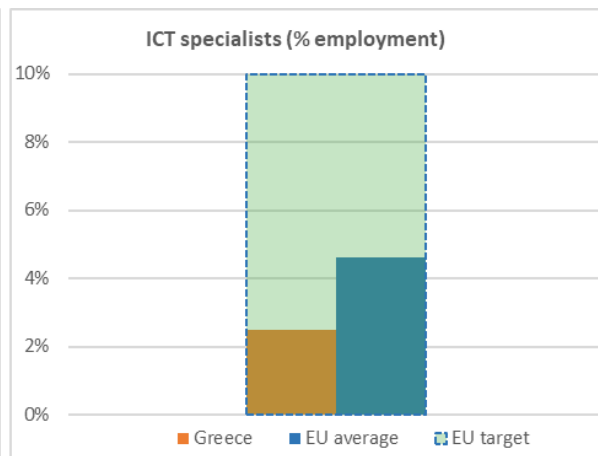
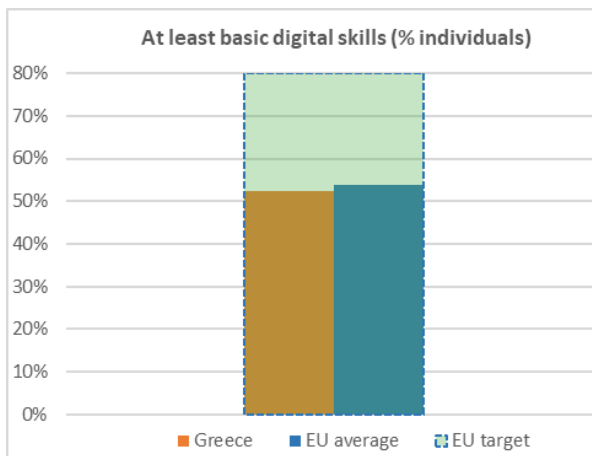
The Greek RRP devotes EUR 7.1 billion (23.3%) to the digital transformation, of which EUR 6.8 billion is expected to contribute to the Digital Decade targets¹⁰⁵.

The first payment disbursed related to 15 milestones and targets, including an IT tool to monitor the labour market, and measures to support private investments in digitalisation. The second payment related to 28 milestones and targets, including the launch of a support scheme for digitalising SMEs and a second measure, also addressed to SMEs, to deploy smart technologies in manufacturing. Further milestones and targets include modernising the lifelong learning strategy, upskilling and reskilling the people in digital skills creating and upgrading infrastructure of research centres across the country.

¹⁰⁵ Each Recovery and Resilience Plan must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plans had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or has no impact (0%) on digital objectives, using Annex VII of the RRF Regulation. Combining the coefficients with the cost estimates of each measure allows assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to allow for an estimation of the possible contribution of RRF measure to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice to potential ongoing revisions of the plan.

1 Digital skills

	Greece			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	77%	77%	82%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	52%	52%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	22%	22%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	62%	62%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	12%	12%	13%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	2.1%	2.4%	2.5%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	3.4%	3.5%	3.5%	4.2%	
% graduates	2019	2020	2021	2021	



In 2022, Greece adopted and started implementing major legislative reforms to improve people's digital skills, as well as upskill and reskill the workforce. The country recognises the importance of a quality training system and a comprehensive approach, in view of having a flexible and specialised labour force, with the qualifications required by a modern market and the digital transition. These fundamental reforms, accompanied by investments projects under the RRP, are part of the strategy to increase the number of digitally skilled people and ICT specialists in Greece.

More than half of the Greek population (age 16-74) have at least basic digital skills (52%), close to the EU average (54%), but below the EU Digital Decade target of 80% by 2030. The breakdown by age group shows that 88% of people aged 16-24 and 82.8% of those aged 25-34 have at least basic digital skills, placing Greece among the frontrunners in these age groups. Furthermore, in 2022 the percentage of people using the internet once a week (82%) rose by 5 percentage points compared with the previous year. However, the percentage of ICT specialists in total employment in Greece is at 2.5% among the lowest in the EU. The share of women among ICT specialists is, at 20.3%, above

the EU average of 18.9%. The percentage of enterprises providing ICT training (13%) is low compared with the EU average (22%).

Greece is currently implementing several measures that will contribute to increasing the level of basic digital skills and the resilience of the population regarding digital transition. The ‘Works again’¹⁰⁶ law, adopted in April 2022, promotes the modernisation and digitalisation of the Public Employment Service (DYPA). It includes upskilling and reskilling the labour force and the diagnosis of the labour market needs. It lays the foundation for a more agile vocational education training (VET) system, to respond to modern socio-economic needs and the digital transition. In 2022, Greece started implementing the strategic plan for VET and Lifelong Learning (2022-2024). It includes a general reform of the curricula to provide modern skills, especially digital and green skills, corresponding to the labour market’s needs. The reform sets out for the first time, a collaboration between the DYPA and the lifelong learning centres of Greek public universities to train 150 000 private sector workers from all economic sectors. The programme ‘[Go forward](#)’ was launched at the end of 2022 to improve skills for the digital and green transitions, with the support of RRP investment. Other RRP measures activated in 2022 are also expected to contribute to developing worker’s digital skills, such as a programme to upskill and reskill employees in the tourism sector (to amount of EUR 44 million), which started in March 2022.

The [National Coalition for Digital Skills and Jobs](#) became an important player in the digital skills strategy in 2022, with its role and mission¹⁰⁷ set out in law and its connection to the European Digital skills and jobs Platform. Operating under the Ministry of Digital Governance, its core mission is to improve the level of digital skills and strengthen the employment readiness of the Greek population, support the digital transition and reduce the digital divide in society. Its members are organisations from the public and private sectors, and civil society. The National Coalition’s interoperability with the European [Digital Skills and Jobs Platform](#) strengthens synergies and the possibilities to spread know-how and information on innovative projects on developing digital skills across Europe.

Activities such as EU Codeweek are promoted by the National Coalition. In 2022, Greece was one of the most active countries in Codeweek with 3 429 activities organised in schools. Greek teachers were particularly active in organising coding activities in their schools, which led them to take the sixth position among other European countries.

The National Coalition is also carrying out activities to increase the number of ICT specialists and develop advanced digital skills. A project to train 20 000 civil servants in cloud-computing technologies was launched in 2021 in partnership with the National Centre for Public Administration and a large technology company. Around 5 000 civil servants have already been trained.

The percentage of ICT specialists in relation to the total number of employees in Greece is 2.5%, below the EU average of 4.6%. Significant factors can have an impact on this shortage of ICT specialists in Greece. The percentage of ICT graduates (3.5%) is lower than the EU average (4.2%), and the percentage of enterprises providing ICT training is only 13% (EU average: 22%). There are other reasons that are difficult to quantify. These includes the brain drain which has remained an issue since the economic crisis hit Greece, and the high global demand for ICT talent.

The Federation of Hellenic Information Technology & Communications Enterprises (SEPE), published a ‘[Study on the sufficiency of ICT specialists in the Greek labour market](#)’ in December 2022. It included a survey that confirmed that Greek businesses already face difficulties in recruiting ICT

¹⁰⁶ Law 4921/2022

¹⁰⁷ Law 4961/2022 (article 87-89)

specialists. The main reasons cited were insufficient specialisation and the loss of talent abroad (brain drain). The study estimated that an additional 120 000-140 000 ICT specialists will be needed in 2023-2030.

In 2022, the adoption of a law ‘New Horizons in Higher Education Institutions: Strengthening the quality, functionality and connection of Universities in Greece’¹⁰⁸ provided for new study programmes in the ICT sector. This aimed to enable more graduates join the ICT labour market over a 5-year period. Participation of Greek universities in European University Alliances focusing on ICT sector will strengthen their cooperation with other European universities and research centres. The Digital Transformation Programme for 2021-2027, adopted in 2022 under the EU’s cohesion policy, focuses on new technologies and is also expected to help increase the number of ICT specialists. The programme provides for the use and integration of cutting-edge technologies. It aims to develop the digital skills needed for the digital transformation of the economy and the country, promote lifelong learning, and facilitate career changes; based on market needs.

In this context, Greece is expected to benefit from the recently launched ‘Digital transformation executive network’ which aims to coordinate more effectively the development, implementation, and evaluation of digital policies, including for digital skills.

Moreover, Greece is chairing the work of the informal working group exploring the possibility of submitting a proposal for an EDIC on the Cybersecurity Skills Academy¹⁰⁹.

Greece should significantly step up its efforts in the area of digital skills. The need to expand the digital talent pool of ICT specialists in Greece will require special attention to tackle the current gap and ensure the economy benefits from a digitally skilled population. It is also crucial that Greece can forecast the skills required to match the labour market needs and anticipate changes in skills.¹¹⁰

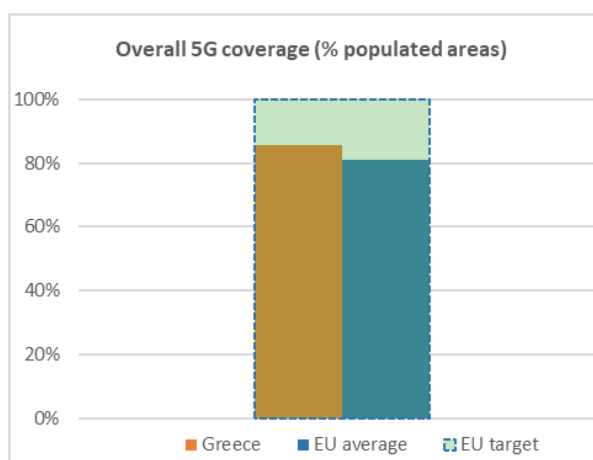
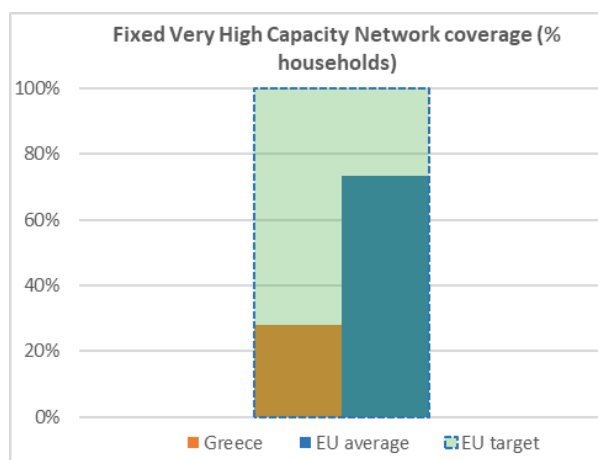
¹⁰⁸ Law 4957/2022

¹⁰⁹ COM (2023) 207 final, 18.4.2023

¹¹⁰ The recommended policies, measures, and actions in this document reflect the Commission Communication ‘Report on the state of the Digital Decade’ COM(2023) 570.

2 Digital infrastructures

	Greece			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up	3%	9%	20%	55%	
% households	2020	2021	2022	2022	
2a2 At least 1 Gbps broadband take-up	<0.1%	<0.1%	<0.1%	13.8%	
% households	2020	2021	2022	2022	
2a3 Fixed Very High Capacity Network (VHCN) coverage	10%	20%	28%	73%	100%
% households	2020	2021	2022	2022	
2a4 Fibre to the Premises (FTTP) coverage	10%	20%	28%	56%	
% households	2020	2021	2022	2022	
2b1 Mobile broadband take-up	67%	76%	76%	87%	
% individuals	2018	2021	2021	2021	
2b2 Overall 5G coverage	0%	66%	86%	81%	100%
% populated areas	2020	2021	2022	2022	
2b3 5G spectrum	99%	99%	99%	68%	
Assigned spectrum as a % of total harmonised 5G spectrum	2021	2022	2023	2023	



In 2022, Greece adopted its [National Broadband Plan 2021-2027](#) with the goal to promote the use of fixed very high capacity and 5G networks as catalysts and accelerators of the country's digital transformation. This strategic roadmap for developing broadband in the country, including the 5G roadmap, has two main objectives: accelerate private investment by removing administrative barriers to create an investment-friendly environment and ensure the wide availability and adoption of very high capacity broadband services.

In connectivity, Greece continues to score low for most fixed broadband indicators: 100 Mbps take-up is at 20% and 1 Gbps at 0% (despite 1 Gbps being available to 28% of households). This is lower than the EU average for VHCN and FTTP coverage (28% for both). On mobile, Greece with 86% on 5G coverage is above the EU average (81%), making a positive contribution to reaching the Digital

decade target. However, on mobile broadband take-up, the country is below the EU average (76% vs 87%).

Greece is lagging behind in Gigabit connectivity deployment for all. The main target of the national Broadband Plan 2021-2027 is to put in place 100 Mbps infrastructure, upgradeable to 1 Gbps, which falls short of the Digital Decade target for making 1 Gbps connectivity available by 2030. Despite this, an evaluation of the connectivity targets is only planned in 2023 to assess how any identified gaps can be addressed. The 2021-2027 broadband strategy aims for 100% coverage of municipalities with fixed technologies (100 Mbps, readily upgradeable to 1 Gbps). However, there is still the question of how end users will be served in rural areas, whereas no further civil works in urban areas will be needed to connect end users.

The [Super-Fast Broadband \(SFBB\)](#) project was successfully completed in September 2022. Its main goal was to stimulate the demand for services provided over high-speed internet connections with download speeds of at least 100 Mbps upgradeable to 1 Gbps. Almost 140 000 vouchers were issued to support households and businesses, showing significant consumer demand. Another project, the Ultrafast Broadband project, aims at making high speed connectivity available to 18% of the population. This will be done by installing the infrastructure needed within 50 metres of relevant buildings, without requiring civil works. This target (100 Mbps, readily upgradeable to 1 Gbps) is less ambitious than the Digital Decade's target.

Moreover, the RRF Loan facility envisages investments in FTTH outside Athens and in other major cities for an amount of EUR 93 million, and for fixed Next Generation Access (NGA) for an amount of EUR 50 million. Currently, there are many isolated projects that converge towards the strategy goals, but Greece still lacks a comprehensive strategy to steer investments and initiatives aligned with the 2030 Digital Decade target of Gigabit connectivity for all.

On mobile networks, Greece is a frontrunner in making the 5G pioneer bands available. The country has shown rapid progress in improving the overall 5G coverage, which is above the EU average, contributing to the relevant Digital Decade target.

In terms of regulatory decisions, at the beginning of 2023, the National Committee for Telecommunication and Post (EETT) analysed and adopted the final measure for wholesale local access provided at a fixed location (market 3a) and for wholesale central access at a fixed location for mass-market products (market 3b).

On permits for mobile network deployment, the previously observed licensing backlog has reduced, and the process is now faster, opening up to new investments.

On market developments, in January 2023, the United Group merged with Wind, a major telecoms operator, to form a bigger mobile and fixed operator on the Greek market. United Group is a telecommunications and media operator in Southeast Europe running the Nova brand (formerly Forthnet, a telecommunications and Pay-TV provider).

Regarding other digital infrastructures, Greece actively participates in developing multi-country projects. In the European Quantum Communication Infrastructure (EuroQCI) initiative, the project HellasQCI¹¹¹ aims to build Greece's National QCI and contribute to safe-keeping critical data and infrastructures. The project will deploy an advanced quantum systems and networks national communication quantum infrastructure comprising three metropolitan test sites and three quantum key distribution QKD testbeds (governmental, industrial and educational). Selected by the European

¹¹¹ Digital Europe Programme (DEP Topic-2): Project DIGITAL-2021-QCI-01, HellasQCI Funding: EUR 9.9 million (50% EU) duration 01/2023-06/2025

Space Agency to host three primary Optical Ground Stations (OGS) systems for satellite QKD, Greece aims to capitalise on this to strengthen European sovereignty in this strategic part of the continent. The three Greek telescopes will operate as OGS and participate in the HellasQCI project, and also contribute to building resilient QCI technologies in Europe. Furthermore, in August 2022, Greece announced the creation of the Institute for Quantum Research and Quantum Technology in the Institute of Research Democritus. This aims to carry-out high-level competitive cutting-edge research in quantum computing, science and technologies.

In high-performance computing, Greece made a step forward in upgrading the national high-performance super-computer (ARIS). In April 2022, the Attica Region and the Greek Research and Technology Network (GRNET), under the auspices of the Ministry of Digital Governance, signed the Inclusion of the Act to upgrade the national high-performance supercomputer ARIS (Phase A). This work is part of the 2014-2020 Attica programme for SMEs using ICT and is funded by the European Regional Development Fund (ERDF). The total budget is EUR 3.8 million, and it will be completed in 2 years. In addition, the Ministry of Digital Governance has planned funding (EUR 23 million) from the RRF to purchase a petascale HPC system. The Governing Board of the European High Performance Computing Joint Undertaking (EuroHPC JU)¹¹² selected GRNET as the hosting entity of a mid-range supercomputer. A machine of more than 30 petaflop is expected to be acquired and become operational within the second half of 2024 (total budget EUR 33 million).

Greece participates in the European Blockchain Partnership (EBP) and work on the Blockchain Services Infrastructure (EBSI), a multi-country project which will contribute to develop technological excellence and safe digital solutions in the EU. Greece is currently hosting two EBSI nodes. In 2022, GRNET was active in the EBSI Early Adopters group (in the Diplomas Use Case). Greece also supported the effort towards transitioning the EBSI nodes to a production-level infrastructure.

To minimise the environmental impact, Greece announced the construction of a new ecological green data centre, Knossos II, with RRF funding. It is expected to be developed in one of the largest Greek data centres and will run on green energy. There are already two other Green Data Centres in Greece.

In the area of semiconductors, Greece also participates in the Important Project of Common European Interest (IPCEI) on Microelectronics and Communication with 6 direct participants focusing on design, edge AI, aerospace/defence, and packaging.

Greece should step up its efforts on connectivity infrastructure, in particular Gigabit coverage. Greece should further improve the effectiveness and coordination of initiatives to ensure coherence in achieving its connectivity goals. Greece's efforts in the area of semiconductors and quantum should be sustained in order to help the EU become a strong market player in these areas.

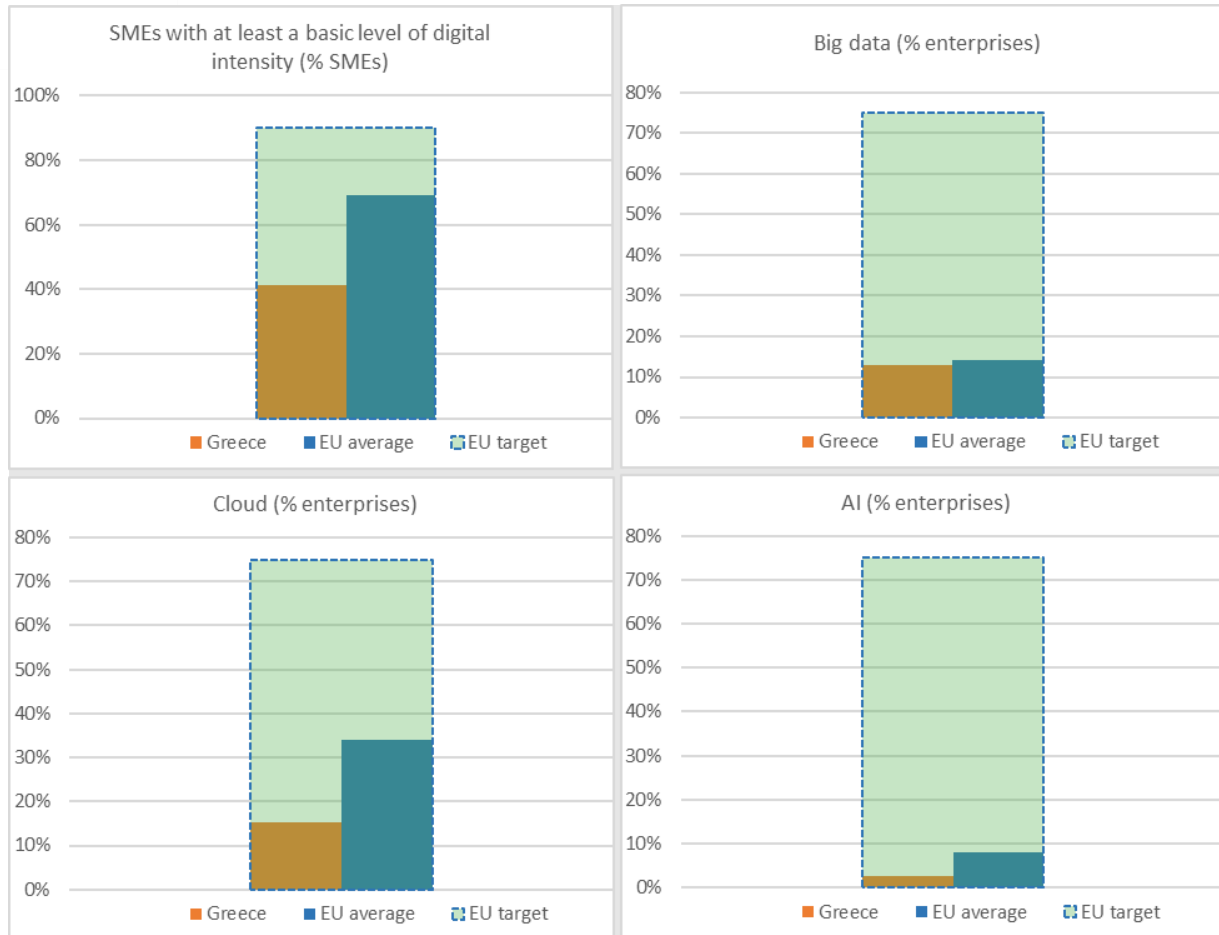
¹¹² On the basis of the call for expression of interest EUROHPC-2021-CEI-MR-01.

3 Digitalisation of businesses

	Greece			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	41%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	38%	32%	32%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	19%	28%	28%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	13%	13%	13%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud¹¹³	NA	15%	15%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI¹¹⁴	NA	3%	3%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	NA	NA	NA	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	NA	19%	17%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	NA	5%	7%	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	4%	7%	7%	9%	
% SMEs	2019	2021	2021	2021	

¹¹³ Enterprises buying sophisticated or intermediate cloud computing services indicator, see [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#). Please note that the 2021 data on cloud for Greece was revised backwards by the Greek National Statistical Institute after the publication of DESI 2022. Eurostat database was updated accordingly.

¹¹⁴ Please note that the 2021 data on AI for Greece was revised backwards by the Greek National Statistical Institute after the publication of DESI 2022. Eurostat database was updated accordingly.



In 2022, Greece took several measures to create favourable conditions for businesses to speed up their digital transformation. This shows that digitalisation of businesses is one of the Greek government's key priorities, as described in the Digital Transformation Bible. It also demonstrates the willingness to create the conditions for businesses to benefit from a modern digital environment, with an emphasis on emerging technologies.

In the Digitalisation of businesses, there is room for improvement to contribute to the collective efforts in reaching the Digital Decade targets. The level of digital intensity of SMEs in Greece is 41%, still far from the EU average of 69%. Regarding take-up of advanced digital technologies, enterprises have been slower at adopting them: in 2020, 13% were using big data analysis (EU average: 14%, whilst 15% were using cloud services in 2021 (EU average: 34%), and only 3% were using AI (EU average: 8%). The share of SMEs in Greece selling online (17%) is slightly below the EU average (19%). However, the digital technologies sector is one of the most dynamic sectors of the Greek economy, with growth rates among the highest in the country (6.1% between 2017 - 2021 in compound annual growth rate (CAGR) terms)¹¹⁵ which could boost Greece's contribution to the Digital Decade.

In 2022, Greece activated several funding measures aimed at strengthening SMEs' digital maturity and businesses' use of advanced digital technologies in line with the Digital Decade targets. The RRP project '[Digital transformation of SMEs](#)' started in March 2022 (with a budget of EUR 375 million). The programme will provide vouchers to help SMEs modernise their production, commercial

¹¹⁵ ΠΡΟΓΡΑΜΜΑ II - ΑΝΑΠΤΥΞΗ ΨΗΦΙΑΚΩΝ ΠΡΟΪΟΝΤΩΝ ΚΑΙ ΥΠΗΡΕΣΙΩΝ - digitalsme.gov.gr

and administrative processes by acquiring new digital tools, for electronic transactions and e-commerce, adopt new forms of hybrid work, and raise the level of security and trust in electronic transactions. Another RRP measure to accelerate smart manufacturing was launched in 2022 (with a budget of EUR 75 million). This supports investment projects of SMEs in the industrial sector. These projects seek to improve business resilience by digitalising production lines, automating and interconnecting supply chains, designing and producing smart products and services, and implementing smart manufacturing technologies. Under the new ERDF Operational Programme (OP) 'Competitiveness', the programme for the 'Digital Transformation of Small and Medium-sized Enterprises' (with a budget of EUR 300 million) started in February 2023. It has three strands: (i) Basic Digital Transformation of SMEs; (ii) Advanced Digital Transformation of SMEs; (iii) Cutting-edge Digital Transformation of SMEs.

Seven European Digital Innovation Hubs (EDIH) had started operations in Greece by the beginning of 2023. They are expected to play a leading role in bringing together industry, businesses, and SMEs in need of new digital solutions (e.g. for smart health, agrifood, e-government, uptake of AI, HPC). Four of them will be partially funded under the Digital Europe Programme (EUR 9.3 million) and the other three which have been awarded the EU Seal of Excellence will be funded by Greece. The total national contribution to the 7 EDIHs is estimated at EUR 25 million (from the OP 'Competitiveness').

In July 2022, Greece adopted the law on 'Emerging information and communications technologies, strengthening digital governance and other provisions'¹¹⁶, one of the first frameworks for emerging technologies in the EU. It aims to create a regulatory environment that strengthens digital governance and innovative technologies, and help the country attract technological development and innovation. The law has separate chapters with rules on developing AI and using advanced technologies, such as the Internet of Things (IoT), unmanned aerial vehicles (UAVs), distributed ledger technologies, and 3D-printing. The recent 'Development Law Greece Strong Development'¹¹⁷ also aims to support specific activities and sectors by giving incentives to achieve digital transition, support innovative investments, and deploy advanced digital technologies such as robotics and AI.

The Greek start-up ecosystem has more than 720 start-ups registered on the platform [Elevate Greece](#), which was launched by the Ministry of Development and Investments in 2020. This is more than double the amount compared with the previous year. By monitoring and supporting the development of these start-ups, the platform acts as a reference point for the Greek start-ups' ecosystem and for potential investors. In June 2022, the second round of the 'Elevate Greece National Register Young Enterprises Support' action (with a budget of EUR 34 million) was announced. In addition, 2022 saw the creation of the National Start-up Awards.

In 2022, two additional Greek start-ups became unicorns, bringing the total number of unicorns to three¹¹⁸. One is in the field of fintech, the first entirely cloud-based European neobank, based on advanced mobile technology. Another in the field of retail, is an online marketplace, the leading comparison-shopping engine in Greece.

There were significant developments in the ICT and tech sectors. The Greek start-ups and scale-ups scene has become more attractive to global industry leaders. Very large ICT companies have made significant investments in developing data centres in Greece and providing cloud services. Through the Loan Facility of the Greek RRP, which started in 2022, several large companies have been able to invest in their digital transformation for a total amount exceeding EUR 100 million.

¹¹⁶ Law 4961/2022

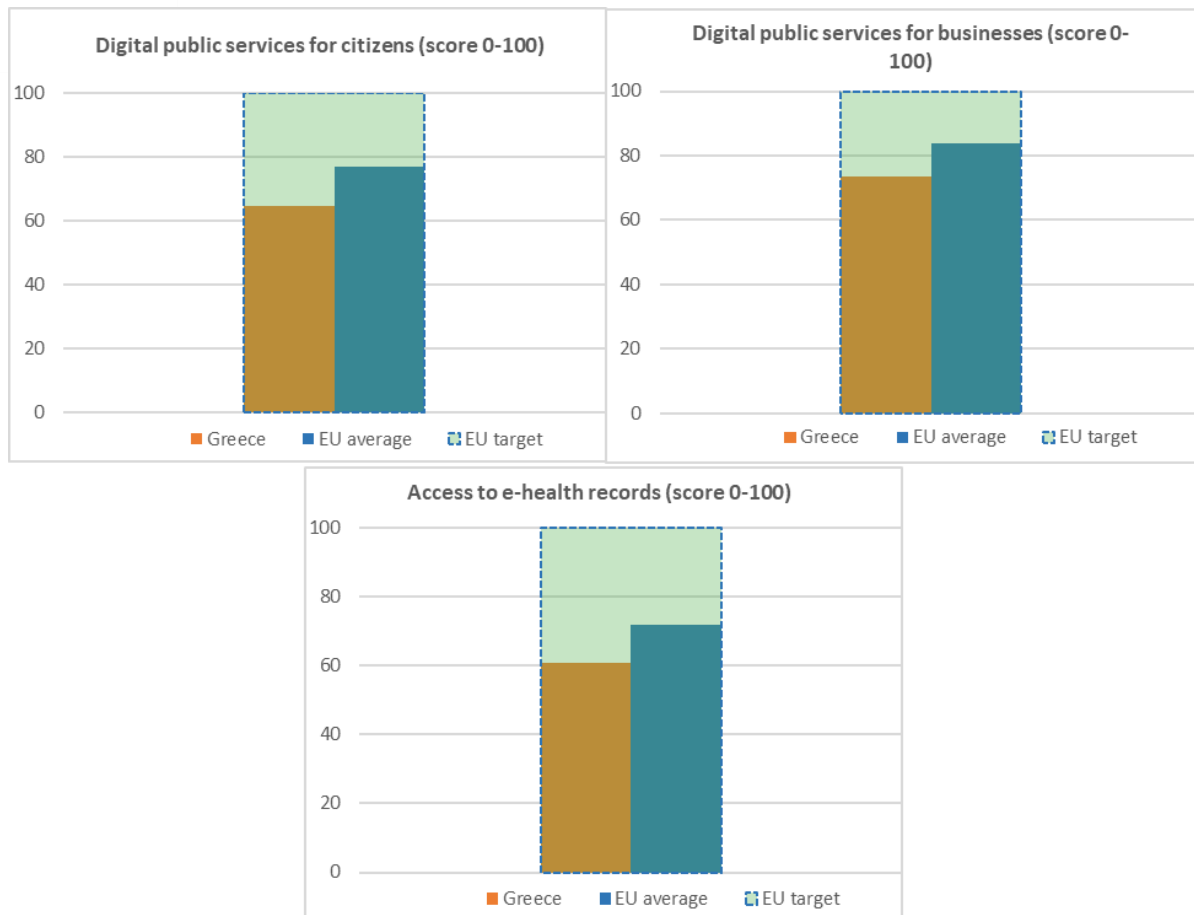
¹¹⁷ Law 4887/2022

¹¹⁸ Source: Dealroom (date of extraction 16/01/2023)

Greece should significantly step up its efforts in the area of digitalisation of businesses, notably by swiftly implementing the RRP measures, and the ERDF Programmes, 'Competitiveness' and 'Digital transformation'. Attention should be paid to supporting the development and deployment of advanced technologies, including big data, AI, in particular in SMEs.

4 Digitalisation of public services

	Greece			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	81% 2022	74% 2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	52 2021	65 2022	77 2022	100
4a3 Digital public services for businesses Score (0 to 100)	NA	48 2021	74 2022	84 2022	100
4a4 Pre-filled forms Score (0 to 100)	NA	45 2021	54 2022	68 2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	49 2021	52 2022	65 2022	
4a6 User support Score (0 to 100)	NA	75 2021	74 2022	84 2022	
4a7 Mobile friendliness Score (0 to 100)	NA	82 2021	85 2022	93 2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	61 2022	72 2022	100



Greece continues to implement its ambitious strategy to modernise and digitalise the public services. Several pieces of legislation have been adopted to provide key public services online and to ease interaction with the public administration both for citizens and businesses. In the health sector, the pandemic crisis accelerated the implementation of projects that were due in the state health system for decade, such as upgrading the digital infrastructure in hospital, the personal electronic health record.

In the Digitalisation of public services, Greece has made progress in almost every indicator. The percentage of active users of e-government services (81%) is above the EU average (74%). Greece still scores below the EU average for the two indicators measuring digital public services for people and businesses. However, the results show remarkable progress on the Digital public services for citizens, Greece scores 65 (up 13 points from the previous year); for businesses, the score is 74 (up 26 points from the previous year). One reason for this progress is the remarkable improvement in domestic and cross-border services. From 2021 to 2022 the score for the cross-border services for businesses increased by more than 5 times, from 8.3 to 50.8. And for the citizens, the score of the digital cross-border services increased by 62% (up from 24.3 to 39.4). This improvement is reflected in the value of the two Digital Decade indicators which are now closing the gap with the EU average. The score for public services provided through mobile-friendly interfaces rose to 85 but remains below the EU average (93). In terms of access to e-health records, Greece scored lower than the EU average (61 vs 72).

Several significant regulatory measures were implemented to improve online access to essential public services for people and businesses and online interaction with public administrations. A new law¹¹⁹ enforced the equivalent validity of digital documents of the [Gov.gr Wallet](#) application with physical documents in Greece (e.g. national identity card, driving licence). A National Disability Portal¹²⁰ hosting all digital procedures relating to disability was set up on Gov.gr. The Public Employment Service (DYPA) digital card¹²¹ was launched for people looking for work when dealing with the DYPA. The planning and implementation phase of the new national interoperability framework was completed in April 2022, meeting the requirements of the European interoperability framework (EIF)¹²². It was accompanied by an integrated governance model and guidelines to guarantee all stakeholders to develop integrated, interoperable public services. Furthermore, the RRP includes a measure for further digitalising public procurement procedures (with a budget of EUR 17 million). The newly established national administrative procedures policy (EPPD) aims to record all public sector administrative procedures. The procedures will be evaluated, simplified, digitised, and then designed to make them more user-friendly for people and businesses. The EPPD is based on three pillars: (i) the National Registry of Administrative Procedures (MITOS); (ii) the national programme for the simplification of procedures; and (iii) the Observatory of the Bureaucracy to evaluate the impact of simplification measures. With the launch of [MITOS](#) in 2022, every procedure of the Greek state has been gradually documented for the first time. This provides people with all the necessary information about the applicable administrative procedures and legislation, including the competent services and processing time. As of July 2023,¹²³ 2 959 procedures have been published in the Greek language, and 376 in English. This project will improve the interaction between the individuals and the state, as they will know in advance what exactly is required to avail of a service.

On inclusive online public services, a guide to further develop the accessibility of websites and applications for people with disabilities has been opened for consultation by the Ministry of Digital Governance. It is addressed to all public sector bodies. At the end of 2022, the Digital Disability Card was launched. It significantly simplifies contacts with the state for persons with disabilities. They no longer need to request a new disability certificate for every interaction with the administration.

In the field of electronic identification (eID), the Hellenic Public Administration Certification Authority ([APED](#)) was launched in 2022 to make signed electronic transactions secure. Its work will extend to identification services, strengthen people's trust in services and improve authentication procedures in line with the eIDAS Regulation. The platform provides free personal digital authentication/signature certificates, equivalent to a handwritten signature, and the possibility to have digitally verified signatures in English. Greece is also participating in three EU large-scale pilot projects testing the European Digital Identity Wallet in a number of everyday use cases funded under the Digital Europe Programme (overall grant request over EUR 1.8 million). These are the Pilot for European digital identity wallet (POTENTIAL), the European Digital Identity Wallet Consortium (EWC), and Digital Credentials for Europe (DC4EU).

Greece embarked on a major digital transformation project using advanced technologies to create a cloud ecosystem. The Ministry of Digital Governance will invest more than EUR 120 million to create the Greek RE-Cloud, G-Cloud and H-Cloud. These will cater to the needs of the Greek research community, and government and health-care services respectively. The RE-cloud, G-Cloud and H-

¹¹⁹ Law 4954/2022

¹²⁰ Law 4961/2022

¹²¹ Law 4921/2022

¹²² COM (2017) 134

¹²³ 05/07/2023

Cloud projects are expected to provide the Greek common data infrastructure and services. In November 2022, the project Supply of advanced Security Services (SOC and DDoS) to the critical infrastructures of the Government Cloud (G-Cloud), with a budget of EUR 8.5 million, opened for public consultation. The project's objective is to ensure uninterrupted and real-time surveillance of government cloud systems by partnering with a specialised and internationally recognised provider for preventing and tackling cyberthreats. The Greek RRP includes a set of reforms and investments launched in 2022 to deliver on the national cybersecurity strategy adopted in 2020.

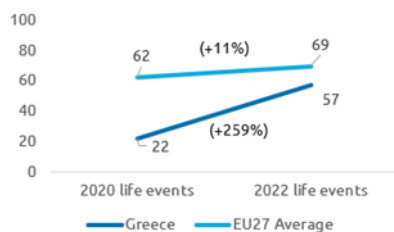
Several digital health projects launched in 2022 will contribute to the Digital Decade target of 100% of citizens having access to their electronic health records. The completion of the individual electronic health record (EHR) is intended to be the IT infrastructure that will be fed by the public's health data from all healthcare sectors. Electronic prescriptions were launched in 2022; about 40% of prescriptions are now electronic, and more than 3 million people are registered with this service. A mobile application, [Myhealth](#) was launched to give access to these new services. Although 80-100% of the individuals can now access their health data online, the data available is somewhat limited. Electronic results and reports, such as medical imaging reports, laboratory test results and hospital discharge reports, are not available. Authentication is not handled by electronic identification (eID) that has been nationally notified or compliant with the eIDAS Regulation, and equal access for disadvantaged groups is not completed. The national telemedicine network covers most of the country's islands but is currently limited to doctor-to-doctor communication (tele-expertise).

Best practice: The Greek government's online platform Gov.gr continues to grow and provide cross-border services

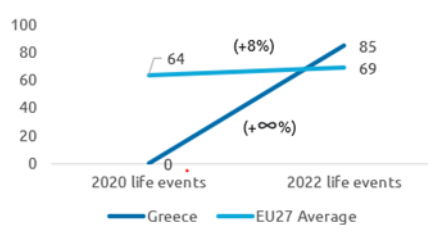
The number of digital public services for people and businesses available on the [Gov.gr](#) continued to grow. In 3 years, more than 1 500 services have been made available online. In 2022, the availability of cross-border services improved remarkably with services in English.

The development of Gov.gr in 2022 is the driver behind improvements to Greece's scores in the two Digital Decade targets for digital public services for citizens and businesses. However, not all improvements are captured in the current scores because the benchmark to measure them uses a biennial average. The comparison of the life events measured in 2022 for citizens (Career, Family, Studying) to the same life events measured in 2020 shows that, for cross-border services, Greece improved its score by 35 points between 2020 and 2022. Regarding the digital public services for businesses measured in 2022 (Business Start-up) compared to the same life event measured in 2020, Greece' scored 85 in 2022, while in 2020, users could not find any information about business start-up services in English.

Cross-border online Availability for Citizen life events 2022



Cross-border online Availability for Business life events 2022



In 2022, services also became available for Greek citizens living abroad and EU citizens and businesses wishing to make their services available in Greece (service portal [EUGO](#)).

Greece should step up its efforts to digitalise public services. In particular, it should notify to the Commission an eID scheme under the eIDAS Regulation. The roll-out of the considerable investments earmarked in the RRP for modernising the public administration should continue at the same pace to ensure citizens and businesses benefit in the immediate future. On e-health records, the scope of data accessible should be expanded and equal access should also be strengthened for disadvantaged groups. Expanding the national telemedicine network should help providing equal access to health services for all residents of the country, regardless their location.



Digital Decade Country Report 2023

Hungary

Introduction

Hungary has untapped digital potential to contribute further to the collective efforts to achieve the EU's digital decade targets. Hungary has progressed with the digital transformation of its economy and society. In 2022, the most significant progress was made in fixed very high capacity networks and 5G coverage. However, to ensure the new capabilities and opportunities offered by improved digital infrastructure are fully utilised, further progress is needed to improve the digital skills of the population. This could also help the further digitisation of the public and private sectors.

On 30 November 2022, the Hungarian Government adopted the new National Digitalisation Strategy 2022-2030, which is aligned with the Digital Decade Policy Programme.

The Hungarian Government's objective is for Hungary to be among the 10 best performing countries in the field of digitalisation in the European Union by 2030. To achieve this, the Strategy has defined indicators based on the Digital Decade's targets, paving the way for the national roadmap.

Process wise, the Digital Decade could be an opportunity for Hungary to adopt a whole government approach of digitalisation, notably through their national roadmap or its future adjustments, to consolidate and streamline existing mechanisms, and set up comprehensive approaches at national level. The establishment of the Digital Hungary Agency, coordinating the digital implementation activities is a right step towards this objective.

Hungary is collaborating with other Member States in exploring the possibility to set-up a **European Digital Infrastructure Consortium (EDIC)** on an Alliance for Language Technologies to develop a common infrastructure in the field of natural language processing and large multi-language models.

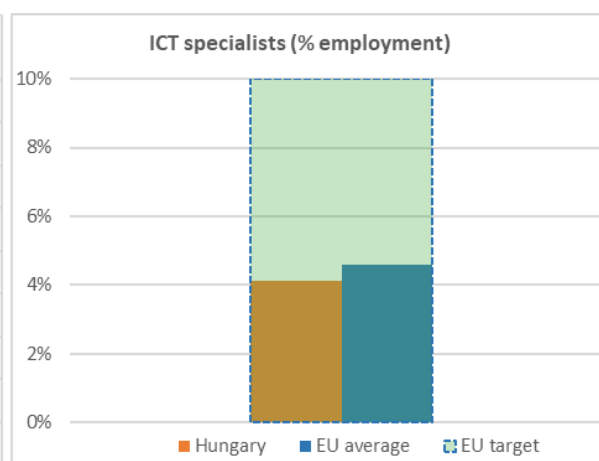
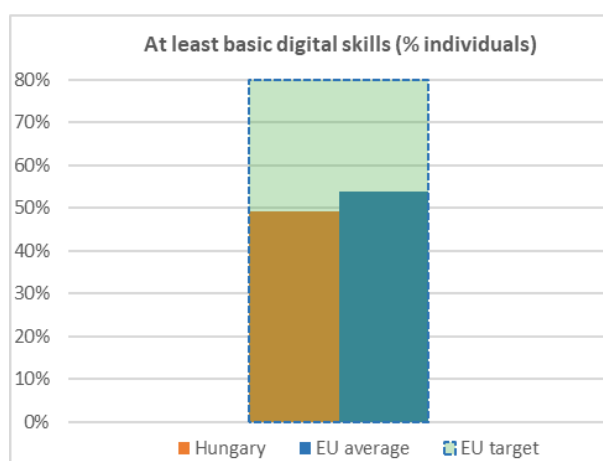
Digital in Hungary's Recovery and Resilience Plan (RRP)

With 30% of its allocation devoted to digital measures (EUR 1.7 billion), of which EUR 1.2 billion is contributing to the Digital Decade targets¹²⁴, the plan includes a comprehensive package to promote the digital transformation of the economy and society. Most components contain measures on digital transition. Significant measures are planned to improve the digital equipment and skills in primary, vocational and higher education. The plan contains measures related to the digitalisation of public administration and of the health, transport and energy sectors.

¹²⁴ Each Recovery and Resilience Plan must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plans had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or has no impact (0%) on digital objectives, using Annex VII of the RRF Regulation. Combining the coefficients with the cost estimates of each measure allows assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to allow for an estimation of the possible contribution of RRF measures to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice to potential ongoing revisions of the plan.

1 Digital skills

	Hungary			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	84%	87%	88%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	49%	49%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	22%	22%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	59%	59%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	16%	16%	18%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	3.8%	3.9%	4.1%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	4.9%	3.1%	5.7%	4.2%	
% graduates	2019	2020	2021	2021	



On digital skills, Hungary scores below the EU average on relevant indicators. Only about half of the population aged 16-74 has at least basic digital skills, significantly below the Digital Decade target of 80% by 2030. The Hungarian RRP includes several measures that target digital skills, mostly in the form of establishing or improving the tools and facilities needed to develop digital competences. In line with the Digital Decade, **Hungary's new [National Digitalisation Strategy 2022-2030](#) acknowledges that improvements in digital skills at all levels are essential to enable the digitalization of businesses and public sector.** One of the strategy's pillars focuses on digital competences, setting targets for 2030 that no more than 5% of the 16-74 age group lacks basic digital competences and that ICT 10% of all graduates should be ICT graduates.

Hungary is implementing several measures related to digital skills, especially to provide the necessary digital tools, as well as network infrastructure and services to students and staff in the primary, secondary and higher education. They also support closing the digital skill gap in disadvantaged groups. As part of the RRF program, every fifth and ninth grade pupil in lower and

upper secondary education and their teachers will receive a personal computer. A total of 120 000 personal computers were delivered to public educational institutions in Q2 2022, 65 000 were for ninth grade pupils, 55 000 for teachers. By mid 2025, the number of distributed devices will reach 579 000. For the distribution of digital notebooks priority is to be given to disadvantaged pupils and teachers in schools with an above-average share of disadvantaged pupils. Additionally, at least 3 100 primary and secondary schools will receive an asset pack (robots, embedded system etc.) to improve pupils' creativity and STEAM skills. Through the Smart Classroom project, 180 institutions are developing digital classrooms, where experience-based teaching of any subject is possible. The project supports the practical application of digital pedagogical tools and collaborative teaching methods. Teachers will receive targeted training on how to use the digital devices and they shall have access to an IT help desk. By Q1 2023, 42 593 teachers had already received training. To support using these devices and the new curriculum, a comprehensive eduroam WiFi infrastructure, central network infrastructure and related services were built between 2013-2023 under the Diákháló Program.

Digital education is an important priority for the Hungarian government. In 2020 the National Core Curriculum introduced a new subject (and also a new matriculation exam subject) called Digital Culture which is the successor to the Informatics subject. Digital Culture is a compulsory subject in grades 3-11, but all the other subjects have the task to develop pupils' digital competences. Algorithmic thinking and programming are also introduced in the requirements of the intermediate level of Digital Culture matriculation exam, which further emphasizes the importance of these topics.

The Digital Theme Week, a major national event on digital pedagogy, has been supported by the ministry responsible for education every year since 2016. It is organized with the cooperation of the Ministry responsible for education (the Ministry of Interior since 2022), industry, social partners and other stakeholders. The event's main objective is to development of pupils' digital competence and the continuous renewal of the methodological culture of digital pedagogy in line with the challenges of the 21st century. In the past 6 years, a total of 1 642 457 pupils and 152 861 teachers have participated in Digital Theme Week programmes. As part of Digital Theme Week 2022, a handbook on Project Pedagogy using Digital Tools was prepared, which deals with pedagogical projects supported by digital tools in theory and practice.

Regarding higher education as part of the RRF's, the "Highly qualified, competitive workforce" component and its activities related to the digital development of training activities, support is planned for closed-system online distance education and digital curriculum development. The investment is expected to consist of purchasing and installing 22 300 pieces of digital equipment in higher education institutions, developing the digital competence of 34 000 higher education students' and staff, and developing 1 900 digital learning content modules. Implementation of the investment is planned to be completed by 30 June 2026.

The proportion of ICT specialists in total employment has slightly increased in recent years but in 2022 remained relatively low with 4.1%, below the EU average of 4.6%. There is a shortage of ICT specialists as according to expert estimates from 2020 around 44 000 IT specialists are missing from the Hungarian labour market. The share of women among ICT specialists is, at 13.6%, among the lowest in the EU, compared to an EU average of 18.9%. However, the percentage of ICT graduates among all graduates improved to 5.7%, above the EU average of 4.2%.

Regarding ICT skills, the 'Programme your Future!' project remained a key initiative in 2022 and continuing this initiative until 2030 would support reaching the Digital Decade target of 20 million ICT specialists by 2030. This initiative was co-funded from ESF in the Economic Development and Innovation Operational Programme (EDIOP). It aimed to increase the number of people with IT qualifications relevant to the labour market and to improve the skills of ICT specialists. The main

results of the initiative until February 2023, which are relevant for the Digital Decade targets are that 6 091 computer science students studying in 19 higher education institute, received industry specific trainings courses relevant to the labour market and acquired the related certificates. In addition, ICT students had completed over 200 000 hours as interns in 282 ICT companies. Extending the training curriculum and internship opportunities could be considered to reduce the shortage of ICT specialists.

Under EDIOP PLUS, almost HUF 30 billion will support ICT higher education graduates with mentoring, tutoring and activities to develop their skills. This is expected to result in a significant decrease in the number of dropouts from ICT courses.

To increase the visibility and popularity of the IT professions, motivational events are planned for high school students. Several non-governmental initiatives are in place to increase female participation in ICT (such as Skool, Women in IT Security and Django Girls Budapest). Hungary's participation in EU Code Week remained stable, in 2022 there were 1 327 activities, most of them happening in the schools. 38% of the over 34 000 participants were female, which is a positive sign.

The new [National Digitalisation Strategy 2022-2030](#) sets three priority areas for digital skills: (1) developing digital competence (based on the [DigComp](#) framework, however the Strategy does not specify that it intends to introduce the latest version DigComp 2.2, adopted at EU level in summer 2022); (2) increasing the number and qualifications of IT professionals and engineers; and (3) strengthening the digital competence development in public education, vocational training and higher education. EU funding will play a key role to implement the planned measures, as Hungary plans to finance the strategy's skills pillar mainly from the Digital Renewal Operational Programme Plus 2021-2027 (DROP+).

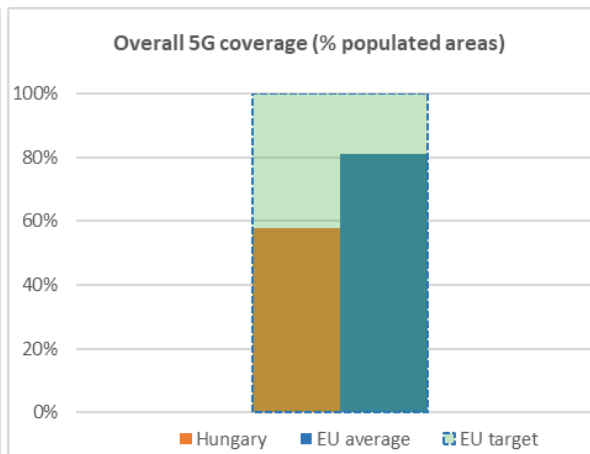
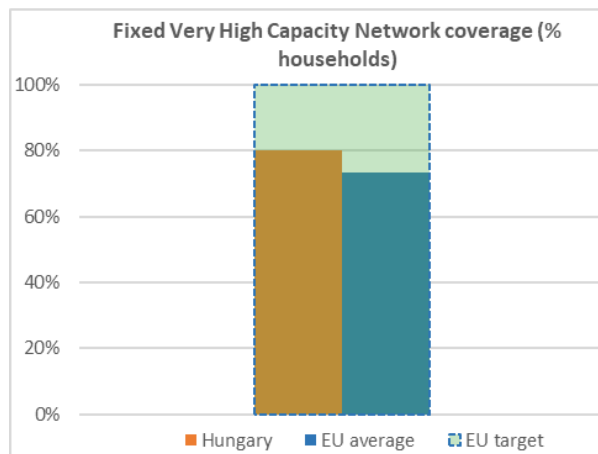
Implementing the new [National Digitalisation Strategy 2022-2030](#) will be crucial to delivering on the Digital Decade targets of over 80% of individuals having basic digital skills and having 20 million ICT specialists in total employment by 2030, although the national strategy might not be sufficiently ambitious.

Hungary should step up its efforts in the area of digital skills. In particular, the digital competence of teachers should be strengthened, together with increased adult participation in digital training courses, to increase the number of people with basic digital skills. Increased cooperation, especially with the private sector, NGOs and social partners, among others, would be relevant in order to develop the skills required within SMEs¹²⁵.

¹²⁵ The recommended policies, measures, and actions in this document reflect the Commission Communication 'Report on the state of the Digital Decade' COM(2023) 570.

2 Digital infrastructures

	Hungary			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up	60%	67%	70%	55%	
% households	2020	2021	2022	2022	
2a2 At least 1 Gbps broadband take-up	14.2%	23.8%	29.8%	13.8%	
% households	2020	2021	2022	2022	
2a3 Fixed Very High Capacity Network (VHCN) coverage	49%	72%	80%	73%	100%
% households	2020	2021	2022	2022	
2a4 Fibre to the Premises (FTTP) coverage	49%	64%	70%	56%	
% households	2020	2021	2022	2022	
2b1 Mobile broadband take-up	71%	84%	84%	87%	
% individuals	2018	2021	2021	2021	
2b2 Overall 5G coverage	7%	18%	58%	81%	100%
% populated areas	2020	2021	2022	2022	
2b3 5G spectrum	60%	60%	60%	68%	
Assigned spectrum as a % of total harmonised 5G spectrum	2021	2022	2023	2023	



Broadband connectivity is above the EU average as fixed very high-capacity network (VHCN) coverage went up from 72% in 2021 to 80% in 2022, surpassing the EU average of 72%. The country has made good progress in the take-up of Gigabit services (29.8%), while 70% of the households subscribe to services higher than 100 Mbps.

Hungary is planning to use the European Regional Development Fund (ERDF) to support broadband infrastructure deployment in its more rural regions. The funding will be used primarily in white areas to offer gigabit connectivity.

As part of the implementation of the Digital Educational Strategy, the capacity and resiliency of educational and research backbone network infrastructure was enhanced. Moreover, the educational and research endpoints in this network saw a substantial increase in capacity: over 91%

of school endpoints are now connected at speeds higher than 100 Mbps and services to universities and research institutions are connected at speeds of more than 10 Gbps.

On 5G, Hungary has made a significant progress towards achieving the digital connectivity targets for 2030. In 2022, 5G coverage in Hungary increased to 58%, an increase by 40 percentage points compared to the previous year. However, this is still significantly lower than the EU average of 81%. On 5G coverage in the 3.5 GHz spectrum band, coverage in Hungary stands at 21%, lower than the 41% EU average.

The National Regulator started an award procedure for the rights to use radio spectrum in the 32 GHz frequency band to ensure the operation of backhaul network systems. One of the main purposes of awarding the 32 GHz frequency band, according to the Regulator, is to enable the use of the 26 GHz frequency band for MFCN (Mobile/Fixed Communication Network) purposes. This will require the clearing of the 26 GHz frequency band and providing an alternative frequency band for the migration of the point-to-point systems previously deployed there, simultaneously with – or preferably before – the expiry of the entitlements in 2024 and 2027. Hungary has also conducted several public consultations on the clearing of the 26 GHz band, but to date there is no demand for the band before the expiration of the current allocations. For Hungary, the 5G development is a major priority. The 5G Coalition is a professional cooperation forum established in the summer of 2017. The goal of the organization, made up of representatives from the market, academia and the state, is for Hungary to become one of the centres of European 5G developments, and be a world leader in the field of introduction, spread and practical application of 5G.

The incumbent operator has already switched off its 3G network as of July 1 2022 and another operator also switched off its 3G network by April 10, 2023. A third operator also started the switching off its 3G network, and this is expected to be completed by the end of 2023.

In terms of market developments, the consolidation trend among telecom operators continued in the previous year as well.

Customers face price increases for electronic communication services. Market players increased their prices based on indexation clauses set in their retail contracts as a consequence of the escalating inflation in Q1 2023.

In terms of consumer trends, the Hungarian market has continued to experience an increase in the bundling of products with 67% of households subscribing to bundled products. The most common bundled packages were made up of a pay television and a fixed internet line; only 18% of bundled packages included a mobile subscription.

It has long been a good practice for incumbent mobile operators to share passive mobile infrastructure. Sharing usually includes towers, masts, joint use of sites in urban areas. Recently two operators have decided to create separate entities to serve partner providers' passive infrastructure needs.

A development with a potential impact on the market is the growth of mobile service solutions compared with fixed services; in many areas, mobile solutions are doing better. In the voice market mobile has long been dominant, but in the data market, the share of mobile services has grown and almost equalled fixed line services in 2022. The penetration rate of fixed line internet services among Hungarian households grew from 57% in 2014 to 75% in 2022 while the rate for small screen mobile data services grew from 32% in 2014 to 74% in 2022.

There were no changes in the regulation of markets in the reporting period, including no deregulatory steps. The review of the regulation of the fixed wholesale access market is planned for 2023.

Several universities and research institution teams are working together to develop quantum technologies. They have created the “National Quantum Laboratory” in Hungary in order to join their efforts and harmonize their research activities. One of the strategic goal of this is to set up a regional quantum communication network, to be joined to the European Quantum Communication Infrastructure (EuroQCI). The Hungarian Governmental Agency for IT Development (KIFÜ) is the operator of the greatest Hungarian HPC capacity and it is the leader of the Quantum Project (QCIHungary) in Hungary. This project aims to lay down the foundations for a national quantum communication infrastructure in Hungary, with the goal being to participate in creating a larger pan-European quantum network.

Hungary has ambitious plans to deploy a quantum computing modules in a future HPC system. In the framework of the Economic Development and Innovation Operational Programme (GINOPDF) the Governmental Agency for IT Development (KIFÜ) procured and installed a new 5 Petaflops HPC called ‘Komondor’ which was put in operation in December 2022 at the University of Debrecen’s Data Centre. Currently together with the Komondor, KIFÜ operates three different HPCs with an overall capacity of 5.4 Petaflops, offering specialized AI, big data, GPU and CPU partitions. The main users of KIFÜ’s HPCs are educational and research institutes as well as small and medium enterprises.

As regards plans towards hybrid HPC (traditional HPC with quantum module), Hungary has submitted an application to the EuroHPC JU Call for Expression of Interest¹²⁶ to build and host a “mid-range” HPC of 20 PetaFlops capacity with modular structure. The Hungarian application was among those selected by the evaluation committee and approved by the EuroHPC Governing Board. The modular structure of the HPC, named “Levente” paves the way to extend the “traditional” HPC with quantum module and to deploy a hybrid HPC with a quantum accelerator module.

In parallel with the “Levente” proposal, Hungarian and German partners, signed a four-party Framework agreement with the intention to cooperate on HPC and supercomputing application development area towards quantum computing, the goal of which is the extension of the “Levente” with quantum computing module by 2026.

Hungary participates in the development and use of the European Blockchain Services Infrastructure. In order to build a broader industry consensus on the applicability of blockchain, Hungary has established a Blockchain Coalition in March 2022. This new cooperation platform is a permanently open forum for public, educational, civic and corporate stakeholders active in the Hungarian blockchain ecosystem and seeks to build international partnerships. Hungary is contributing to the Important Project of Common European Interest (IPCEI) on Microelectronics and Communication Technologies ecosystem with associated participants (aid below the GBER threshold).

In Hungary, the production of semiconductors is limited to back-end activities, but there are development activities in the design of new circuits. A Hungarian player has a dominant global market share in the semiconductor measurement technology market, therefore the Hungarian Government provides all possible assistance for their projects.

During the reporting period, Hungary witnessed a continued increase in 5G coverage especially. In the fixed network market, there was an improvement in the coverage of FTTP and VHCN. This in turn coincided with a corresponding increase in consumer take-up of high speed connections. This suggests that Hungary is well positioned to reach the fixed connectivity objectives as set out in the Digital Decade. However, more needs to be done if Hungary is to reach the related 2030 Digital

¹²⁶ EuroHPC-2021-CEI-MR-01 Call for Expression of interest for the Selection of Hosting Entities for mid-range Supercomputers.

Decades target of 100% 5G coverage. Meeting these targets could be facilitated by the implementation of the National Digitalisation Strategy which should better define the roadmap to be used for reaching the desired targets. Furthermore, the emergence of new players in the Hungarian market, may affect the current ecosystem. The impact of the recent mergers on the competition has not been assessed. The risk of potential future price increases cannot be excluded.

Best practice: 5G Coalition

The 5G Coalition is a professional cooperation forum established in the summer of 2017. The goal of the organisation, made up of representatives from the market, academia and the state, is for Hungary to become one of the centres of European 5G developments, and be a world leader in the field of introduction, spread and practical application of 5G. The main achievements of the 5G Coalition (5GC) include testing the first traffic use cases based on 5G at the vehicle industry test track in Zalaegerszeg and achievements in agricultural use cases (e.g., development of innovative monitoring, data collection, analysis and intervention control solutions that take advantage of the possibilities of 5G, which support farmers' decisions with the help of AI-based analysis).

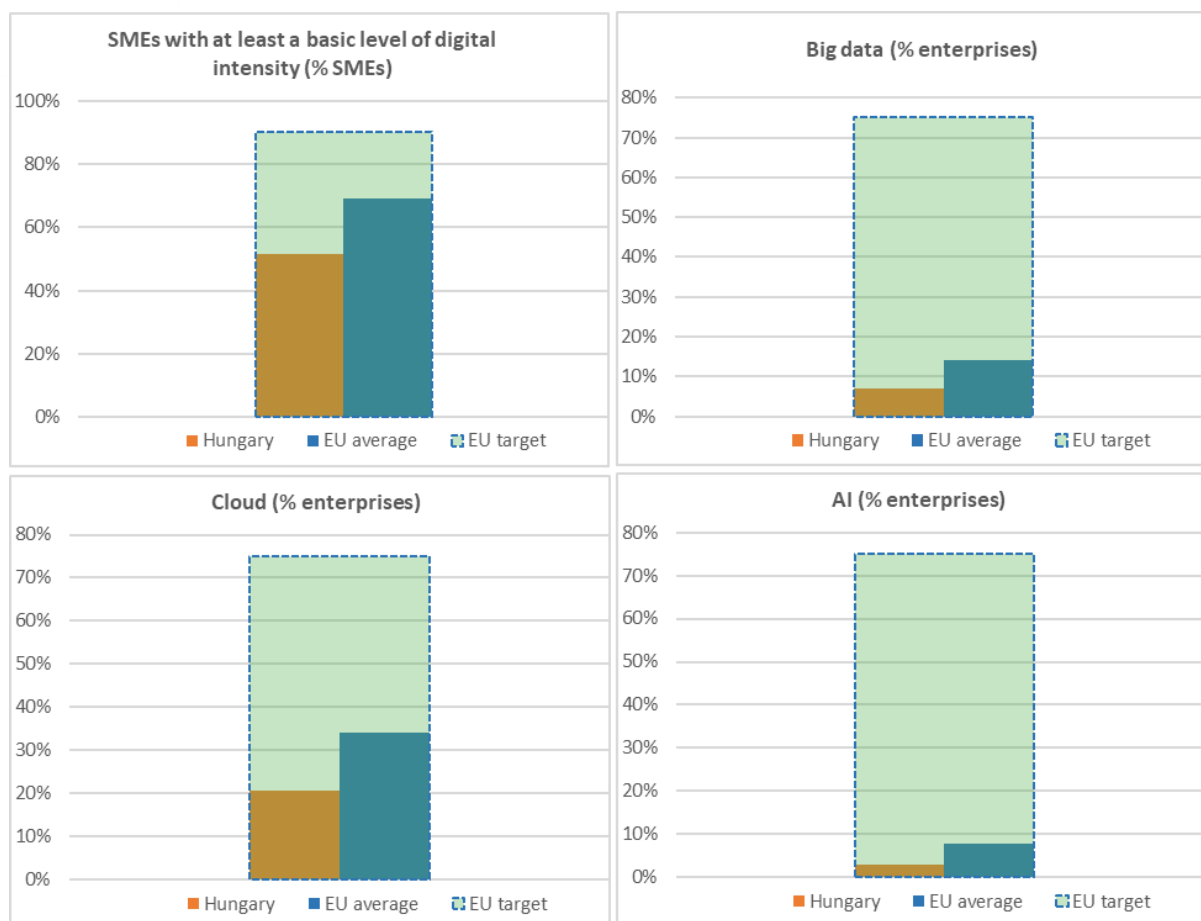
Hungary should step up its efforts on connectivity infrastructure, in particular in 5G roll-out. The implementation of the National Digitalisation Strategy, which sets out the path for reaching the targets, would help achieve these goals.

Hungary's efforts in the area of semiconductors and quantum should be sustained in order to help the EU to become a strong market player in these areas.

3 Digitalisation of businesses

	Hungary			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	52%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	14%	21%	21%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	12%	13%	13%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	7%	7%	7%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud¹²⁷	NA	21%	21%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	3%	3%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	14%	14%	14%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	13%	18%	20%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	9%	11%	11%	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	5%	7%	7%	9%	
% SMEs	2019	2021	2021	2021	

¹²⁷ Enterprises buying sophisticated or intermediate cloud computing services indicator, see [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).



The digitalisation of businesses remains a major challenge in Hungary. Most businesses, in particular SMEs, are not yet maximising the opportunities offered by digital technologies. This has a negative impact on the competitiveness of the economy. One of the pillars of the country's new [National Digitalisation Strategy 2022-2030](#) focuses on businesses, setting a target that at least one third of businesses use integrated business processes by 2030. However, this target might not be enough to meet the Digital Decade targets of 75% of businesses taking-up cloud, AI or big data and 90% of SMEs having at least a basic level of digital intensity.

Although the use of electronic information sharing increased substantially (from 14% of enterprises in 2019 to 21% in 2021), the country still performs poorly on the technology adoption indicators. Only 14% sent e-invoices (which are suitable for automatic processing) and 13% used social media (at least two channels) compared to 32% and 29% in the EU respectively. Looking at the technology targets of the Digital Decade, the use of advanced digital technologies, such as big data and artificial intelligence, was less than half of the EU average in 2021 (3% in Hungary against 8% in the EU). In 2021, the use of cloud computing services was 21%, 13 percentage points lower than the EU average (34%). In 2022, only 52% of SMEs in Hungary had at least a basic digital intensity (significantly below the EU average of 69%).

Hungary supported the digitalisation of businesses through a mix of instruments – including grants, loans, risk capital and non-financial support – as part of the Economic Development and Innovation Operative Programme (EDIOP). One instrument was the Modern enterprises Programme, which helped over 10 000 SMEs to draw up digitisation strategies, provided professional services, and organised events in the field of digitisation, and ran information and media campaigns. Other instruments provided mentoring support to start-up ICT SMEs, grants and services in specific fields

such as the internationalisation of ICT SMEs, cloud services and AI. In addition, instruments targeting the development of SMEs also provided for the introduction of ICT technologies in businesses (big data, robotics, AI, automation), including advanced technologies and systems (e.g. ERP).

Hungary used EU funding of more than HUF 27 billion (EUR 68 million) from the European Structural and Investment Funds for targeted financial support for the digitalisation of businesses.

Around half of the amount was provided as grants, while the other half as loans. Funding was provided through three initiatives with a special focus on cloud computing: (1) EDIOP-3.2.2-8.2.4-16 supporting the development of complex info-communication and mobile solutions and the dissemination of cloud-based online business services, (2) EDIOP-3.2.4-8.2.4-16 supporting the development and market penetration of cloud-based (IaaS, PaaS, SaaS) business services and ICT solutions and EDIOP-3.2.6-8.2.4-17 supporting the increased digitalisation of competitive companies' activities. The total number of beneficiaries in the three programs were 1 142.

It is important that Hungary improves the framework conditions for start-ups and scale-ups.

Established in 2016, the INPUT Programme is the government's dedicated initiative for the development of the digital start-up ecosystem. The mission of the INPUT Programme is to build and foster the digital innovation and entrepreneurial ecosystem across the country, especially in the rural areas and to help innovative ICT start-ups to enter global markets. The programme functions as an umbrella organization integrating five different activities to enable start-ups to validate their ideas, find investment, develop their products and enter international markets. The five activities are (1) offsetting up an international mentor and expert network; (2) providing business development services with personalized consulting sessions; (3) trainings and workshops; (4) an international soft landing programme providing resources and knowledge to expand internationally; and (5) setting-up a nationwide coordinator network. As of January 2023, 2 615 potential ICT start-ups had participated in the programme, and 661 training courses and events had taken place.

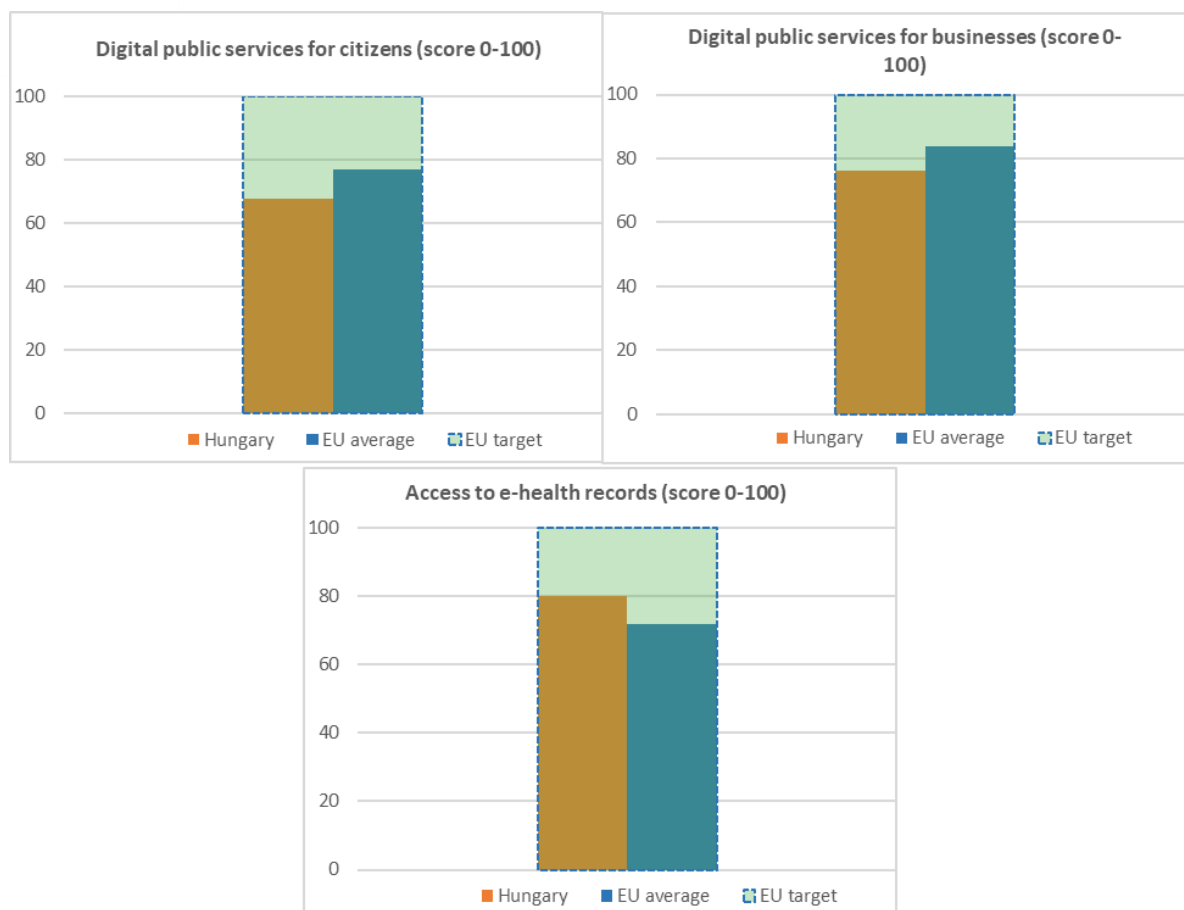
Hungary is one of the 12 Member States taking part into the Important Project of Common European Interest on Next Generation Cloud Infrastructure and Services (IPCEI-CIS). The IPCEI-CIS as part of the *Multi-Country Project on a Common Data Infrastructure and Services* aims at equipping the European Union with the next generation of advanced, distributed, secure, sustainable and innovative cloud-to-edge capabilities that citizens and businesses are in need for. Participating in this major European project will help encourage more Hungarian businesses take up cloud technologies (which is currently 13 percentage points below the EU average of 34%).

In Hungary five digital innovation hubs were selected to receive the first three years of funding from the Digital Europe Programme and became the part of the network of European Digital Innovation Hubs (EDIHs). With the support of these hubs, SMEs can digitally transform and improve their business and production processes, products or services in agriculture, artificial intelligence, data-related services within the health industry, high performance computing, cybersecurity and other areas of digital competencies.

Hungary should significantly step up its efforts in the area of digitalisation of businesses. Further incentives for investments, as well as measures to ensure supportive framework conditions for the digital transformation of SMEs, in particular in the area of skills, are necessary to speed up the digital transformation of businesses, to increase SMEs' use of digital technology, and to develop digital start-ups.

4 Digitalisation of public services

	Hungary			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	81% 2022	74% 2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	64 2021	68 2022	77 2022	100
4a3 Digital public services for businesses Score (0 to 100)	NA	74 2021	76 2022	84 2022	100
4a4 Pre-filled forms Score (0 to 100)	NA	60 2021	60 2022	68 2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	50 2021	57 2022	65 2022	
4a6 User support Score (0 to 100)	NA	67 2021	69 2022	84 2022	
4a7 Mobile friendliness Score (0 to 100)	NA	84 2021	85 2022	93 2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	80 2022	72 2022	100



Hungary continues to make progress in digitalising public services, but it still performs below the EU average in this respect. To improve the situation, in December 2022, the government adopted the National Digital Citizenship Programme prepared by the newly established Digital Hungary Agency. Most measures planned will be financed from DROP (ERDF) which drew up a strategy for this alongside the Digital Decade objectives. This programme breaks down the digital government goals of the National Digitalisation Strategy 2022-2030 and sets the main objectives for the period of 2022-2026. The Programme sets strategic goals related to open data and the use of cloud technology in the public administration. Regarding digital public service provision, it reinforces the aim to develop user-friendly and user-centric services, and for the first time embraces the “mobile first” principle.

The Hungarian RRP includes several measures that focus on digitalisation in healthcare where Hungary scores 80, above the EU average.

The Digital Renewal Operational Programme (DROP), supported by Cohesion Policy, sets strategic goals related to open data and the use of cloud technology in the public administration.

81% of internet users used e-government services through websites or mobile applications, above the EU average of 74%. The country slightly improved on most of the indicators about the supply of digital public services, although it stands below the EU average for all of them. For the Digital Decade target that all key public services should be fully available online by 2030, Hungary scores 68 (out of 100 for all supply side indicators) on services for citizens and 76 on services for businesses. It is the low cross-border availability of services that is mainly responsible for these results. There is room for improvements on the use of pre-filled forms (so that citizens and businesses do not need to provide information that had been shared already with the public administration), the transparency of service delivery, design and personal data as well as the user support for online services.

To improve digital public service provision, the government launched the National Digital Citizenship Programme. This programme introduced the concept of digital citizen. This reinterprets the relationship between the state and citizens based on the EU's digital identity initiative, through user-friendly channels operating on a single platform, with a "mobile first" approach. A new mobile application will be developed for electronic identification, in line with the current and forthcoming eIDAS regulations, which will establish the framework for a European Digital Identity. With the help of the new mobile wallet, citizens will be able to log into the digital citizen platform, and use the most important digital public services according to their life events. The programme aims at making all necessary digital public services online on mobile devices by 2026. The development of the most important services will begin in 2023.

Regarding e-ID, Hungary has recently conducted the bilateral testing of its e-ID node, but the country does not yet have an e-IDAS notified scheme. The development of the eIDAS Node (HPEPS) has been financed by the Public Administration and Public Service Development Operational Programme through European Structural and Investment Funds (ESIF). The tests were conducted with 12 Member States. The test reports created during the bilateral tests are being finalised and some temporary errors found are being resolved (e.g. update of certificates, system configuration update to the test and production domains, fine-tuning of parameters, publishing of the new node data). The national systems must also be able to accept eIDAS identification. In the first quarter of 2023 there were approximately 6.7 million national eID cards in circulation in Hungary (covering 67% of the population) that were capable of e-identification. The use of national eID cards remained limited, with about 300 000 transactions per month, as most users preferred the client gate trusted profile (5.54 million active profiles and 40 million e-identification transactions monthly in the fourth quarter of 2022).

The National e-Health Infrastructure (EESZT) is the central IT system that ensures communication and collaboration between healthcare service providers and patients. The system transfers the health data of every patient to a central cloud-based database in the Government Data Centre, which the various health professional can access through the corresponding hospital, general practitioner and pharmacy systems. The EESZT services provide information to health professionals about patients, allowing them access to information about any medical records, referrals or drugs prescribed by other medical professionals. Meanwhile, citizens can access their personal health records through a single centralised interface following eID authentication. The portal contains all medical data uploaded to the EESZT cloud since 1 November 2017 by institutions who joined the service. The citizens' degree of online access to their electronic health records is 80, ranking the country 11th in the EU. The national online health data access service offers citizens the opportunity to administrative data, information on medical procedures and medicines, ePrescription and eDispensation data, as well as laboratory results, medical imaging reports and hospital discharge reports. As of the beginning of 2023, all publicly funded healthcare institutions (more than 300 outpatient and more than 100 inpatient institutions), 10 000 private healthcare provider, more than 3 200 pharmacies, 35 000 doctors, 14 000 pharmacists and more than 6 000 general medical practitioners use the EESZT. As of 2022 the EESZT contained 2 billion healthcare data points, more than 500 million medical care events more than 250 million electronic health record documents. 800 000 electronic prescriptions are issued daily, which is more than 96% of all prescriptions. There are 40 thousand citizen logins daily to EESZT. As of 2022, 80-100% of the national population have technical access to their electronic health data supplied by public and private primary, secondary and tertiary care providers, pharmacies, rehabilitation centres and mental health facilities.

Related to education, **as part of the international cooperation of KIFÜ with GÉANT the pan-European research and educational network KIFÜ provides access to federated identity and**

authorisation services for 95% of the educational and research organisations. One facet of this federated services is the eduroam, providing seamless internet connectivity to students or teachers moving across campus. In Hungary alone more than 4700 eduroam hotspots locations are installed and are available at universities, research centres, academies, many schools, and other research and education institutions and additional places such as libraries, museums. Worldwide there are more than 70 000 eduroam hotspots locations available to securely access the Internet for research and educational users. A second federated service is eduGAIN and in Hungary eduID.hu. eduGAIN enables worldwide access via allowing students and researchers to securely access world of educational and research resources using a single-sign-on. In Hungary more than 70 educational and research organisations are part of eduGAIN with help of KIFÜ (counting only 1 in eduGAIN more than 3500 primary and secondary schools in Hungary).

Despite the progress on making the above basic public services available online, Hungary still faces the **challenge of accelerating the adoption of several advanced digital solutions into its public sector**, among others especially the innovation procurement of transformative digital technologies. The national digital strategy recognises the challenge, but only identifies the need to help innovative companies access existing public procurement but does not address the need for public authorities to create more innovation procurement business opportunities for companies.

Best practice: Automated issuing of driving licences

If all legal conditions are met, driving licences (such as a first driving licence or a replacement due to a licence expiring or changing to other vehicle categories) are immediately registered in the road traffic registry. Then the new licences are issued and sent to citizens automatically.

To use this service, citizens just have to make a declaration for the issuing of documents online via the Magyarország.hu national single point of contact portal, and take the required tests (first aid, category test and medical aptitude test). The issuing bodies then send the certificates of the necessary tests electronically to the specific sectoral information system that manages the driving licence register. After this the process is fully automatic.

In addition, since January 2023, the relevant controlling authorities have real time online access to driving licences data via a standard interface directly from the Hungarian registry real-time online. As a result, drivers are no longer required to carry the physical documents when driving in the country.

Hungary should accelerate its efforts to digitalise public services.



Digital Decade Country Report 2023

Ireland

Introduction

Ireland is expected to make a positive contribution to the collective efforts to achieve the EU's Digital Decade targets. The country shows a high level of digital skills and it also has the potential to further improve its performance in digital infrastructure and digitalisation of businesses. The implementation of its National Digital Strategy, published in February 2022 and fully aligned with the Digital Decade Policy Programme, should help to achieve this goal.

Ireland is collaborating with other Member States in exploring the possibility to set up a **European Digital Infrastructure Consortium (EDIC)** on establishing an Alliance for Language Technologies, to develop a common infrastructure in the field of natural language processing, and to develop large multi-language models.

Concerning the Digital Decade objectives, and in particular the digital contribution to the green transition, Ireland is committed to reducing emissions by 51% across all sectors of the economy by 2030 and to having net zero emissions by 2050. Irish European digital innovation hubs are also set to contribute to the green transition. Also, to help SMEs with decarbonisation path, notably to help them understand their current carbon footprint and how to reduce it, Ireland launched in December 2021 the [Climate toolkit 4 business](#). So far, 7 614 businesses have completed the calculator and generated their climate action report.

Digital in Ireland's Recovery and Resilience Plan (RRP)

Ireland's RRP, one of the EU's smallests, amounts to EUR 989 million. Of this, 32% (i.e. EUR 312 million) is allocated to the digital transformation, all of which is expected to contribute to reaching the Digital Decade targets¹²⁸.

In the context of the first payment request, Ireland is expected to:

- sign the contract for the building of the shared government data centre;
- launch calls for proposals in the framework of digital transformation of Irish enterprise project;
- connect primary schools to broadband network (i.e. installing routers in at least 750 primary schools);
- publish a circular to communicate the criteria for the funding of ICT infrastructure and grant that funding to at least 3 415 primary and post-primary schools;
- award the contracts for the procurement of an e-Pharmacy system;
- complete the building and configuration of an integrated financial management system to support the effective management of the health service;
- publish a 10 -year strategy on adult skills;

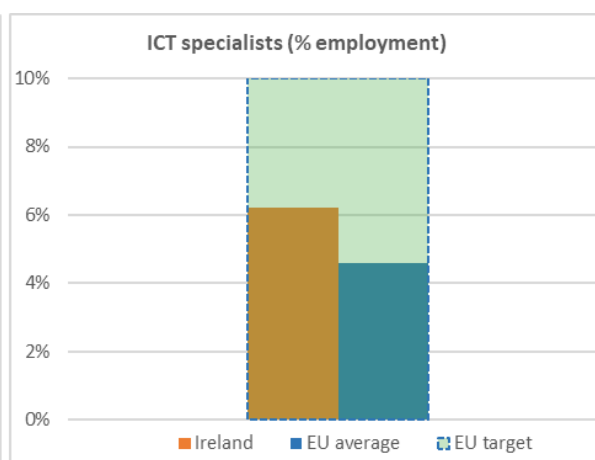
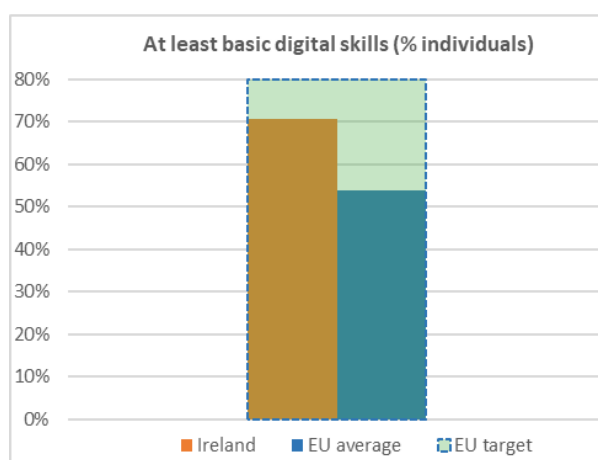
¹²⁸ Each Recovery and Resilience Plan must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plans had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or has no impact (0%) on digital objectives, using Annex VII of the RRF Regulation. Combining the coefficients with the cost estimates of each measure allows assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to allow for an estimation of the possible contribution of RRF measures to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice to potential ongoing revisions of the plan.

- publish a digital strategy for schools;
- equip disadvantaged students at further and higher education institutions with ICT devices (i.e. at least 20 000 laptops).

Based on the Council Implementing Decision on Ireland's RRP, other investments associated with milestones and targets to be reached in 2023 include investments in building a low-latency edge platform to harness 5G technology for the benefit of public services (target: the purchase of at least 18 compute nodes, Q4 2023) and in deploying an e-Pharmacy system across hospitals in Ireland to better monitor the use and costs of medication (milestone: completion of the building and configuration of the e-Pharmacy system, Q4 2023).

1 Digital skills

	Ireland			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	89%	98%¹²⁹	95%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	70%	70%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	40%	40%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	77%	77%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	27%	27%	23%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	5.7%	6.3%	6.2%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	7.8%	8.6%	8.0%	4.2%	
% graduates	2019	2020	2021	2021	



Ireland is determined to be an international leader in the digital economy. It is therefore trying to ensure that its skills policy is focused on developing digital skills at all levels, including high-level digital skills, digital skills for the labour market and digital skills for society. This vision is reflected in its [National Digital Strategy](#), where the Dimension 3 is dedicated to skills. It is underpinned by two targets: (i) increasing the number of learners graduating with higher-level digital skills to over 12 400 (around 0.05% of the current workforce), with the ambition to further increase digital skills provision in the following years; and (ii) increasing the share of adults with at least basic digital skills to 80%.

Ireland's continuing efforts regarding digital skills have been successful. 70% of adults have at least basic digital skills, well above the EU average of 54%. Provided a positive trend is maintained, Ireland

¹²⁹ Break in series for Ireland in 2021

could make a positive contribution to reaching the 2030 EU target of at least 80% of the population having at least basic digital skills. A similar trend is observed for women with at least basic digital skills (72.6% compared to the EU average of 59%)¹³⁰. The country also scores higher than the EU average for individuals with above basic digital skills (40% in Ireland versus 26% in the EU) and at least basic digital content creation skills (77% compared to the EU average of 66%). The proportion of internet users is at 95%, thus more people use internet in Ireland than in other Member States on average.

Ireland continues to boost digital skills development across the entire education system, in schools, further education and training, higher education, and lifelong learning in general. It also continues to implement ambitious reforms under its RRP. The [10-year Adult Literacy for Life strategy](#) (September 2021), aims to bridge the digital divide across Irish society by improving basic digital skills. The strategy sets a target of increasing the share of adults in Ireland with basic digital skills from 53% to 80% by 2030, which is also in line with the targets in the [National Digital Strategy](#) and the [EU Digital Decade](#). The policy framework is complemented by the [Digital strategy for schools to 2027](#) (April 2022), with a capital investment of EUR 200 million over its lifetime under the 2018-2030 National Development Plan. To ensure coverage across all regions of the country, nine regional skills fora continue to provide support for regional SMEs, by bringing business and education and training providers together to co-create curricula.

Under its RRP, Ireland is progressing in providing primary schools with high-speed connectivity. Strategic Connection Points (SCPs) are a key part of the National Broadband Plan (NBP) providing high speed broadband in every county in advance of the roll out of the fibre-to-the-home network. As of 23 June 2023, high-speed broadband service has been installed in 649 schools and the high-speed broadband service will be switched on in these locations through service provider contracts managed by the Department of Education.

The recommendations of the OECD Review of the National Skills Strategy highlight a number of challenges for Ireland's skills landscape, particularly with respect to emerging megatrends, digital transformation, and the future of work. Meanwhile, Ireland is making significant progress toward achieving the digital skills goals set out in the National Digital Strategy.

In October 2022, the Department of Further and Higher Education, Research, Innovation and Science and the Economic and Social Research Institute launched a 3-year partnership to undertake research on developments in the labour market and the shifting nature of skills. This research will help follow up on the findings in the above-mentioned OECD review, specifically the need to have dynamic, granular, real-time data and analysis. The first project began in February 2023 and is examining the role of emerging technologies in Ireland's labour market skills needs. The project is expected to be completed in Q4 2023.

Some private sector initiatives are also providing additional support to increase Ireland's basic digital skills level. [Technology Ireland](#)¹³¹ under the ICT Skillnet has a focus on awareness raising and event engagement. There continues to be significant growth in the number of places available on cyber security courses at third level institutions and further education centres, a number of which are collaborating with industry partners.

Ireland has the second highest share of graduates in the EU studying ICT programmes (8% versus the EU average of 4.2%). The country has a high share of ICT specialists: the percentage of ICT

¹³⁰ Analyse one indicator and compare countries — Digital Scoreboard - Data & Indicators (digital-agenda-data.eu).

¹³¹ Technology Ireland is a business organisation representing Ireland's tech sector.

specialists is 6.2% of total employment, above the EU average of 4.6%. The share of businesses in Ireland providing ICT training to their employees decreased from 27% in 2020 to 23% in 2022 and is currently only slightly above the EU average of 22%. Ireland's performance is average as regards the presence of women in the digital sector: female ICT specialists represent 21.8% of ICT specialists, against the EU average of 18.9%¹³². Regarding ICT specialists, Ireland's above average performance plays a big part in the collective EU efforts to reach the Digital Decade target of 20 million ICT specialists. However, Ireland needs to do more to ensure gender convergence.

Ireland is also taking measures to support the development of high-level digital skills and skills for the labour market. The Department of Further and Higher Education, Research, Innovation and Science supports the [Human Capital Initiative](#) (HCI) Pillar 3, which focuses on two key areas: (i) innovation in modes and methods of delivery and (ii) agility serving future skills needs. HCI Pillar 3 will deliver 24 projects in higher education institutions, including nine ICT related projects.

The same Department is also developing a policy vision to progress toward a more unified tertiary education system. The goal is to facilitate the creation of a broader set of clear and coherent pathways and transition points for learners across and between the systems, as well as developing talent, and increasing and promoting opportunities for engagement in lifelong learning, upskilling and reskilling to meet specific skills demands. Following an online public consultation process in May-August 2022, it has become apparent that the policy vision is welcome and there is a willingness to embrace it. The midterm review of the 2019-2024 National Cyber Security identified the need for a stronger focus on addressing the cybersecurity skills needs of industry and society. A number of actions are to be announced.

[Skillnet Ireland](#)¹³³ delivers digital skills programmes focusing on (i) specialised talent for new or emerging technologies, and (ii) enabling SME digital transformation. It also provides upskilling solutions by supporting the growth and competitiveness of ICT businesses through cutting edge and highly specialised education and training. In 2021, approximately 12 000 trainees undertook digital and ICT skills training, 35% of whom were female.

Ireland is trying to meet future digital skills needs, including high-level ICT skills, needs through [Skillnet Ireland's Future skills programme \(FSP\)](#) and [Expert group on future skills needs \(EGFSN\)](#)¹³⁴. The FSP facilitates innovation and collaboration between businesses, academic institutions and industry training providers in new programme design and industry-based research on the future of work and learning. The primary objective of [EGFSN](#) is to produce an annual assessment of the nature of high-level ICT skills demand in Ireland, by gathering information about the specific skills required across the Irish economy.

Ireland participated in [EU Code Week 2022](#) with over 730 activities (approximately a five-fold increase from 2021). There were over 17 600 participants (more than double that in 2021), over half of whom were women.

¹³² Statistics | Eurostat (europa.eu).

¹³³ Skillnet Ireland is a business support agency of the government. It partners closely with industry to create upskilling programmes which are responsive to business needs and designed to develop future-ready talent.

¹³⁴ EGFSN under the Department of enterprise, trade and employment is a chief advisory body on the current and future skills needs of Ireland's economy.

Best practice: Junior cycle cyber security short course and UL@Work – Skills for a digital future

The pilot programme of the [Junior cycle cyber security short course](#)¹³⁵ was recently extended for another 2 years. The programme contributes to the cyber and digital skills development of post-primary students. In the first phase of the pilot, the 2021-2022 academic year, approximately 300 pupils from 10 participating schools took part. An initial EUR 5 000 was provided to facilitate the programme, and under the extension a further EUR 20 000 will be provided with contributions from University College Dublin. Discussions to scale-up this initiative on completion of the extended pilot in 2024 are underway.

UL@Work – Skills for a digital future is a new range of digital-based programmes from the University of Limerick, co-designed with industry. It enables upskilling and reskilling by combining education and work in areas such as data analytics, ICT, Industry 4.0, robotics, digital leadership, law and technology and future studies.

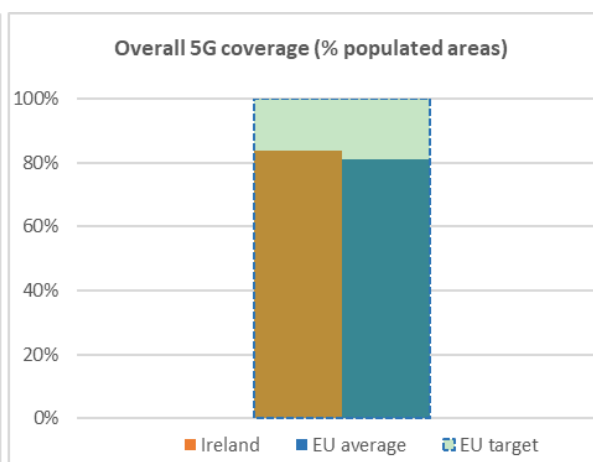
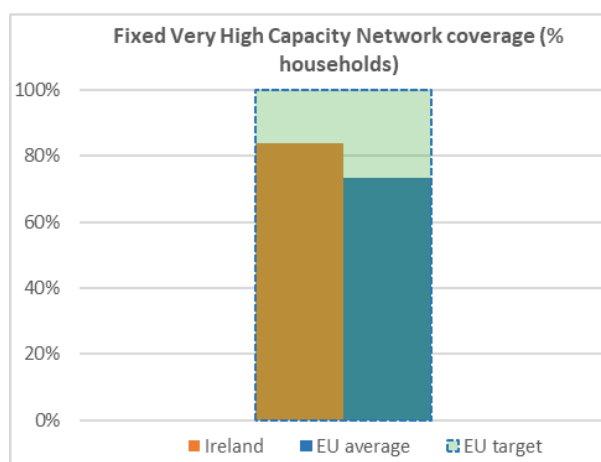
Ireland should continue implementing its policies in the area of digital skills, to further boost the development of basic and high-level digital skills, while giving specific attention to ensuring gender balance.¹³⁶

¹³⁵ This course constitutes an action in Measure 12 of the National cyber security strategy 2019-2024.

¹³⁶ The recommended policies, measures, and actions in this document reflect the Commission Communication 'Report on the state of the Digital Decade' COM(2023) 570.

2 Digital infrastructures

	Ireland			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up % households	36%	45%	50%	55%	
	2020	2021	2022	2022	
2a2 At least 1 Gbps broadband take-up % households	4.1%	5.2%	7.5%	13.8%	
	2020	2021	2022	2022	
2a3 Fixed Very High Capacity Network (VHCN) coverage % households	67%	78%	84%	73%	100%
	2020	2021	2022	2022	
2a4 Fibre to the Premises (FTTP) coverage % households	48%	62%	72%	56%	
	2020	2021	2022	2022	
2b1 Mobile broadband take-up % individuals	81%	98%	98%	87%	
	2018	2021	2021	2021	
2b2 Overall 5G coverage % populated areas	30%	72%	84%	81%	100%
	2020	2021	2022	2022	
2b3 5G spectrum Assigned spectrum as a % of total harmonised 5G spectrum	29%	29%	63%	68%	
	2021	2022	2023	2023	



Ireland is committed to digital transformation across the country. The availability of high speed, reliable, secure and sustainable digital connectivity help Ireland to realise its economic and social ambitions, leading to more balanced regional development, ensuring that no one is left behind in the digital transition, and supporting the green transition. To solidify this vision, in December 2022, Ireland launched its [Digital connectivity strategy](#). It sets out goals for digital connectivity in Ireland until 2030. It also supports the achievement of the digital infrastructure targets set out in Dimension 2 of the [National Digital Strategy](#), particularly that all Irish households and businesses will be covered by a gigabit network by 2028 and all populated areas covered by 5G by 2030. These goals are fully consistent with the [EU's Digital Decade](#) targets for digital infrastructure. **For the past few years, the Irish market has featured steady growth of fixed very high-capacity network (VHCN) coverage, reaching 84% in 2022, well above the EU average of 73%. Ireland is thus gradually progressing**

towards reaching the EU 2030 target of 100% fixed VHCN coverage. However, despite a steady increase, the take-up of at least 100 Mbps broadband and at least 1 Gbps broadband by Irish households continues to be below the EU average (50% and 7.5% in Ireland respectively, compared to 55% and 13.8% at EU level respectively). The indicator measuring fibre to the premises (FTTP) coverage shows a continuous growth pattern and is higher than the EU average (72% versus the EU average of 56%). As of Q1 2023, FTTP is the dominant high speed broadband technology in Ireland.

In a bid to reach the EU 2030 target of 100% fixed VHCN coverage, Ireland continues to facilitate gigabit connectivity. It is implementing the National Broadband Plan, which is aligned with the EU's Digital Decade targets. It aims to ensure that high speed broadband services are delivered to all premises across the country, with the ultimate goal of removing the existing digital divide in Ireland. This is being done through investment by companies coupled with state intervention in those parts of the country where private companies have no plans to invest. National Broadband Ireland (NBI) is tasked with implementing the state intervention side of the plan. NBI advises that as of 28 June 2023, over 166 600 premises are available for order and pre-order through local broadband service providers across 26 counties. Over 44 700 premises have been connected to the NBP fibre network with a further 4 398 connection orders pending. The building of the NBP network, which started in 2020, is scheduled to be completed by 2027. A Final Remedial Plan was finalised in December 2022. Under this Plan, NBI is committed to delivering a cumulative target of 185 000 premises passed by the end of January 2024.

In 2021, the investment trend remained stable, with a total investment in electronic communications networks and services of approximately EUR 650 million and an investment share of revenue at over 15%. Service providers are currently investing in the roll-out of FTTP networks. ComReg estimates that in Q2 2022 approximately 1.2 million unique premises (approximately 50%) in Ireland were passed by an FTTP network.

With mobile broadband take-up of 98%, Ireland is the best performer in the EU. It also demonstrates stable growth in overall 5G coverage. Compared to other Member States, Ireland's performance on overall 5G coverage is slightly above average (84% compared to 81% at the EU level), putting it on track to reach the 2030 100% coverage target. Ireland performs above the EU average on 5G coverage on the 3.4-3.8 GHz spectrum band (56% versus the EU average of 41%), a band that is essential for enabling advanced applications requiring large spectrum bandwidth. However, it performs slightly worse than the rest of the EU on the respective rural coverage (9% versus the EU average of 10%).

The overall positive trend should be reinforced in the future, as in January 2023, [ComReg completed a multi-band spectrum award](#), awarding long term spectrum rights across four bands (700 MHz, 2.1 GHz, 2.3 GHz and 2.6 GHz) suitable for providing wireless and mobile broadband services and increasing network capacity. Each of the three mobile network operators won 2x10 MHz of spectrum in the 700 MHz frequency band (one of the three 5G pioneer bands that enables a wider coverage). 700 MHz coverage obligations to be fulfilled within 7 years are: 99% population and 92% of geographic area with 3 Mbps service, and 95% of the population, 90% of motorways and 80% of primary roads with 30 Mbps service. This latest award contributed to a significant increase in assigned 5G spectrum in Ireland (from 29% to 63%), but the country is still below the EU average of 68%¹³⁷. This is mainly because the spectrum in the 26 GHz frequency band has not yet been awarded.

In January 2023, ComReg published consultation proposals on the future significant market power (SMP) regulation related to broadband networks and proposed updated market interventions to

¹³⁷ ComReg awarded the 3.6 GHz frequency band already in 2017.

support investments. It also proposed an updated regulatory regime for wholesale local access (partial deregulation) and wholesale central access markets (full deregulation)¹³⁸. It proposed the SMP regulation of the physical infrastructure access market on a standalone basis on which it is opening up access to the incumbent's duct and poles to promote competition¹³⁹. The current universal service designation remained in place until June 2023.

Ireland has implemented measures to improve the security and resilience of electronic communications networks (e.g. 5G cybersecurity). Since 2019, ComReg has been conducting a network resilience review of risk management practices. The objective of this project is for ComReg to understand the level of risk management undertaken by operators of electronic communications networks and electronic communications services and give operators feedback on best practice methodologies where appropriate.

In terms of technological developments, the predominant technologies/networks in use are FTTP (gigabit-capable passive optical network, XGS-PON), fibre to the cabinet (very high-speed digital subscriber line, EVDSL) and cable (DOCSIS 3.1). On network sharing, the mosaic network sharing agreement between Eircom and Three has been in place since 2014. On site sharing, there is a lot of mobile site sharing on the Irish market.

Ireland continues to support international connectivity. In November 2022, a [subsea telecoms cable 'IRIS'](#), was installed between the west coast of Ireland and Iceland. This new cable will provide direct high capacity links to Iceland with onward connectivity to northern Europe via Denmark. The cable system will greatly increase the capacity and diversity of internet connections in Ireland.

Through the EUR 500 million [Disruptive Technologies Innovation fund](#), the Department of Enterprise, Trade and Employment continues to support collaborative research and innovation in a range of ICT projects. This will be essential for the next generation of semiconductor chips and could contribute to reaching the Digital Decade target of the production of cutting-edge semiconductors in the EU being at least 20% of world production in value by 2030. The Department of Enterprise, Trade and Employment supports initiatives to develop and scale technology companies that are part of the semiconductor value chain. Ireland is home to over 100 semiconductor companies, with over 25 000 people employed in the sector and exporting EUR 13.5 billion worth of products annually. The [Tyndall National Institute](#) is the national focal point for excellence in research, development and training in micro and nano-electronics, photonics, materials and software.

To contribute to the achievement of the deployment of at least 10 000 climate-neutral highly secure edge nodes in the Union by 2030, the Office of the government chief information officer, through the Recovery and Resilience Facility, aims to deploy 18 edge nodes by 2024 to provide coverage across Ireland. This is considered a pilot programme focused on strengthening telecoms for public protection and disaster relief services, such as the Garda (the Irish police force) service.

The first phase of this proposal covered the creation of a platform that consists of compute nodes interconnected with a high-speed low-latency backbone.

In 2022, Ireland carried out procurements to purchase the components and the roll-out of the nodes will start in 2023. Ireland expects to have 8 edge nodes installed in 2023, 18 in 2024, and 23 in 2025. This goes a long way towards reaching Ireland's effort of the overall target.

In December 2022, the government and the EU each committed themselves to investing EUR 5 million in a new initiative to protect the transmission of sensitive data and prevent

¹³⁸ ComReg Document 23/03.

¹³⁹ ComReg Document 23/04.

cyberattacks. The initiative aims to help reaching the Digital Decade target for the Union being at the cutting edge of quantum capabilities by 2030. Having a quantum communications infrastructure (QCI) network is a first for Ireland. The network will be deployed over the next 2 years by the IrelandQCI. It will support an innovative quantum technology ecosystem that will enable the transition from research-based experimental quantum systems and devices to commercialisation-ready quantum communication products, solutions and services. This network forms part of the EuroQCI initiative to build a secure QCI across the EU. Quantum 2030 is Ireland's strategy to develop a high-performing, highly productive, and economically competitive quantum technologies research, development, and innovation (R&D&I) hub.

The main regulatory development in blockchain was Ireland's involvement in the drafting of EU legislation on crypto assets markets. The Central Bank of Ireland has established an innovation hub that enables informal engagement with innovative companies, whereby such companies could develop financial service offerings underpinned by blockchain technology.

The Communications Regulation and Digital Hub Development Agency (Amendment) act was signed into law in March 2023 and entered into force on 9 June 2023. Together with the European Union (Electronic Communications Code) Regulations 2022, which also entered into force in June 2023, the act substantially transposes the **European Electronic Communications Code**. The act updates ComReg's enforcement powers, provides for additional and enhanced consumer protection, and establishes a legal basis for the enforcement of the Electronic Communications Security Measures.

Best practice: Mobile Phone and Broadband Taskforce (MPBT)

The MPBT, made up of state actors and industry representatives, is tasked with identifying and overcoming barriers to better connectivity. It was formally re-established in December 2021 and a [new three year work programme](#) was agreed in April 2022. The work programme focuses on: (i) resolution of problems with permit granting, planning and licensing processes; (ii) more efficient use of infrastructure and assets; and (iii) better outdoor mobile phone coverage. When fully implemented, these actions will remove barriers to telecoms infrastructure rollout, hereby improving access to telecommunications services nationwide. The EU connectivity toolbox is being incorporated into the work of the MPBT.

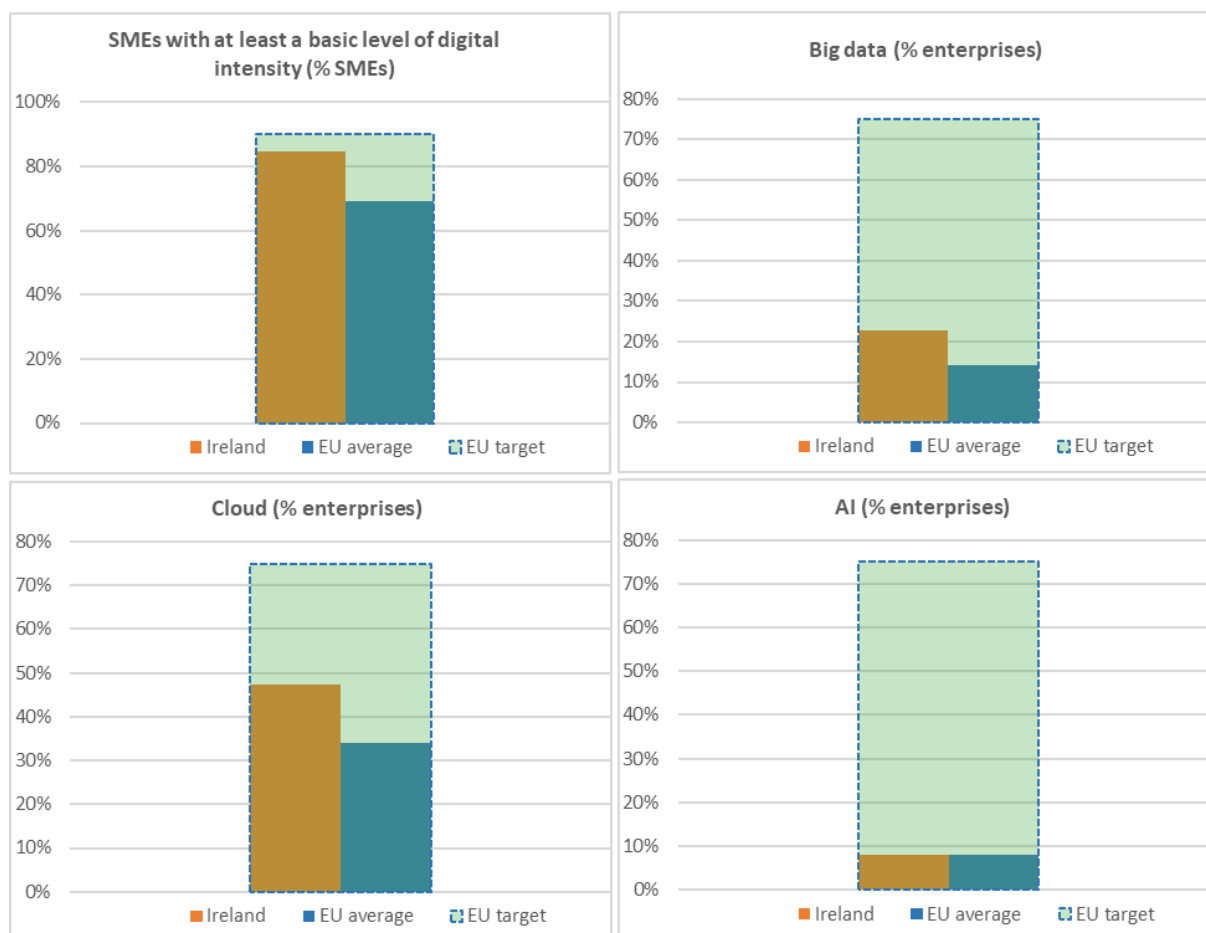
Ireland should accelerate its efforts on connectivity infrastructure. In particular, Ireland should (i) increase its efforts to enable 5G connectivity, in particular 5G coverage in the 3.4-3.8 GHz spectrum band, (ii) undertake a timely public consultation regarding the 26 GHz frequency band, and (iii) further enable gigabit connectivity, in particular regarding the take-up of at least 100 Mbps and at least 1 Gbps broadband.

Measures taken by Ireland in the field of semiconductors and edge nodes should continue in order to help the EU to become a strong market player in these areas.

3 Digitalisation of businesses

	Ireland			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	85%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	28%	24%	24%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	44%	32%	32%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	23%	23%	23%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud¹⁴⁰	NA	47%	47%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	8%	8%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	19%	19%	19%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	32%	33%	35%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	27%	22%	26%	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	18%	11%	11%	9%	
% SMEs	2019	2021	2021	2021	

¹⁴⁰ Enterprises buying sophisticated or intermediate cloud computing services indicator, [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).



As the digital economy in Ireland is running at two different speeds, with only a small proportion of businesses having fully embraced digitalisation, Ireland continues to accelerate digital adoption in all businesses. To make further progress on this, in May 2022, Ireland established the [Enterprise digital advisory forum](#)¹⁴¹ to support the government in the implementation of the business aspects of the [National Digital Strategy](#). The Strategy sets out targets that are very much aligned with the [EU's Digital Decade](#) targets for digitalisation of businesses, for example, 75% of enterprises take-up of cloud, big data or AI by 2030, and 90% of SMEs having at least basic digital intensity by 2030.

With 85% of SMEs in Ireland demonstrating at least a basic level of digital intensity (significantly higher than the EU average of 69%), Ireland is well positioned to contribute to reaching the 2030 EU target of over 90%. Enterprises in Ireland take good advantage of available digital technologies: the use of social media (32%), big data analysis (23%) and cloud (47%) are above the EU average (29%, 14% and 34% respectively) and the use of AI is as widespread as in other Member States on average (8%). Ireland underperforms in electronic information sharing (24% compared to the EU average of 38%) and the use of e-invoices (19% compared to 32% at the EU level). In 2022, SMEs continued to perform above the EU average in digitalisation, with 35% of SMEs selling online and more than a quarter of their turnover coming from e-commerce, a slight improvement on 2021, when those indicators were 33% and 22% respectively. The share of SMEs selling online cross-border (11%) is just above the EU average of 9%.

¹⁴¹ The forum brings together representatives of indigenous businesses of all sizes, multi-national companies, and experts in digital technologies and their adoption by businesses.

Ireland's performance on the uptake of digital technologies by businesses is on par with that of other Member States, but in general the country is significantly behind the EU targets for 2030 (i.e. at least 75% for the adoption of either big data, cloud, or AI technologies by enterprises). For example, on cloud uptake, Ireland is still 28 percentage points away from reaching the 2030 Digital Decade target. As part of Ireland's Recovery and Resilience Plan, to boost the uptake of digital technologies in businesses, in June 2022 the government launched an EUR 85 million [Digital transition fund \(DTF\)](#) that will run until 2026 and aims to support at least 800 businesses. It will enable the digitalisation of businesses across products, processes, supply chains and business models, as well as productivity gains, access to new markets, increased innovation and improved competitiveness. The DTF includes the following: digitalisation vouchers (as of June 2022 called 'digital discovery'), innovation in digital processes, developing digital marketing capability, strategic consultancy, smaller and larger research and development projects. By the end of 2022, 159 businesses had been grant-approved by [Enterprise Ireland](#)¹⁴² to the tune of over EUR 10 million in funding. This suggests that Ireland is well on track to reach the target of supporting the digitalisation of at least 800 businesses by 2026. In addition, in Q1 2023, work began on the development of a voucher scheme to support the digitalisation of the locally traded sector that has not traditionally received direct funding from the government to digitalise. The funding model being considered will be aligned with the indicators of the [Digital intensity index](#). Ireland has engaged with other Member States on how similar schemes operate.

In July 2022, the government issued a [Statement on the role of data centres in Ireland's Enterprise strategy](#). It sets out a set of principles to harness the economic and societal benefits that data centres bring, facilitating sustainable data centre development that adheres to Ireland's energy and businesses policy objectives.

As only 8% of businesses in Ireland use AI, which is significantly lower than the 2030 EU target of at least 75%, Ireland continues to work on encouraging the take-up of AI. It continues to implement the 2021 [National AI Strategy](#), which includes a strand dedicated to the adoption of AI by businesses. The [Enterprise Digital Advisory Forum](#) has dedicated one of its workstreams in its work programme to further spurring the adoption of AI by businesses in Ireland. The Office of the Government Chief Information Officer is leading the digital transformation of the public service and ensuring an ethical and trustworthy approach to AI development, adoption and use. In May 2022, the government appointed Dr Patricia Scanlon as Ireland's first AI ambassador to lead a national debate on the role of AI in people's lives and to encourage more businesses to adopt it.

Ireland is participating in the network of European digital innovation hubs (EDIH) that are helping businesses to digitalise. All four of Ireland's designated EDIHs passed the Commission threshold making them eligible to become part of the EDIH network. Two EDIHs are expected to be co-funded through the [Digital Europe Programme](#) and the [Recovery and Resilience Facility](#). The remaining two hubs have been awarded a 'seal of excellence', which permits them to become full EDIH network members subject to national funding (entirely provided for under the [Recovery and Resilience Facility](#)). Two of these EDIHs, Factoryxchange (FxC) and Data2Sustain, were established in February 2023 and another, ENTIRE, was established in May 2023. Each EDIH will have a budget of EUR 1.9 million in 2023. [CeADAR](#)¹⁴³ will become a national AI hub. FxC will focus on providing services to enhance skills and training to accelerate the digital transformation of regional manufacturing SMEs in Industry 5.0. Data2Sustain will aim to contribute to digitalisation by harnessing regional AI skills,

¹⁴² Enterprise Ireland is the government organisation responsible for the development and growth of Irish enterprises in world markets.

¹⁴³ Technology centre for applied data analytics and machine intelligence.

thereby contributing to reaching regional, national and European targets and KPIs. ENTIRE will make expertise, technology platforms and infrastructure/testbeds available to enable companies to experiment with new digital technologies including AI.

The [Digital Transition Fund](#) continues to support the transformative digitalisation of businesses in Ireland, particularly SMEs. This funding is intended to help companies at all stages of their digital journey: from the early days of simply going online to the digitalisation of products and business processes, to facilitating exporting and to using digital technologies to develop new markets and business models. Besides that, the trading online voucher scheme (TOV) offers a voucher of up to EUR 2 500 (50% co-funded by the applicant) to help businesses develop their online trading capability. The scheme includes training sessions that cover various topics, such as developing a website, digital marketing, social media for business and search engine optimisation. By the end of December 2022, 1 790 trading online vouchers (TOVs) had been approved for EUR 3 830 111.14.

EDIHs will also help SMEs. For example, CeADAR will give SMEs access to a dedicated high-performance computing infrastructure and enable them to accommodate very large datasets. FxC will develop and deliver digital skills in AI and advanced skills in digital technologies for SMEs.

Ireland currently has 8 unicorns¹⁴⁴ and 22 potential future unicorns¹⁴⁵ (start-ups whose market valuation is between EUR 100 million and EUR 1 billion). The country is therefore expected to make a significant contribution to reaching the 2030 EU target of at least doubling the number of unicorns. To support the growth of innovative high potential start-ups (HPSUs) with global ambitions so they can scale-up and potentially achieve unicorn status, [Enterprise Ireland](#) has put a number of mechanisms in place. For example, in the second half of 2022, it launched a new [Pre-seed start fund](#) which doubled the amounts available for investment from EUR 50 000 to EUR 100 000. The EUR 90 million [Irish innovation seed fund](#) (launched by the European Investment Fund and [Enterprise Ireland](#) in February 2022) invests in other specialist fund managers who will target high-growth innovative enterprises, that are at the early stages of external funding for innovative, high growth, scalable sectors. From 2010 to 2022 [Enterprise Ireland](#) has supported the development of 1 197 HPSUs. Almost 80% of them approved up to 2020 are still in business. They make a significant contribution to the Irish economy (e.g. they had over 10 000 employees in 2020 and the employment growth is accelerating). [Enterprise Ireland](#) has set itself a target that by 2025, 35% of HPSUs reach EUR 1 million in sales and/or 10 jobs within 3 years of HPSU approval, and it is on track to reach this target.

EDIHs are also intended to support enterprises and organisations by providing financing advice. CeADAR will provide support to help more SMEs in tapping into existing national and European financial investments and exploring new relevant financial instruments. For example, FxC aims to facilitate access to finance and advanced business services for SMEs.

The implementation of the [National cyber security strategy 2019-2024](#) is progressing well. Of the 20 measures set out in 2019, 11 have been completed and of the remaining 9 measures, 1 has been amended under the [midterm review](#) process (as it has been superseded by proposals such as NIS 2¹⁴⁶), 9 other measures are all partially completed. The mid-term review of the National cyber security strategy 2019 - 2024 was published in June 2023. It sets out 18 new strategic actions to be

¹⁴⁴ Dealroom (date of extraction 16/01/2023).

¹⁴⁵ Dealroom (date of extraction 24/03/2023).

¹⁴⁶ Directive (EU) 2022/2555 of the European Parliament and of the Council of 14 December 2022 on measures for a high common level of cybersecurity across the Union, amending Regulation (EU) No 910/2014 and Directive (EU) 2018/1972, and repealing Directive (EU) 2016/1148 (NIS 2 Directive), (OJ L 333, 27.12.2022, p. 80).

implemented within the lifetime of the strategy. These have been developed following a public consultation as well as engagement with stakeholders from across the public and private sectors.

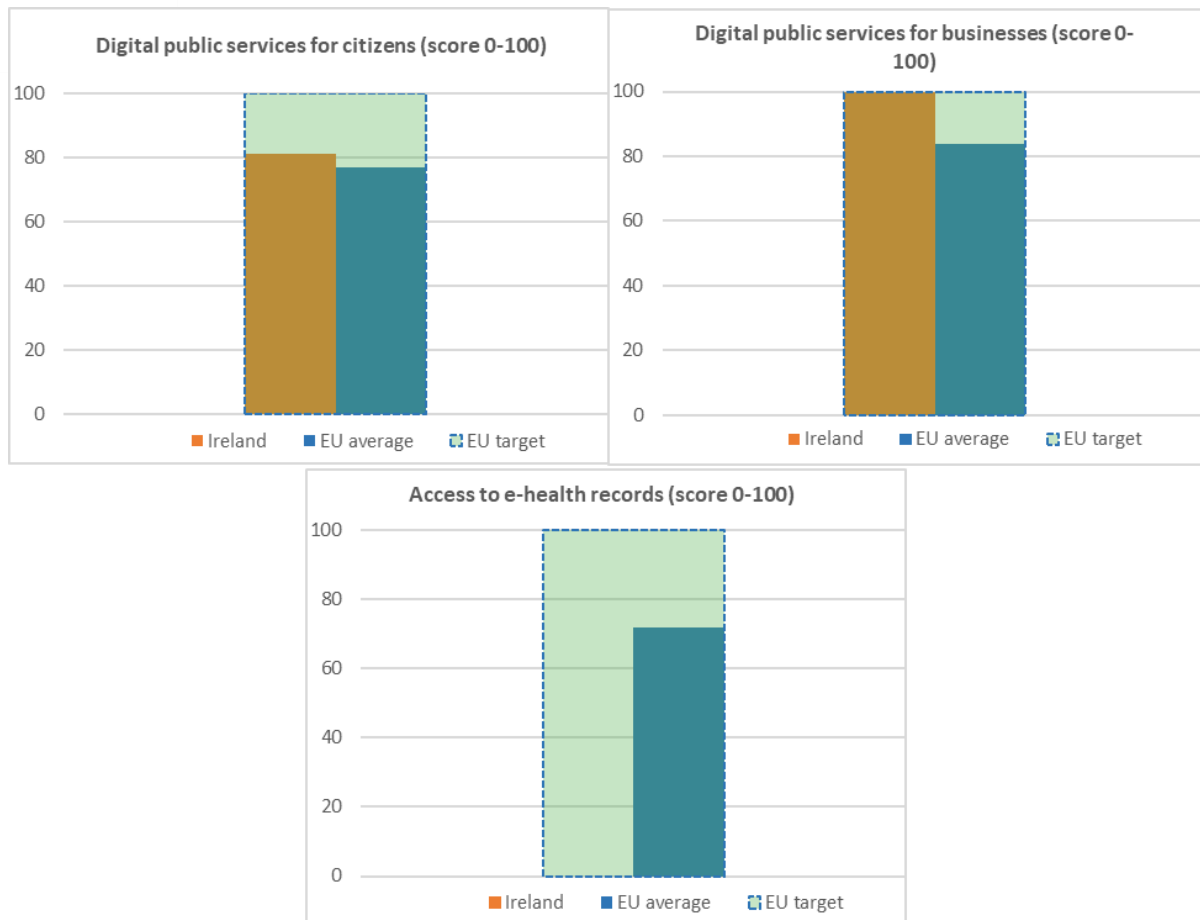
The Irish government will continue to invest in building the capacity of the National Cyber Security Centre (NCSC) particularly in its ability to monitor and respond to cyber security incidents and growing threats in the state such as ransomware. The midterm review will also ensure Ireland plays a full and active part in the cyber discussions in the EU and internationally and is fully prepared to implement the revised EU Network and Information Systems Directive (NIS2) from next year.

The National Cyber Security Centre is undergoing a period of expansion and development as a result of the government decision taken in July 2021 to implement the recommendations from the Capacity Review. In mid-2022, it was assigned additional functions as regards cybersecurity certification under the Cyber Security Act Regulation (2019/881) and the National Co-ordination Centre role for Ireland under the European Cybersecurity Competence Centre and Network Regulation (2021/887).

Ireland should continue implementing its policies in the area of digitalisation of businesses, in particular to advance the adoption of big data, cloud and particularly AI across the entire business base of the country.

4 Digitalisation of public services

	DESI 2021	Ireland		EU	EU
		DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	88%	74%	
			2022	2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	80	81	77	100
		2021	2022	2022	
4a3 Digital public services for businesses Score (0 to 100)	NA	100	100	84	100
		2021	2022	2022	
4a4 Pre-filled forms Score (0 to 100)	NA	59	61	68	
		2021	2022	2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	71	71	65	
		2021	2022	2022	
4a6 User support Score (0 to 100)	NA	93	93	84	
		2021	2022	2022	
4a7 Mobile friendliness Score (0 to 100)	NA	99	98	93	
		2021	2022	2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	0	72	100
			2022	2022	



In Ireland, the public services provided to businesses and the general public are highly digitalised. To create a trusted, user-driven, intuitive, inclusive and efficient digital government service, Ireland is determined to further digitalise public services and ensure that the data held by them is used safely and effectively. Ireland continues to work on reaching the public service related targets set out in the [National Digital Strategy](#), notably that 90% of applicable services will be used online by 2030 and 80% of eligible citizens will use MyGovID by 2030.

Ireland has a perfect score of 100 in digital public services for businesses, so it has already reached the 2030 EU target for this indicator. In 2022, the level of digital public services for citizens increased by a single point (to 81) and was above the EU average (77). If Ireland intensifies its efforts, it could make a positive contribution to reaching the 2030 EU target for this indicator. It scores high on e-government users (88% compared to 74% at EU level). In 2022, its performance in user support and the transparency of service delivery, design and personal data remained the same (93 and 71 respectively), but slightly decreased in mobile friendliness (from 99 in 2021 to 98 in 2022). Nevertheless, in all those three indicators Ireland scored above the EU average. Its performance concerning the pre-filled forms increased slightly (from 59 in 2021 to 61 in 2022), it was, however, below the EU average (68 in 2022). Ireland is among the top three performers in the EU on open data maturity (95%)¹⁴⁷. There are no access opportunities for citizens in Ireland that allow them to access routine healthcare information in a digital environment, apart from online access to COVID-19 test results and the EU Digital COVID-19 Certificate. This alone, however, does not qualify Ireland to score points for this Digital Decade target's indicator. Ireland ranks 27th with a score of 0.

¹⁴⁷ Open Data in Europe 2022 | data.europa.eu.

Ireland continues to implement the [Connecting government 2030: Digital and ICT public service strategy](#) (published in March 2022), which supports the [National Digital Strategy](#) and is aligned with the [EU's Digital Decade](#) targets. It focuses on the user-centricity, security and accessibility of digital public services. The strategy highlights (i) Ireland's ambition to provide better access to trusted, high quality digital government services, (ii) its determination to ensure that services are delivered in an equitable, inclusive and sustainable manner with better service to those who need assistance, (iii) the importance of the secure and transparent reuse of personal data and (iv) opportunities to co-create government services.

A digital inclusion roadmap is due to be published in the second half of 2023. It will set out measures to better support people who may not be able to access services online. The high-level commitments of the roadmap will include achieving digital inclusion through a coherent and integrated whole-of-government approach to adopting the principle of 'leave no one behind'.

A preferred bidder has been selected to build the government data centre (set out in Ireland's Recovery and Resilience Plan). The 2023 ICT apprenticeship programme will see over 100 apprentices appointed to 23 civil service organisations in Q1 2023. Work is underway on a national life events portal that will host key life events procedures online. The Enterprise Digital Advisory Forum will act in an advisory capacity for GovTech development in addition to its existing work. The Forum's work will now include advising on the actions in the GovTech Priority Action Plan which is led by the Office of the Government Chief Information Officer.

As there are no opportunities for citizens in Ireland to access electronic health records, a lot needs to be done in this area in order to reach the EU 2030 target (i.e. that 100% of EU citizens have access to their electronic health records). To address this shortcoming, Irish authorities are developing several solutions. The development of a Health information bill is underway, and the general scheme was presented to the government in December 2022. This will ensure that Ireland has a fit for purpose national health information system, including by providing for a national health information guardian (a standards-based approach to health information) and a national health information authority (with funding under budget 2023 to support its design and development). To update the [2013 eHealth strategy](#), the development of a new 2023-2027 Digital healthcare framework is underway. It will set out the roadmap for digital health in Ireland for the next decade, present options for investing in and deploying electronic health records and explicitly state the objective of giving all Irish citizens access to their electronic health records by 2030.

Ireland is investing considerably in the technical infrastructure required for the safe clinical and administrative systems needed to collate and share the data necessary for the provision of electronic health records. The provision of electronic health record systems for the [New children's hospital](#) is underway with a contract signed with an international vendor following approval by the government in July 2022. The deployment plans for the electronic health record system to the maternity hospitals in Limerick and the Coombe in Dublin are being adjusted to take the 2021 cyberattack into account. Ireland has established a national e-pharmacy programme, including a national electronic prescription project. It has also started to roll out the national individual health identifier across general medical practice systems and hospital patient administration systems.

The [MyGovID](#) digital identity service aims to give individuals safe and secure access to digital public services in Ireland. It is designed to facilitate a more joined-up government approach, with more sharing, reuse and integration of information between public bodies. It provides access to a range of public services in welfare, revenue, transport and education with more coming soon. In Q1 2023, there were over 1.88 million verified [MyGovID](#) accounts, representing 49% of the adult population.

However, Ireland has not yet notified the [MyGovID](#) scheme to the Commission under the eIDAS Regulation¹⁴⁸.

Ireland is involved via public and private entities in one large-scale pilot project funded under the Digital Europe Programme, with an overall grant request of approximately EUR 0.15 million. According to the 2022 [eGovernment Benchmark](#), Ireland has maintained the score of 6% on cross-border eID services, while the EU average increased from 21.7% to 23.8%. It has also maintained full transparency in service design (100%).

Ireland is one of the strong performers (second position) in the [EU benchmarking of national investments in innovation procurement of digital solutions](#). The investments in transformative digital technologies, including those that are new to the market, are well above the EU average.

As part of a co-ordinated approach to digital policy and regulation, the 2022 Online Safety and Media Regulation Act amends the 2009 Broadcasting Act to establish a Media Commission (to be known as *Coimisiún na Meán* in Irish), dissolve the Broadcasting Authority of Ireland, establish a regulatory framework for online safety, update the regulation of television broadcasting and video on-demand services, and transpose the revised Audiovisual Media Service Directive. A *Coimisiún* has also been designated as the digital services co-ordinator for the purposes of overseeing the implementation of the Digital Services Act, which will lead to the assignment of further functions.

Ireland is committed to reducing emissions by 51% across all sectors of the economy by 2030 and to reaching net zero emissions by 2050. The annual climate action plans outline the actions and measures that will enable Ireland to reach these targets. For example, the plan for 2023, among others things, sets out the following actions: promote the digital transformation, sustainable remote working practices and the roll-out of the [National broadband plan](#).

The [Climate toolkit 4 business](#) helps Irish SMEs and micro enterprises to begin their transition to decarbonisation. It helps them understanding their current carbon footprint and provides them information on what resources are available to help them reduce their emissions. The Climate4Business Toolkit was launched in December 2021 and so far, 7 614 companies have completed the calculator and generated their climate action report.

Given the role that digital hubs play in supporting balanced regional, economic and social development, the government has identified and mapped every enterprise, scaling, R&D, co-working and community hub in Ireland. These hubs were invited to join the National Hub Network (NHN) and its shared online platform, [connectedhubs.ie](#). In 2022, the government provided EUR 5 million in targeted funding to established hubs (this followed an investment of EUR 9 million under the same measure in 2021).

Although the [National Digital Strategy](#) sets out a target of 80% of eligible citizens using [MyGovID](#) by 2030, this goal is not entirely aligned with the [EU's Digital Decade](#) target of 100% of Union citizens having access to electronic identification (eID). Nevertheless, given a steady increase of [MyGovID](#) accounts observed over the past years, Ireland is expected to make an important contribution to reaching the EU target. The notification of MyGovID to the Commission is still pending.

¹⁴⁸ Regulation (EU) No 910/2014 of the European Parliament and of the Council of 23 July 2014 on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC (OJ L 257, 28.8.2014, p. 73).

Best practice: gov.ie

The single public service portal, [gov.ie](https://www.gov.ie), is designed to create a much better user experience by thematically presenting and simplifying information about public services to ensure that they are not only easy to find, but also easy to follow and navigate. User centricity, inclusivity and accessibility are of key importance. [Design principles for government in Ireland](#) (published in October 2022) and [digital user experience \(UX\) checklist](#) support the provision of a quality service. Most government departments are on [gov.ie](https://www.gov.ie) with the final two in the process of transitioning shortly. The [gov.ie](https://www.gov.ie) service continues to be the trusted platform for government communications, with over 70 million page views in 2022.

Ireland should continue implementing its policies to digitalise public services. In particular, it should ensure everyone throughout the country can access the electronic health records.



Digital Decade Country Report 2023

Italy

Introduction

Italy has untapped digital potential to contribute further to the collective efforts to achieve the EU's Digital Decade targets. In recent years, Italy has made significant advances in terms of infrastructure, but performs below the EU average on skills and some aspects of the digitalisation of public services. The strategies adopted on cloud, blockchain, AI, on cybersecurity, and recently the strategy for the telecom sector, together with the reforms and investments under the Recovery and Resilience Plan, create a solid framework for progressing towards a sustainable and inclusive digital transformation.

The adoption of the [National Strategy on Cybersecurity](#) for 2022-2026 is an important development contributing to the Digital Decade objective to strengthen resilience. It aims at ensuring the protection of national strategic assets, responding to national cyber threats, incidents and crises, and promoting the secure development of digital technologies.

Italy is clearly aware of threats disinformation poses to democracy. Besides information campaigns, in particular during election periods, the National Authority for Electronic Communications actively monitors the information landscape through an Observatory on Online Disinformation and Pluralism and runs an in-depth exchange through a Working Table on Platform involving industry, journalist and consumer associations.

Italy is collaborating with other Member States in exploring the setting up of a **European Digital Infrastructure Consortium (EDIC)** on the European Cybersecurity Skills Academy. Italy is one of the Member States that have jointly submitted a formal application to set up the European Blockchain Partnership and the EDIC on European Blockchain Infrastructure, supporting EU-wide cross-border public services.

Digital in Italy's recovery and resilience plan (RRP)

The Italian RRP amounts to EUR 191.5 billion. EUR 48 billion of this (or 25%) are devoted to the digital transformation; out of this amount, EUR 42 billion are expected to contribute to Digital Decade targets¹⁴⁹.

So far, EUR 67 billion has been disbursed to Italy, including pre-financing, and two payment requests have been approved. The third payment request has also received the Commission's positive preliminary assessment in July 2023.

The first payment request was disbursed in April 2022. Italy achieved 51 milestones and targets. These were linked to investments and reforms contributing to the digital transformation. These include, in particular, an ambitious programme for the digitalisation of the Italian public administration set out in the RRP: (i) the 'cloud first and interoperability' reform, including a new cloud strategy and legislative amendments introducing incentives for and rules on cloud adoption by public administrations; (ii) the reform of ICT procurement reform, streamlining and accelerating the

¹⁴⁹ Each Recovery and Resilience Plan must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plans had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or has no impact (0%) on digital objectives, using Annex VII of the RRF Regulation. Combining the coefficients with the cost estimates of each measure allows assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to allow for an estimation of the possible contribution of RRF measures to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice of potential ongoing revisions of the plan.

procurement process for ICT services and assets; (iii) the publication of calls for expression of interest to select projects under the 'Important Projects of Common European Interest' (IPCEIs), including 'microelectronics II' and 'next generation cloud infrastructure and services'; (iv) and drawing up the national programme for the guaranteed employability of workers and a national plan for new skills.

The second payment request was disbursed in November 2022. Italy achieved 45 milestones and targets. These were also linked to digital transformation and reforms.

For example, Italy awarded public contracts for five connectivity projects to complete the national ultra-fast and 5G telecommunications networks throughout the country. These projects are expected to significantly contribute to Italy's digital transition objectives and reduce the digital divide: *Italia a 1Giga* (Italy at 1Giga), *Italia 5G* (Italy 5G), *Scuole connesse* (Connected Schools), *Sanità connessa* (Connected Healthcare facilities), and *Collegamento isole minori* (Connected smaller islands)¹⁵⁰.

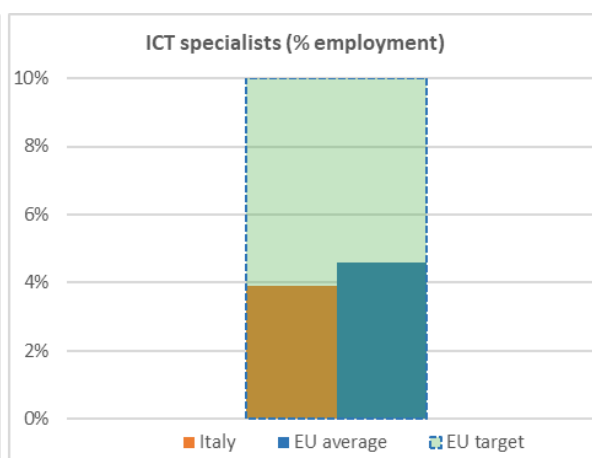
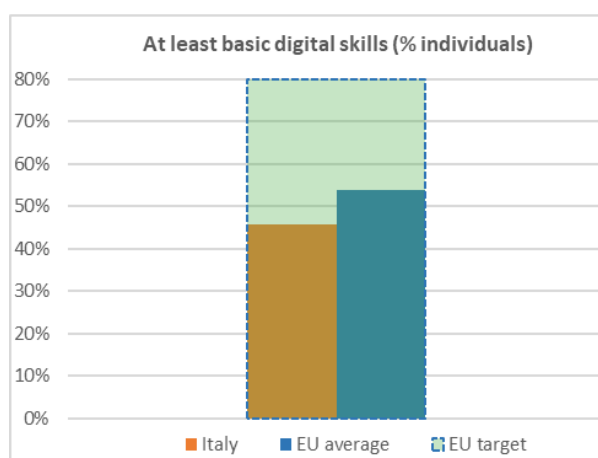
Moreover, the country adopted a legal act allocating the required funding to support projects participants in IPCEIs, including the IPCEIs on microelectronics and next generation cloud infrastructure and services. Italy also adopted the national plan School 4.0, to transform classrooms into innovative learning environments through the use of digital technologies. It signed an institutional development contract between the regions and the health ministry paving the way for investments in the digitalisation of 280 hospitals and homecare and telemedicine infrastructure. The country also awarded contracts to create national research centres, some of them in key emerging digital technologies.

Under the third payment request, Italy has provided evidence of the achievement of additional milestones and targets linked to investments and reforms contributing to the digital transformation, including cybersecurity.

¹⁵⁰ An updated status of the NRRP Plans related to digital infrastructures is available on the dedicated online platform: <https://connetti.italia.it/en>.

1 Digital skills

	Italy			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use % individuals	76%	80%	83%	89%	
1a2 At least basic digital skills % individuals	NA	46%	46%	54%	80%
1a3 Above basic digital skills % individuals	NA	23%	23%	26%	
1a4 At least basic digital content creation skills % individuals	NA	58%	58%	66%	
1a5 Enterprises providing ICT training % enterprises	16%	16%	19%	22%	
1b1 ICT specialists % individuals in employment aged 15-74	3.6%	3.8%	3.9%	4.6%	20 million ~10%
1b2 ICT graduates % graduates	1.3%	1.4%	1.5%	4.2%	



More than half of the people in Italy still do not have at least basic digital skills, making it very difficult for them to benefit from digital opportunities and exercise their rights of citizenship in an increasingly digitalised world. This significantly impacts the inclusiveness of the digital transformation in Italy. Italy's performance on above basic digital skills is closer to the EU average (23% against 26%) but still displays a gap that needs to be addressed.

The national strategy on digital education and skills has not been fully implemented yet. An annual Monitoring Operational Plan has been implemented specifically to track the progresses of the national strategy for digital skills, the [second assessment](#) recognizes that for some indicators the observed average annual progress is lower than the expected average annual progress. The assessment does not yet cover the impact of measures implemented under the RRP.

The [structured dialogue on digital education and skills](#) (involving the European Commission and many Member States, including Italy) helped to trigger a much-needed coordination between key public and private players at national level, which is expected to accelerate the implementation and the effectiveness of the digital skills strategy.

In addition, several initiatives supporting digital skills development continued and were strengthened under the umbrella of the [Repubblica Digitale \(Digital Republic\)](#). A dedicated fund ([Fondo per la Repubblica Digitale](#)) was set up as a public-private partnership to further support initiatives aiming to increase digital skills, and the first two initiatives 'Futura' and 'Onlife' were launched. They use a pay-for-performance method and are focused on reskilling and upskilling, targeting women in particular.

The Digital Civil Service is another major initiative that is expected to significantly reduce the risk of digital exclusion by raising the level of digital skills of 1 million citizens by 2025. Another relevant initiative is the network of Digital Facilitation Centres that are physical access points, usually located in libraries, schools and community centres, which provide citizens with in person and online training. The overall goal is to set up 3 000 centres, with approximately 1 200 located in southern Italy to support inclusiveness.

There have also been many media education initiatives aimed at increasing the media literacy skills of the population, in particular raising awareness to counter disinformation. Notably, the [Italian Digital Media Observatory](#) joined forces with universities and private stakeholders to increase media and information literacy and help citizens develop a critical understanding of online media.

Digital competence plays a crucial role in the design of Italy's new educational system. The new system aims to help children acquire the skills needed to face the challenges of the future, overcoming inequalities and gaps between different parts of the country. Reforms and investments set out in the RRP to improve infrastructure and competence in schools continue under 'Futura - Education for the Italian Future', which aims to build innovative schools designed to serve the whole community. The reform of school programmes for 2022/2023 is expected to help schools include more STEM subjects. The E-Portfolio initiative will target secondary school students, together with a specific digital platform, to encourage them continue STEM studies. These initiatives aim to create synergies between education, university and the world of work¹⁵¹. Moreover, the [School 4.0](#) plan was adopted to transform 100 000 classrooms into innovative, connected and digital environments, suitable for new ways of learning. It has been complemented by specific teacher training since 2022, which aims to train 650 000 school leaders, teachers and staff by 2024.

Another initiative is the ITS Academy reform. This aims to guide technical and professional institutes towards the innovation output of the National Industry 4.0 plan and the significant digital innovation happening in all job sectors. The main goals are to increase the training offer at higher technical institutes and improve professional development paths by adapting laboratories to the new training needs of the digital transition. Italy should continue implementing measures that benefit all education levels: primary, secondary and tertiary. In addition to teaching ICT as a standalone subject, digital should be integrated across all subjects to ensure school curricula take into account how digital technologies are used in everyday life and at the workplace.

Regarding the Digital Decade target on ICT specialists, Italy's share of 3.9% remains below the EU average of 4.6% and the share of women among ICT specialists is 16%, below the EU average of 18.9%. Future prospects are undermined by low rates of ICT graduates and enrolment.

¹⁵¹ Decreto Ministeriale n. 328 del 22 dicembre 2022.

The importance of developing new skills and updating job profiles is recognized as a common priority for almost all categories of companies. However, the number of enterprises actually offering training to their employees is still insufficient with 19% compared to 22% at EU level. Progress could be driven by the collective labour agreements signed in the last two years in different sectors, which included digitalisation as one of the strategic priorities for vocational training. Moreover, there is an opportunity for structures as the EDI (Digital Ecosystem for Innovation) and the Competence Centres to improve technical knowledge of the workforce, in particular for SMEs. By December 2022 the latter had already provided more than 138 000 hours of qualified training on advanced technologies. Specific initiatives to foster ICT competences among SMEs are also supported by tax credits.

Italy's number of ICT graduates remains significantly below the EU average and the ambitions for the Digital Decade, as the country is unable to meet the business demand for qualified professionals. Even though the formative offer is evolving and expanded by new flexible training offers, the share of ICT graduates remains particularly low, at only 1.5%, compared to an EU average of 4%, and less than a fifth are women. Moreover, while women account for more than half of graduates (57.7%), only 8.8% have a STEM degree (slightly above the EU average of 8.1%).

The government is making large-scale investments in research projects under the Recovery and Resilience Plan to limit brain drain and increase the attractiveness of Italy's universities and research ecosystem which is low compared to other European Countries and lacks adequate remuneration and incentives. These measures are not limited to the ICT field but are highly relevant. Moreover, the gap between the different Italian regions is reflected in the university and research activities. For 2023-24, 99 universities will be able to offer 18 770 doctoral scholarships, including 13 292 scholarships for innovative doctorates in partnership with private companies to bring scientific knowledge closer to the market and vice versa. Companies co-financing innovative doctoral scholarships at 50% can benefit from a tax relief provided they hire PhD graduates in permanent positions.

The Ministry of Universities and Research launched the second cycle of the *Dipartimenti di Eccellenza* initiative for 2023-2027, providing selected departments with an average of EUR 1.5 million in funding over the next five years. The introduction of result-based funding has had a positive impact on Italian research.

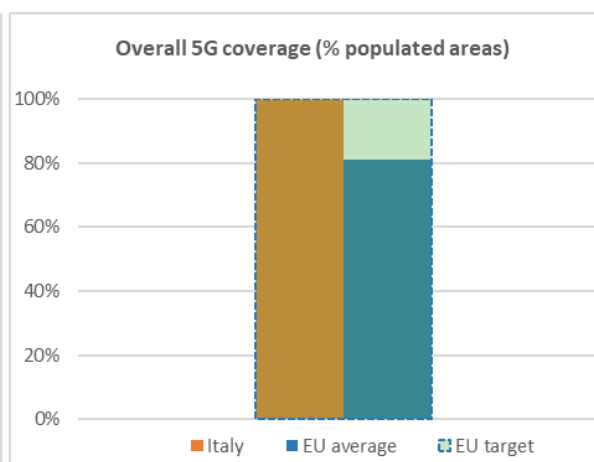
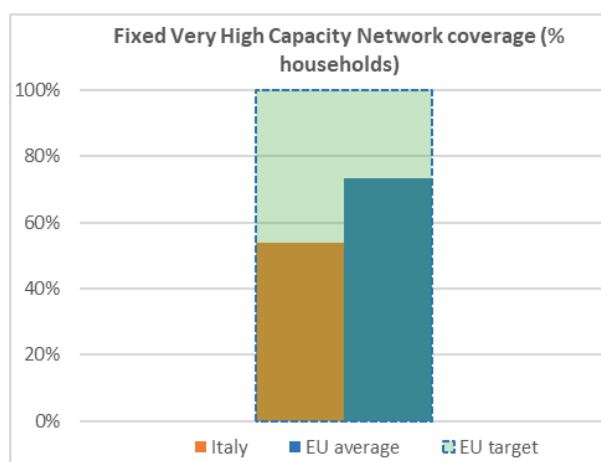
Reinforcing basic and advanced digital skills is a precondition for Italy to exploit the full potential of the digital transformation and bridge existing digital divides.

Italy should step up its efforts on digital skills, in particular in upskilling and reskilling of its labour force. Moreover, it should introduce skills forecasting to match the needs of its labour market and improve cooperation particularly with industry and civil society. Italy should increase the capacity of the educational systems to train more ICT specialists, leveraging the RRF funding¹⁵².

¹⁵² The recommended policies, measures, and actions in this document reflect the Commission Communication 'Report on the state of the Digital Decade' COM(2023) 570.

2 Digital infrastructures

	Italy			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up	41%	52%	60%	55%	
% households	2020	2021	2022	2022	
2a2 At least 1 Gbps broadband take-up	6.1%	9.7%	13.4%	13.8%	
% households	2020	2021	2022	2022	
2a3 Fixed Very High Capacity Network (VHCN) coverage	34%	44%	54%	73%	100%
% households	2020	2021	2022	2022	
2a4 Fibre to the Premises (FTTP) coverage	34%	44%	54%	56%	
% households	2020	2021	2022	2022	
2b1 Mobile broadband take-up	70%	80%	80%	87%	
% individuals	2018	2021	2021	2021	
2b2 Overall 5G coverage	8.1%	99.7%	99.7%	81%	100%
% populated areas	2020	2021	2022	2022	
2b3 5G spectrum	60%	60%	93%	68%	
Assigned spectrum as a % of total harmonised 5G spectrum	2021	2022	2023	2023	



Italy performs well in digital infrastructures and has made some remarkable progress towards the Digital Decade targets. However, efforts are still needed.

Concerning the Digital Decade target for fixed Very High Capacity Network (VHCN), Italy still lies below the EU average. Only 54% of households are covered, compared to 73% in the EU, but there has been a 10 percentage points jump between 2021 and 2022. All VHCN coverage in Italy is provided through fibre-to-the premises (FTTP). A considerable gap still exists between urban and rural areas. Only 26% of rural areas are covered by fixed VHCN. Fixed wireless access technology capable to deliver VHCN performances can help to close this geographical gap faster. Significant investments are still needed to reach the Digital Decade target of 100% of households covered by VHCN by 2030.

The percentage of households with fixed broadband take-up of at least 100 Mbps is 60% (higher than the EU average of 55%) and has risen significantly, by 8 percentage points, between 2021 and 2022.

In 2022, Italy made progress concerning the percentage of households with fixed broadband of at least 1 Gbps, which reached 13.4% and is in line with the EU average of 13.8%.

Italy progressed on several RRP measures linked to the Digital Decade targets and objectives for both fixed and mobile broadband coverage. The Italian RRP allocates EUR 6.7 billion to support the deployment of connectivity infrastructure, the highest allocation in all Member States. This has resulted in Italian investments in connectivity increasing over the last two years. In this context, the Italian National Regulatory Authority for electronic communication has set the new rules for funding projects – under national RRP – aimed at increasing availability of gigabit connectivity and 5G coverage. This includes setting wholesale service access prices, consistently with the market and regulatory conditions.

The *Piano Italia a 1 Giga* aims to provide connectivity of at least 1 Gbit/s download and 200 Mbit/s upload in grey and black market failure areas, identified as a result of mapping activities. Its implementation is progressing and is expected to be completed by 30 June 2026. As of December 31, 2022, a total of 41 896 dwellings comprising 88 412 households were connected.

The implementation of the *Piano Banda Ultralarga* (BUL)¹⁵³ is also in progress, with a total of 3.255 FTTH municipalities that have been already marketed at the end of 2022; 781 FTTH municipalities that have been successfully tested; 4.961 fibre sites opened; and 972 FWA sites that have been positively tested. The project is scheduled for completion in September 2024.

Italy has achieved nationwide 5G coverage in 2021 and 93% of the harmonized spectrum was assigned in 2023. Concerning 5G coverage on the 3.4-3.8 GHz spectrum band, which is very important for enabling advanced application, the overall percentage of households covered is 80%.

Mobile broadband take-up in Italy is below the EU average (80% vs. 87%), despite a 10 pp increase between 2018 and 2021 (from 70% to 80%).

Some stakeholders pointed out that structural issues will likely delay progress towards the Digital Decade connectivity targets in Italy. These include the administrative and bureaucratic burden on operators, in particular building permits and other unexpected issues, such as the spike in prices due to inflation.

One of the barriers to 5G deployment, in particular for standalone offers, is the limit to electromagnetic emissions, which is considerably lower in Italy than the EU recommendation. This has a considerable impact on network deployment as some sites cannot be upgraded with any 5G equipment or with optimal power due to the electromagnetic spectrum being saturated by existing signals. This also creates barriers for new entrants.

The *Piano Italia 5G* included in the Italian RRP aims to encourage the deployment of 5G mobile networks in market failure areas to meet the mobile connectivity needs of citizens, businesses and public administrations. The Plan has two measures. The ‘backhauling’ measure plans to bind back to fibre some 11 098 existing radio mobile sites that are not connected with fibre and would not be until at least 2026, preventing the deployment of 5G and/or more advanced technologies. The tender for this work was awarded in May 2022. The ‘densification’ measure plans to deploy new 5G radio mobile sites in more than 1 385 white areas of the country. Contracts to start the work were signed

¹⁵³ A daily update on the status of BUL is provided by the online dedicated platform: <https://bandaultralarga.italia.it/en/>.

with the selected companies in July 2022 and infrastructure activities are expected to be completed by 30 June 2026.

Overall Italy has made some remarkable progress towards achieving the Digital Decade targets, especially on mobile connectivity, and its RRP represents a major boost for investment. The newly adopted Strategy for the ultrabroad, designed to further reinforce the telecom sector, is in line with these actions. In particular, it supports the creation of an edge cloud computing network to contribute to Digital Decade target. It will be crucial to make the best use of the available resources to further decrease the gaps that still exist with the other Member States in certain areas, especially fixed connectivity, and at the same time consolidate the important achievements made in mobile connectivity, in particular for advanced applications.

Italy is continuing to strengthen its positioning in the sector of semiconductors technologies.

Besides investments planned under the RRP for participating in the IPCEI ‘Microelectronics and Communication Technologies’, a new Italian Center for the Design of Semiconductor Integrated Circuits has been created with an initial allocation of EUR 10 million for its establishment in 2023 and another 25 million a year from 2024 to 2030. The Center will promote the design and development of integrated circuits, strengthen the professional training system in the field of microelectronics and help establish a network of universities, research centres and companies to support innovation and technology transfer in the sector.

Italy is at the forefront of High Performance Computing (HPC) and quantum computing, thanks to a joint investment¹⁵⁴ of EUR 120 million in LEONARDO, a world-class supercomputing system developed and assembled in Europe, which is currently the fourth most powerful supercomputer in the world and it will be further improved to become one of the first European-built quantum computers.

The ICSC National Research Centre coordinates research and development activities at national and international level in the field of simulations, computing and analysis of high-performance data to supports innovation in 10 selected areas. These areas include quantum computing, future HPC and big data, fundamental research and the space economy, environment and natural disaster, digital society and smart cities.

In March 2023, Italy launched TeRABIT, an infrastructure based on last-generation dedicated fibre optics, allowing data to be exchanged at terabit speeds (1 000 billion bits per second). It aims to build by 2025 a next-generation integrated computing and network infrastructure to improve collaboration and information exchange among the Italian scientific community.

Italy should step up its efforts on connectivity infrastructure, in particular Gigabit coverage. It will be crucial for Italy to maximise the available to improve fixed connectivity coverage and consolidate the significant achievements made in mobile connectivity, particularly for advanced applications.

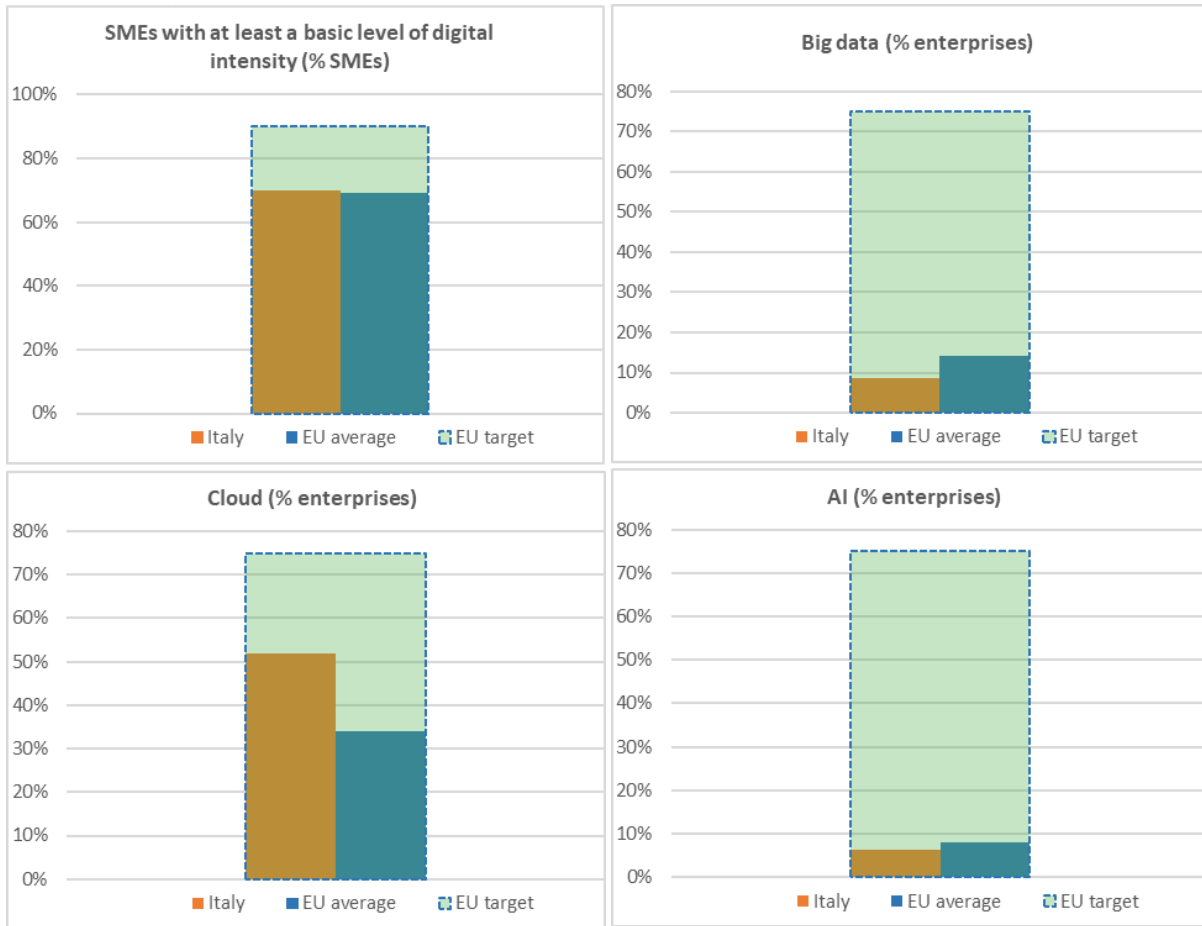
Measures taken by Italy in the field of semiconductors, edge nodes and quantum computing should continue in order to help the EU to become a strong market player in these areas.

¹⁵⁴ Half of the investment of which comes from the EuroHPC JU and the other half from the Italian Ministry of Universities and Research and the CINECA consortium consisting of five more participating EuroHPC countries.

3 Digitalisation of businesses

	Italy			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	70%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	35%	32%	32%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	22%	27%	27%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	9%	9%	9%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud¹⁵⁵	NA	52%	52%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	6%	6%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	95%	95%	95%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	11%	13%	13%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	9%	9%	14%	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	7%	7%	7%	9%	
% SMEs	2019	2021	2021	2021	

¹⁵⁵ Enterprises buying sophisticated or intermediate cloud computing services indicator, see [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).



Most Italian SMEs have at least a basic level of digital intensity (70% compared to EU average of 69%). Progress is especially pronounced in the use of electronic invoices, where Italy outperforms the EU average with 95%. The percentage of SME turnover from ecommerce reached 14% in 2022, above the European average of 11%. Other indicators like the use of social media, SMEs selling online and SME selling online cross border are still below the EU average. As regards the uptake of advanced technologies, **sophisticated or intermediate cloud computing is being used by 52% of enterprises, well above the EU average of 43%, but only 9% of enterprises use big data analysis (compared to 14% at EU level) and only 6% are using AI (compared to 8% at EU level).**

Italy is one of the 12 Member States taking part into the IPCEI-CIS, which forms part of the Multi-Country Project on a *Common Data Infrastructure and Services*. The uptake of cloud services, which is at the core of any digital business transformation and the competitiveness and innovation of economic sectors, is well advanced. Italy is encouraged to continue fostering the use of new advanced trusted cloud solutions and to contribute to advanced cloud upskilling for enterprises, including on cloud security and environmental performance.

The new Strategy for cybersecurity adopted in 2022 includes 82 measures to be implemented by 2026. This should guarantee, among other things, a cyber resilient digital transition of the Public Administration and industry and the management of cyber crises, contributing to national and European strategic autonomy in the digital sector. A specific set of KPIs has been defined to measure the achievement of the objectives.

Italy is actively promoting an integrated technology transfer system to encourage the provision of advanced and innovative technological services to businesses, especially SMEs, by focusing on technologies of excellence and production specializations.

Italy is actively participating in the European Digital Innovation Hub (EDIH) network with 13 EDIHs, which were selected to be co-funded by the European Commission's Digital Europe Programme and the Italian Government. Another 17 Italian projects have received the Seal of Excellence and will also become part of the network. In addition, business digitalisation is supported by the Competence Centres, public-private partnership acting as innovation clusters and formed by at least one research organisation and one or more undertakings.

Furthermore, the 'Houses of emerging technologies' support emerging technologies funding research, experimentation and technology transfer centres, with a focus on emerging technologies that use 5G and 6G networks (Blockchain, artificial intelligence, augmented, virtual and immersive reality, Internet of Things and quantum technologies). Following the 2022 tender, which allocates EUR 80 million, from the 2014-2020 Development and Cohesion Fund, Houses of Emerging Technology will be launched in seven new cities that will be added to the already existing six.

The Digital Innovation Hubs (DIH) promoted by the business association and the Digital Enterprise Points (PID) promoted by the Italian Chambers of Commerce are also providing training and support services to companies seeking to implement innovation, industrial research and experimental development projects.

To further strengthen efforts to create an innovation ecosystem for start-up and SMEs, Italy, together with 23 other Member States, signed the EU Startup Nations Standard of Excellence, thereby committing to encourage entrepreneurship and create a more favourable environment for start-ups.

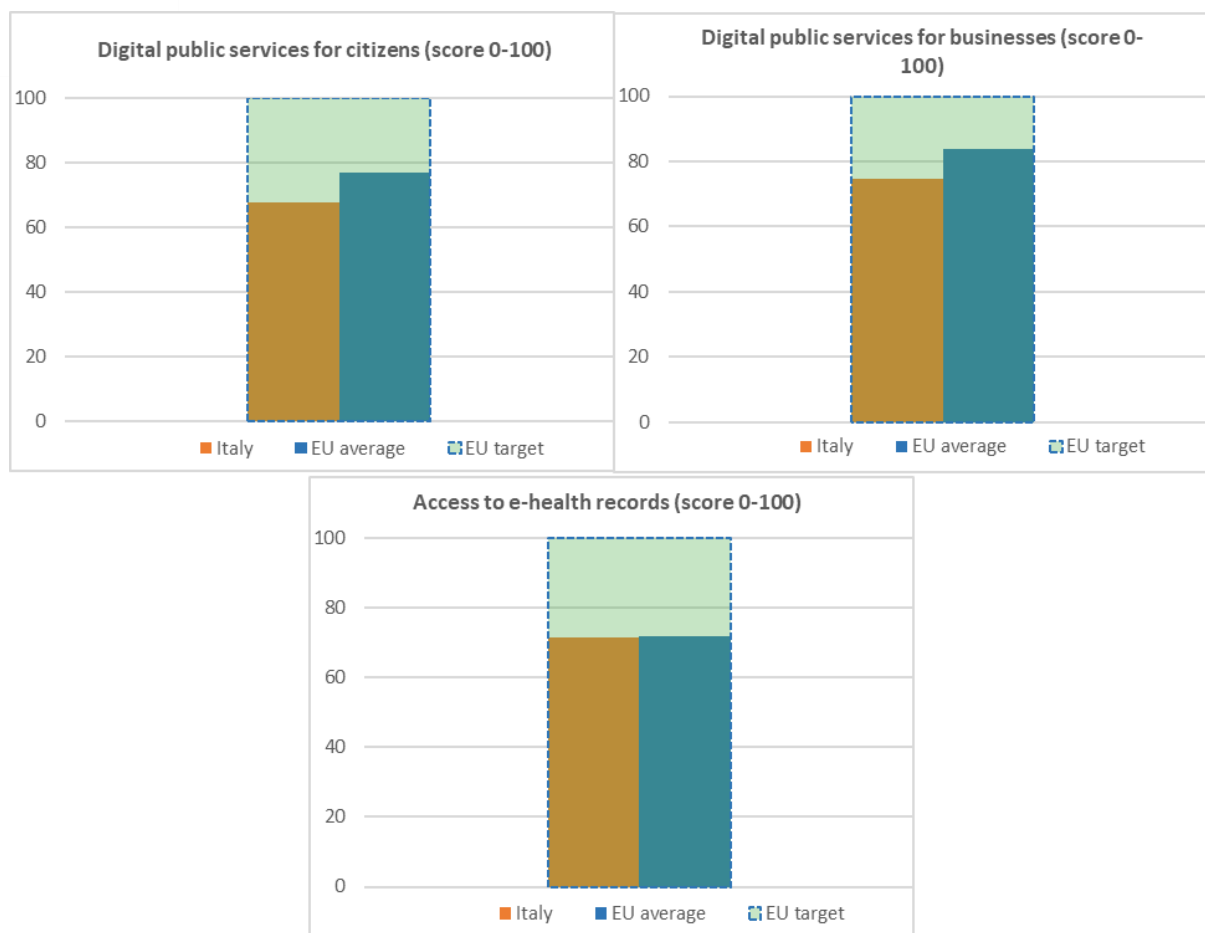
However, despite the numerous measures and dedicated resources, take up of AI and big data by Italian businesses is still very low and negatively impacts the possibility to create a favourable ecosystem for start-ups. Moreover, the possibility for start-ups to scale-up in Italy remains limited when compared to other Member States with similar economic size and industrial sectors. Italy has only 5 companies with unicorn status (i.e. a one billion USD capitalization). The chances for start-ups to reach unicorn status are extremely low, despite the dynamism of new start-ups in the ICT sector. ICT start-ups make almost half of the registered start-ups in Italy and marked a growth of 22.6% in 2022, driven mostly by blockchain, cybersecurity, artificial intelligence¹⁵⁶. The weakness of the Italian ecosystem for innovative start-ups could undermine the concrete possibility for Italy to contribute to EU digital leadership.

Italy should continue implementing its policies in the area of digitalisation of businesses. In particular, Italy should continue supporting the development and deployment of advanced technologies, notably AI and big data, including capacity and knowledge building. Italy should strengthen its efforts to encourage entrepreneurship in digital sectors and create an ecosystem of innovation, in particular for start-ups and SMEs, improving their chances to scale up.

¹⁵⁶ Innovative start-ups and SMEs that have registered their activities with the ATECO codes belonging to the ICT sector at the Chambers of Commerce.

4 Digitalisation of public services

	Italy			EU	EU
	DESI	DESI	DESI	DESI	2030
	2021	2022	2023	2023	target
4a1 e-Government users % internet users	NA	NA	76%	74%	
			2022	2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	67	68	77	100
		2021	2022	2022	
4a3 Digital public services for businesses Score (0 to 100)	NA	79	75	84	100
		2021	2022	2022	
4a4 Pre-filled forms Score (0 to 100)	NA	48	47	68	
		2021	2022	2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	49	49	65	
		2021	2022	2022	
4a6 User support Score (0 to 100)	NA	76	78	84	
		2021	2022	2022	
4a7 Mobile friendliness Score (0 to 100)	NA	91	91	93	
		2021	2022	2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	71	72	100
			2022	2022	



Italy scores below the EU average on the provision of digital public services for citizens and businesses, reaching a score of 75 and 68 against an EU average of 84 and 77, respectively. Moreover, the digital public services that are being provided score well below the EU average as regards transparency of service delivery, design and personal data, with no progress achieved between 2021 and 2022. Nonetheless, the percentage of internet users using e-Government services lies at 76%, slightly above the EU average of 74%.

In 2022, the National Registry of the Resident Population, which collects the data and maintains a general register of citizens, was fully implemented. Citizens can verify and request corrections to their demographic data and access registry services in one place, regardless of their municipality of residence. Already 8 out of 40 services are available.

After creating the National Cybersecurity Agency, the government published the national strategy on cybersecurity. This was an important step to improve the security and efficiency of the public administrations because cybersecurity of digital services is crucial to encourage citizens and businesses to use them.

The Digital National Data Platform (PDND) was set up; it aims to enable the interoperability and exchange of data among public administrations in a secure and simplified way. The National Strategic Hub (PSN), a high-capacity cloud infrastructure to host critical and strategic data and services for Italian public administrations, was also launched. Moreover, Italy launched a programme to support and encourage the migration of local government systems, data and applications to qualified cloud services.

Italy is still lagging behind on the user-friendliness, design and transparency of digital public services. The 'Designers Italia' platform was set up, and new design guidelines for websites and digital services were issued to promote and foster the design of user-centred services across the public sector.

Moreover, to promote the accessibility of public services, a project, *POLIS – Casa dei servizi di cittadinanza Digitale*, was launched to promote economic, social and territorial cohesion by ensuring that everyone, wherever they live, can benefit from all digital public services. A total of 6 910 post offices in small and remote urban centres will be transformed into one-stop shops for public services as well as co-working and learning spaces throughout Italy. The project will be partially funded under the complementary national plan to the RRP.

Access to services will be further improved with the Single Digital Gateway. In December 2022 the national components of the Italian technical infrastructure of the gateway was implemented, tested and delivered. Harmonising and fully digitalising 21 priority administrative procedures is ongoing. The national digital strategy set a target to increase public demand for digital solutions to 40%.

The uptake of Italian eID systems continued. The SPID had been issued over 34.5 million times as of March 2023 and can be used to access the services of 14 010 public administrations and 157 private companies. In addition, 32.7 million national identity cards (CIE or *carta di identità elettronica*) were issued. The cards are equipped with a contactless microchip that enables authentication to access the online services of 6 240 public and private bodies. The government aims to integrate the two digital identity systems into a single national service. Italy has also joined two international consortia, NOBID and POTENTIAL, that will test the European Digital Identity Wallet in Italy and across participating countries.

An investment of EUR 1.3 billion, supported by the RRP, aims to transform electronic health records (EHRs) into a single access point for health data and services and ensure full interoperability between and portability across Italy's regions. In particular, a new data architecture was put in place (known as the Health Data System), and a new governance system was set up with additional competences in the digital domain under the National Agency for Health. EHRs are active in all regions, and the associated services are fully accessible in almost all regions. Access to EHR by citizens, general practitioners and healthcare is in line with the EU average (score 71/100) but differs considerably across regions.

Overall, several factors have contributed to overcoming the delays accumulated over the past years: the availability, efficiency and security of digital infrastructure, the interoperability of data and information across public administrations, the implementation of the once-only principle, increasing use of the digital identity and the completion of the EHR. Recent measures taken to ensure more user-centric public services and improve the accessibility of digital public services, along with efforts to increase the digital skills of civil servants and the basic skills of the population, promise to further increase the use of digital public services by citizens in the coming years.

Best practice: National Strategy on Cybersecurity

The strategy builds on the awareness that cybersecurity is as an essential element of the digital transformation. Its objective is to plan, coordinate and implement measures to make the country safe and resilient while ensuring citizens' trust and safeguarding fundamental rights and freedoms.

The National Cyber Security Strategy has a holistic approach with 82 actions organized around three objectives:

- Protection of national strategic assets.
- Response to national cyber threats, incidents and crises, including the national architecture for managing cyber security incidents and crises.
- Informed and secure development of digital technologies, research and industrial competitiveness, responding to market needs.

The strategy includes numerous training activities aimed at ensuring that the actors involved in various capacities have the appropriate technical tools, expertise and operational skills.

The strategy also includes the creation of a High Performance Computing infrastructure dedicated to national cybersecurity, as well as the development of simulation tools, based on artificial intelligence and machine learning, to support the prevention, discovery, response, and prediction of the impacts of systemic cyber-attacks.

The implementation plan will be monitored by the National Agency for Cybersecurity through a system of pre-defined KPIs. The RRP resources dedicated to Cybersecurity amount to EUR 623 million.

Italy should step up its efforts to digitalise public services. In particular, it should speed up the implementation of existing and planned measures.



Digital Decade Country Report 2023

Latvia

Introduction

Latvia has untapped digital potential to contribute further to the collective efforts to achieve the EU's Digital Decade targets. While performing very well on fixed connectivity and on digital public services, Latvia has made limited progress on 5G and on the take up of gigabit services and is underperforming on the digitalisation of business. Therefore, sustained efforts are key to unlock the potential for the economy. Latvia still needs to increase the level of digital skills among its population. Aligned with the Digital Decade Policy Programme, and coordinated between national and local authorities, academia, and NGOs, the Implementation plan 2023-2027 has updated Latvia's national digital strategy.

Latvia is collaborating with the other Member States in exploring the possibility to set up **European Digital Infrastructure Consortia (EDICs)** on: (i) establishing an Alliance for Language Technologies, to develop a common infrastructure in the field of natural language processing and large multi-language models; and (ii) 'Copyright Infrastructure', to release the potential of EU's creative sectors.

Digital in Latvia's Recovery and Resilience Plan (RRP)

Latvia's RRP amounts to over EUR 1.8 billion in funding and allocates more than EUR 384 million, 21% of the total RRP allocation, and it is expected to contribute to the Digital Decade targets¹⁵⁷. The plan's main objectives are to tackle the digital skills gap and boost digital transformation and innovation in enterprises while maintaining its strong position in the modernisation and digital transformation of public services. Investments in 5G backhaul and last-mile connectivity are also envisaged. The entire budget is estimated to contribute to the Digital Decade targets, most of it to digital skills and digital public services, and some of the budget will contribute to the targets on digitalisation of businesses and unicorns.

A first payment was disbursed for EUR 201 million in 2022. It was paid following Latvia's satisfactory fulfilment of a number of milestones, including three milestones on digital policies:

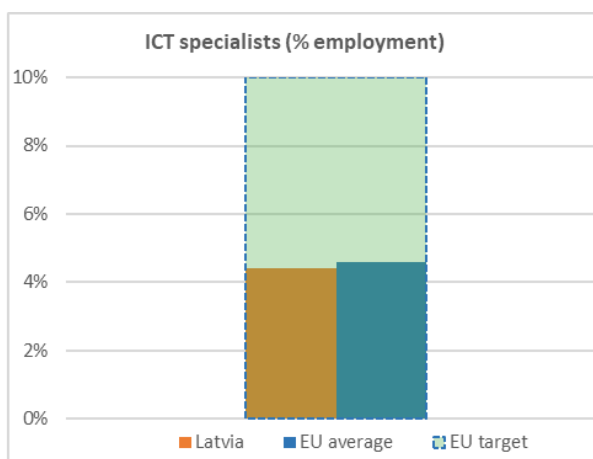
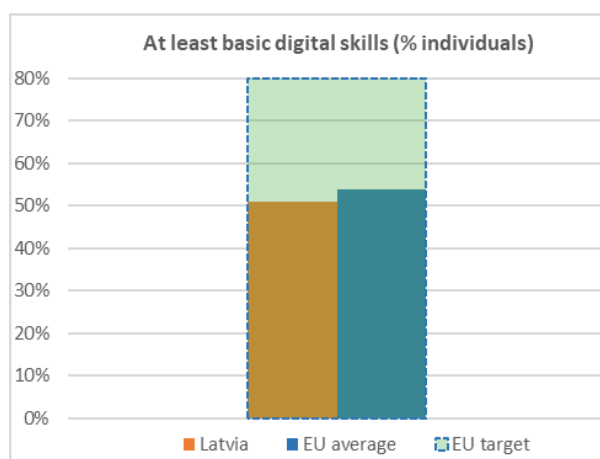
- the adoption of a common model for the development of last-mile broadband connections, to ensure end-user access to very high capacity broadband network in regions and rural areas;
- the adoption of a framework for the organisation and implementation of remote learning in educational institutions, to tackle the digital divide for disadvantaged pupils; and
- the adoption of technical requirements for connected and automated driving, to support the development of the Latvian section of the Via Baltica corridor, a railway connecting Estonia, Latvia and Lithuania to Poland and Czechia.

The Latvian authorities have started discussions to amend their RRP and to include a chapter on the REPowerEU plan.

¹⁵⁷ Each Recovery and Resilience Plan must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plans had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or has no impact (0%) on digital objectives, using Annex VII of the RRF Regulation. Combining the coefficients with the cost estimates of each measure allows assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to allow for an estimation of the possible contribution of RRF measure to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice to potential ongoing revisions of the plan.

1 Digital skills

	Latvia			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	87%	90%	90%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	51%	51%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	24%	24%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	64%	64%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	17%	17%	15%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	3.6%	3.8%	4.4%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	4.4%	4.6%	5.0%	4.2%	
% graduates	2019	2020	2021	2021	



Latvia is only slightly below the EU average on both at least basic and above basic digital skills. 51% of the population aged 16 to 74 have at least basic digital skills, and 24% have above basic digital skills, against the EU averages of 54% and 26% respectively. With 64% of the population with at least basic digital content creation skills, Latvia is close to the EU average of 66%. The share of ICT graduates slightly increased to 5%, which is higher than the EU average (4.2%). On ICT specialists, Latvia is narrowing the gap with the EU. ICT specialists represent 4.4% of the total workforce, against the EU average of 4.6%.

Latvia has taken several measures, both for schools and for adults, that are expected to contribute to increasing the level of basic digital skills of the population.

At school level, Latvia launched last year a national programme for school equipment for pupils in grades 7 to 9 (budget EUR 11.14 million). The objective is to purchase personal computers for all public schools in Latvia. Since the end of 2022, 25 080 devices have been delivered to 614 schools

and delivery will continue throughout 2023. The schools also received tech support on how to successfully implement the one student, one device teaching approach.

In 2023, Latvia successfully implemented the main data collection stage in the 2023 International Computer and Information Literacy Study. Almost 3 000 eighth-grade students from 145 schools participated in the study. The results of internationally comparable assessment of 8th grade students' computer and information literacy, and computational thinking will be available at the end of 2024. They will track Latvia's progress in achieving the target of the European Education Area, which is to have under 15% of low-achieving eighth graders in computer and information literacy by 2030.

The State Education Development Agency continued to run the national ESF project on improving the professional competence of the workforce aged 25+. The project has a total budget of EUR 45.5 million (covering the period 2017-2023), of which ESF financing provides EUR 38.68 million. Since 2017, 60 728 people have completed education programmes under the project. The highest share of participants (32 559) work in the ICT / electronic sector. Nevertheless, 51% of participants are learning digital skills in other sectors of the industry. In 2022 the agency developed several new activities, focusing on workers with a low level of education. For example, this involves an individual approach, analysing the individual's profile and discussing their learning needs and potential. In this programme, training was provided on basic digital skills (DigComp level 1) and on other modules.

The rise in the number of ICT specialists in Latvia reflects the labour demand and the job market in the ICT sector. **The number of specialists continued to rise over the reporting period despite being below the EU average overall.** In 2022, the number of jobs in ICT sector rose by 19.7% (almost 7 000 jobs) compared to 2021. Jobs in computer programming, consultancy, and related activities (NACE red.2 J62) and information service activities (NACE red.2 J63) saw an even greater increase by 10.6% (2 900 jobs).

Latvia performs well on the number of women ICT specialists: 22.8% of its ICT specialists are women, putting Latvia in the top 10 of Member States on gender balance and provides positive contribution to the achievement of the Digital Decade goals. The Latvian authorities continue working towards this EU Digital Decade target. Although Latvia already performs well on gender balance, it has launched a plan to promote equal rights and opportunities for women and men for 2021-2023 which includes measures to stimulate interest among young people, especially girls, in careers in IT. One of the activities in the plan is to teach girls to create simple apps or to code. Other activities are planned to reduce negative gender-related stereotypes regarding career and educational choices of girls and boys, thereby encouraging girls to learn digital skills and get involved in ICT. For example, the initiative aims to reduce the risks of gender discrimination in the labour market and to promote gender equality in the field of artificial intelligence by avoiding gender bias. These measures are expected to contribute to the Digital Decade targets of having a digitally skilled population and highly skilled digital professionals, with the aim of achieving gender balance. It includes educational events, information campaigns promoting public discussions (inspiring online and face-to-face conversations and discussions in social networks and during public events, discussion-stimulating articles), public discussion with industry experts on the connection between gender equality and the AI industry.

The State Employment Agency (SEA) also runs activities to develop digital skills to encourage people out of work or at risk of becoming unemployed to take part in lifelong learning initiatives, particularly people with lower qualification levels. Recently digital skills were one of the priority policy actions run by the Ministry of Welfare. The SEA created partnerships with stakeholders and with a particular focus on bringing more people into digital careers. The SEA also increased the use of online learning platforms. SEA digital skills programmes have been particularly effective in helping

lower skilled people, older workers, young unemployed and people with disabilities get back into the labour market.

Latvia plans a measure in its RRP on ‘Development of digital skills for society, development and support of technological creativity for society, especially young people’. This will take the form of both a digital self-service skills learning approach and an e-learning course. Learning modules and learning materials on digital self-service skills will be developed for people to learn through self-learning or with the support of trainers - mentors. This course will help build digital skills among the population, in particular the skills to use public and private digital services. To ensure the project is sustainable, Latvia will run training activities open to the public in close cooperation with local municipalities using a decentralised approach (closer to the person). This will involve encouraging and motivating people to learn and identifying and using existing resources effectively.

Latvia has started to develop and reinforce the concept of individual learning accounts under its RRP. The aim of the investment is to strengthen the implementation, management and storage of individual learning pathways and outcomes of individuals learners. It also aims to promote adult participation in education by helping learners develop and improve their digital skills. By 2026, Latvia will run pilot project with individual learning account resources designed to help at least 3 500 adults learn digital skills.

Under the new approach, creating a learning environment for self-managed ICT training is expected to increase the proportion of ICT specialists and prepare around 500-600 new ICT specialists by 2027. To help people develop digital skills and recognise that they can also develop these skills through non-formal education programmes, Latvia has developed a regulatory framework which stipulates that the content of the non-formal education programmes and learning targets should follow the descriptions of the Digital Competencies of the European Citizens (DigComp 2.1) and the competence levels.

Best practice: Women4IT

In March 2022, the Latvian Information and Communication Technology Association (LIKTA) in cooperation with the SEA announced a call for applications for the 3rd round of the Women4IT project training programme in Latvia. Under this programme, young women who are not in employment, education, or training can develop skills for a range of digital job profiles and receive career guidance. In total, over 250 women applied for this round and 67 young women have started training. The greatest level of interest was registered in the information system tester profile and digital media specialist profile.

To help participants choose their field of study, women assessed their current digital skills and suitability for different professions by taking specially designed tests before starting the course. The tests are available on the digital platform, developed by the Women4IT consortium, which bring together nine organisations from European countries. The platform also provides infographics and descriptions of each profession, detailing the required skills.

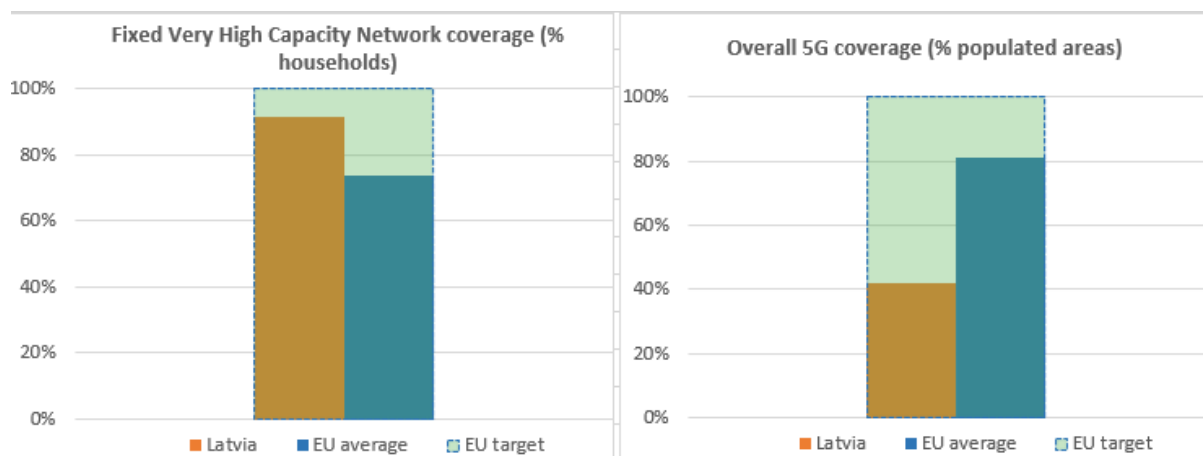
Latvia should accelerate its efforts in the area of digital skills. In particular Latvia is encouraged to continue implementing measures to address all cycles of education and to mainstream digital in the

education system, integrated to all subjects. Special attention should be paid to attracting and retaining ICT specialists¹⁵⁸.

¹⁵⁸The recommended policies, measures, and actions in this document reflect the Commission Communication 'Report on the state of the Digital Decade' COM(2023) 570.

2 Digital infrastructures

	Latvia			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up % households	56%	61%	62%	55%	
2a2 At least 1 Gbps broadband take-up % households	<0.1%	<0.1%	<0.1%	13.8%	
2a3 Fixed Very High Capacity Network (VHCN) coverage % households	88%	91%	92%	73%	100%
2a4 Fibre to the Premises (FTTP) coverage % households	88%	89%	91%	56%	
2b1 Mobile broadband take-up % individuals	74%	86%	86%	87%	
2b2 Overall 5G coverage % populated areas	0%	0%	42%	81%	100%
2b3 5G spectrum Assigned spectrum as a % of total harmonised 5G spectrum	29%	63%	63%	68%	



Latvia has room for improvement on digital infrastructure. Concerning connectivity, it performs well in terms of fixed very high capacity network (VHCN) coverage positively contributing to Digital Decade targets, but it is far below EU average on 5G coverage. On quantum, Latvia made some notable progress over the reporting period on semiconductors.

A large majority of households in Latvia has access to VHCN, currently, fixed VHCN are available in 92% of households, which is 19 percentage points higher than the EU average of 73%. Fibre to the premises coverage in Latvia is also among the highest in the EU at 91%. In rural areas, VHCN coverage has increased by 5 percentage points to reach 80% in 2022, far above the EU average of 45%. However, the uptake of gigabit services remains limited. This may be explained by the wide availability of commercial offers for home internet using 4G and 5G networks.

Under the RRF, Latvia has proposed investing EUR 4 million in developing its very high capacity network 'last-mile' infrastructure. This complements an EUR 8.7 million investment partially drawn from the European Regional Development Fund (ERDF). Through this investment, the target is to provide 1 500 households, businesses and socio-economic drivers with access to very high capacity networks by the end of 2025. It also draws on EUR 13 million from the (ERDF) to create very high-performance electronic communications network infrastructure including middle-mile and last-mile infrastructure. Latvia began commercially rolling out 5G in 2019, while the increase in wider public availability of 5G services started in 2022. As of mid-2022, 5G coverage reached 42% of populated areas in Latvia, considerably below the EU average of 81%. The 3.4-3.8 GHz spectrum band, which is crucial for enabling advanced applications requiring large bandwidth, reached 21% coverage in Latvia by mid-2022, also well below the EU average.

Latvia is working on the construction of 5G support infrastructure for its road and rail transport infrastructure and lowering the barriers to achieving it. It plans to make available optical networks on the Via Baltica motorway by the end of 2025. Construction of this passive infrastructure aims to provide 5G coverage along the Latvian part of this road corridor. It has also drawn almost EUR 8.3 million from the ERDF to construct passive infrastructure along the Latvian part of the Rail Baltica to ensure continuous 5G coverage along this transport corridor. Bureaucratic and regulatory issues over property rights and use of public properties are hampering the building of towers needed to roll out 5G. It is also facing spectrum interference issues at its border. Latvia is working on reducing the administrative burden affecting the roll-out of 5G and on solving the spectrum issues.

Despite its late roll-out of 5G, Latvia is one of the frontrunners in developing industrial and innovative applications of 5G technologies. It has launched the first 5G military testbed in Europe, showcasing the potential of 5G for military applications. The testbed allows the incumbent operator, the National Armed Forces, the Ministry of Defence and allies from NATO and the EU to research and develop range of military applications of 5G. An operational experiment that took place in late 2022 combined the use of augmented and virtual reality and 5G technologies. Latvia's 5G use case development also goes beyond military applications, with the incumbent operator and a Latvian network equipment manufacturer working together to develop new 5G-enabled products and new 5G use cases.

So far, the Latvian authorities have not seen demand for the 26 GHz band but they are able to assign the rights of use for this band and to allow use from 2024 onwards. Until 2024, to boost 5G coverage, the Latvian authorities, made available dedicated spectrums for public mobile networks for nationwide use and for private mobile networks to operate in geographically limited areas on a first-come, first-served principle.

An EUR 8 million project started in January 2023 co-funded by the Digital Europe Programme. The aim is to develop a national-level experimental and advanced quantum communication infrastructure, integrating existing communication network and testing quantum technology operations. The project is planned to run for 30 months. One part will be used for use cases restricted to the defence sector, another part will be publicly available for testing commercial services in healthcare, finance, 5G, etc. Extensive user training is also planned as part of this project. In addition, the Latvian Quantum Initiative, signed in October 2022, brings together Latvia's leading scientists and teaching staff in the field of quantum technologies to support knowledge, skills, technologies and ideas related to practical applications of quantum physics. Lastly, during the fourth quarter of 2022, a Quantum Excellence and Competence Centre was formed by several universities and advanced science institutions in Latvia, with the aim of developing advanced digital skills, fostering cooperation between quantum computing and artificial intelligence research, quantum

nanoelectronics and photonics, and quantum cryptography and communication. The project receives funding from the RRF and will be completed by 2026.

Latvia also signed a memorandum of understanding between 12 partners in November 2022 to develop semiconductors capabilities in Latvia across the whole value chain. It covers developing the microchip ecosystem, developing educational and research capabilities and developing manufacturing capabilities. Latvia's electronic and optical device manufacturing sector has been the fastest growing manufacturing sector since 2010, growing from 3.7% to 7% in 2022 in terms of manufactured volume with 90% of these electronic devices exported. The main forthcoming measures envisaged under the EU Chips Act include issuing a call for tender for the status of the National Competence Centre and setting up the national contact point for coordination and cooperation within the semiconductor ecosystem in forthcoming measures.

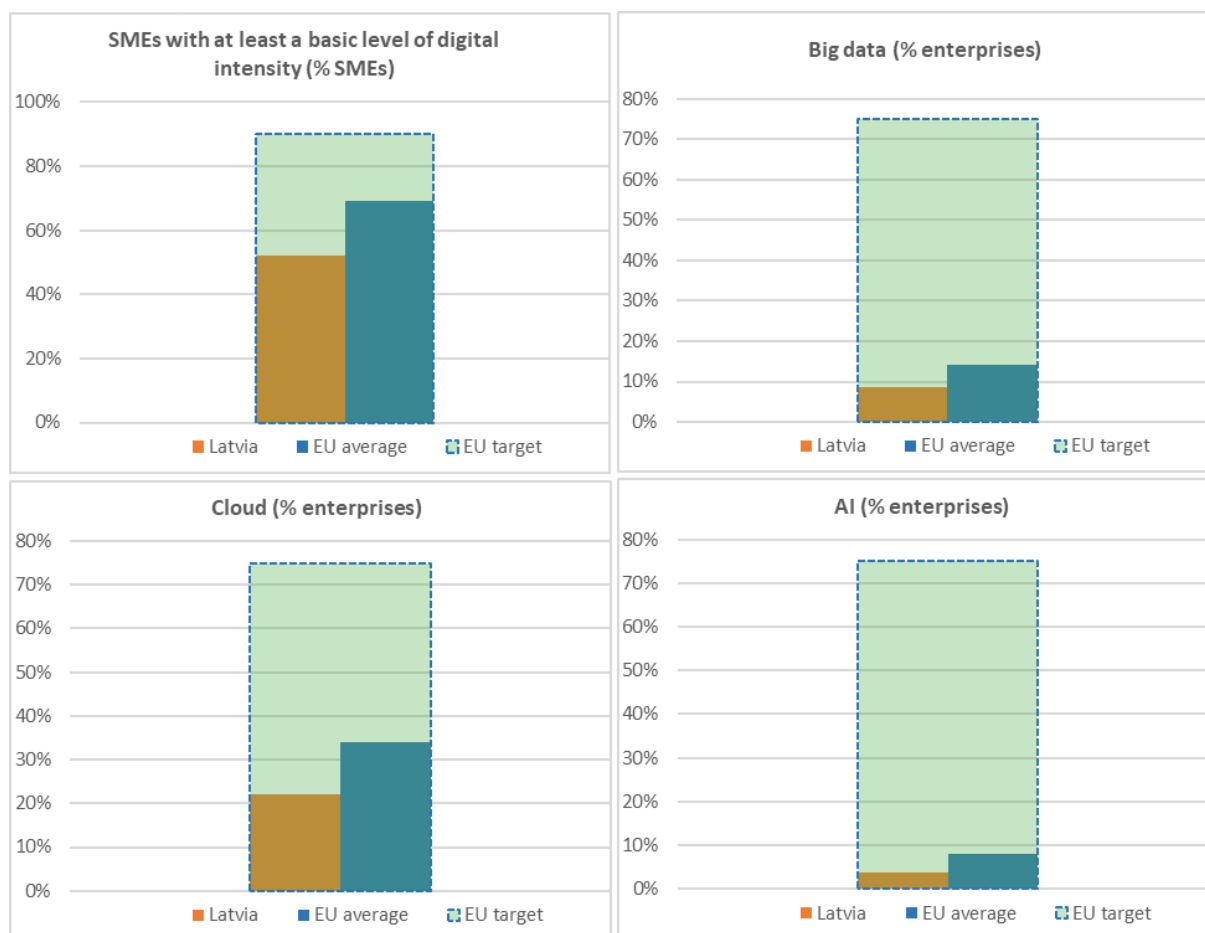
In relation to the target on edge nodes, the telecoms sector plays an important role in Latvia. Latvia's incumbent operator develops, tests, implements, and scales telecommunications solutions in local environments and abroad, in many fields ranging from mobility, smart city solutions to the internet of things (IoT) and public safety. Other main telecom operators provide world class global IoT connectivity and related services.

Latvia should accelerate its efforts on connectivity infrastructure. In particular, Latvia should increase efforts in rolling out 5G connectivity. The swift implementation of the RRF measures is very relevant. Moreover, Latvia's efforts in the area of quantum and semiconductors should be sustained in order to help the EU become a strong market player in these areas.

3 Digitalisation of businesses

	Latvia			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	52%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	32%	39%	39%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	19%	26%	26%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	9%	9%	9%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud¹⁵⁹	NA	22%	22%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	4%	4%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	15%	15%	15%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	11%	14%	16%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	7%	8%	8%	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	7%	7%	7%	9%	
% SMEs	2019	2021	2021	2021	

¹⁵⁹ Enterprises buying sophisticated or intermediate cloud computing services indicator, [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).



Latvia's performance on digitalisation of businesses is still far from achieving the Digital Decade targets and shows a significant room for improvement. Although Latvia has improved on some indicators, it is still below the EU average overall. In 2022, 52% of SMEs had at least a basic level of digital intensity, far below the EU average of 69%, and the Digital Decade target of over 90% of SMEs reaching at least a basic level of digital intensity by 2030. The share of Latvian enterprises using social media (two or more channels) and sharing information electronically has increased to around the EU average in 2021. However, in 2021 only 9% of enterprises used big data and 4% used AI, well below the EU average. Latvia's share of enterprises using in 2021 cloud services (22%) was also low compared with the EU average (34%). On e-commerce, only 16% of SMEs sell online, and 8% of SME turnover is generated from e-commerce.

Significant efforts will be needed over the coming years to meet the EU's targets for more than 90% of EU SMEs to have reached at least a basic level of digital intensity and for 75% of companies to use big data, cloud or artificial intelligence by 2030. Several programmes are either ongoing or under development to support progress in these areas. Latvia is welcome to fully implement the digitalisation of businesses actions outlined in its RRP.

Latvia is a partner in the IPCEI-CIS on cloud and could benefit from stepping up dissemination and roll out actions and strategies jointly developed by both public and private actors to strongly boost the use of new advanced cloud solutions among SME ecosystems.

Developing a sustainable digital economy is identified as one of Latvia's main policy priorities. The actions for the digitalisation of businesses outlined in Latvia's RRP will boost digital transformation. In its RRP, Latvia includes several measures promoting the digital transformation of businesses,

including an EUR 40 million investment to help digitalise business processes and EUR 45.1 million support via financial instruments to promote the digital transformation of economic operators, which is ongoing. Two more investments to help integrate new products and services in business and business digital skills are under development.

Latvia has set up two digital innovation hubs – the Latvian Digital Innovation Hub and the Digital Accelerator of Latvia – with over 10 regional contact points as one-stop-shops in the largest cities.

Latvia anticipates receiving funding from the RRF (EUR 10 million), the Digital Europe Programme (EUR 3.2 million) and the ESF (EUR 8 million). Furthermore, the Business Development, Innovation and SME Programme, launched in 2021 by the Investment and Development Agency of Latvia and co-funded by the Norwegian Financial Mechanism aims to support SMEs to develop new products and technologies, to modernise and to improve production facilities. In ICT field, 12 projects are being implemented for an amount of EUR 2.6 million.

In April 2022, the Latvia's Ministry of Economy signed a memorandum of understanding with one of the world's leading IT companies to provide training to enterprises to boost their knowledge and skills in areas such as e-commerce, export and international growth, digital marketing and technology integration and well as cybersecurity. So far, 6 000 companies participated last year. The training programme also makes one-to-one follow-up coaching available to participants.

A Latvian company operating in the digital sector reached the unicorn status, i.e. with value at or above 1 billion. The company operates in the digital printing and sewing outsourcing business, producing and delivering orders in Latvia. With production facilities and partners in EU and all around the globe, the company employs a total of 1 800 people, a third of whom works in Latvia.

On the regulatory side, the Investment and Development Agency of Latvia developed in 2022 a state platform for business development (business.gov.lv), which promotes the digitalisation of services and the development of e-services more broadly. The Portal of State Administration Services (www.latvija.gov.lv) has been operational since 2016, with the aim of providing easy access to information and services for business activities, and is currently being redesigned. As of 2023, the portal is expected to provide not only information but also access to public services to both the general public and businesses.

Under Latvia's smart specialisation strategy (RIS3), an informative report has been developed and approved by the Cabinet of Ministers on a fully fledged innovation system management model.

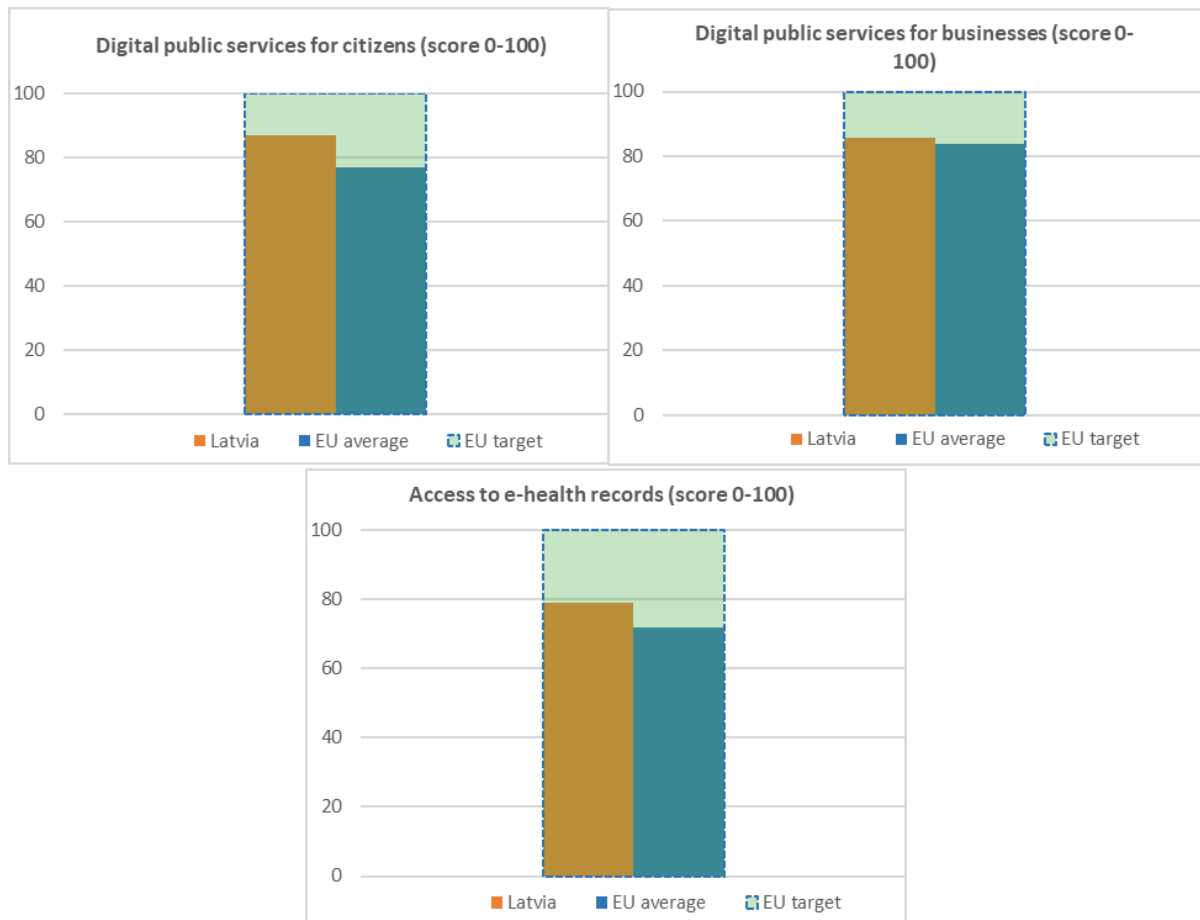
This includes a RIS3 steering group dedicated to ICT, bringing together representatives of the public sector, private sector, academia and associations. The aim of the RIS3 strategy in ICT is to analyse issues related to legislation, human capital, access to finance, R&D, commercialisation and internationalisation. It currently includes four clusters of action: (1) radically innovative digitalisation (blockchain, quantum, space data, digital twins, etc.); (2) open infrastructure including 5G/6G, OpenRAN, IoT, etc.; (3) digitalisation paradigms such as Industry 4.0; and (4) technology platforms (machine learning and AI, speech technologies, etc).

Finally, Latvia is gradually developing national capacities in satellite data to support the uptake of big data. To this end, Latvia benefits from having associate membership in the European Space Agency, from participating in the EU Space programme initiatives and in national-level digitalisation initiatives. Currently, the aim is to expand the user uptake to communities that are actively involved in digitalisation, but not yet in downstream space data usage.

Latvia should significantly step up its efforts in the area of digitalisation of businesses. In particular, Latvia should strengthen the dissemination and exploitation efforts of digital technologies and the implementation of strategies jointly developed by both public and private actors, to strongly boost the use of new advanced cloud solutions among SME ecosystems.

4 Digitalisation of public services

	Latvia			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	77%	74%	
			2022	2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	87	87	77	100
		2021	2022	2022	
4a3 Digital public services for businesses Score (0 to 100)	NA	86	86	84	100
		2021	2022	2022	
4a4 Pre-filled forms Score (0 to 100)	NA	77	76	68	
		2021	2022	2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	72	71	65	
		2021	2022	2022	
4a6 User support Score (0 to 100)	NA	78	89	84	
		2021	2022	2022	
4a7 Mobile friendliness Score (0 to 100)	NA	95	98	93	
		2021	2022	2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	79	72	100
			2022	2022	



Latvia's performance on digital public services is positively contributing to the achievement of the Digital Decade targets. 77% of internet users use e-Government services, above the EU average of 74%. Latvia performs well on the availability of digital public services, and outperforms the European EU average on the key aspects of online service provision (pre-filled forms, transparency, user support and mobile friendliness), and on access to e-health records too.

Latvia is one of the leading Member States in terms of digitalisation of public services. The country performs above the EU average on all indicators in this area and performs well at acquiring and providing innovative digital public services.

Public services for both individuals and businesses are highly digitalised in Latvia. With a score of 86 in digital public services for business and 87 in digital public services for citizens, the country performs well above the EU averages, thus positively contributing to reaching the 2030 Digital Decade target of digitalising all public services in all EU Member States. To further encourage citizens and businesses to interact online with public administrations and advance innovation in the public sector, Latvia participates in the GovTech consortia 'The incubator for knowledge sharing and collaborative delivery for all GovTech initiatives in the EU (GovTech4all)'. This consortia brings together 22 partners from 15 countries in a joint effort to create a single European Union GovTech. The project involves working together with public and private sector entities, research bodies and NGOs with the ultimate goal of providing an ongoing forum for joint innovation among innovators in the public sector across all EU Member States.

Although 77% of Latvians use e-Government services (against the EU average of 74%), there is still potential to make public services more appealing, especially for people that do not use them regularly. Latvia has taken substantial regulatory measures to improve the online accessibility of key

public services for citizens and businesses. The Ministry of Environmental Protection and Regional Development (VARAM) has implemented the board e-Government policy, which includes creating State and Municipal Unified Customer Service Centres (CSCs) to provide state and local government services and implementing modern and effective information and communication technologies in the public sector. CSCs are one-stop shops where individuals and businesses can submit requests to public regulation bodies and receive services. The network of 141 CSCs has proven to be a reliable and effective e-Government channel for citizens that need to be encouraged to use digital services. The expected result is to establish 592 CSCs across the country to expand access to digital public services, particularly for non-digital clients, across the country in each commune until 2026.

Latvia is finalising its ‘Digital Health Strategy until 2029’ policy, which will frame the strategic development and management of digital health by building an open and interoperable health data ecosystem. In cooperation with professional organisations in the public health sector, the Ministry of Health signed the cooperation memorandum on digital health on 7 July 2022. The Digital Health Council was established on 7 December 2022 to work on digital health issues, develop an open digital health ecosystem, and improve the quality, affordability, accessibility, and convenience of healthcare for all parties involved at all levels of healthcare. The national electronic health system underwent a number of improvements in 2022, including a functionality that enables Latvian citizens to indicate on their electronic health cards whether they authorise organ donation or whether they authorise others to approve medical treatment.

The score on access to electronic health records is 79, ranking the Baltic country 12th in the EU, and above the EU average (72). In 2022, Latvia launched the digital health pilot project ‘Open Health Labs’ organised by the National Health Service, which promotes the implementation of innovative and digital solutions in healthcare organisations across Latvia. This involved developing cooperation with four hospitals to provide access to specialists for start-ups and a better knowledge of issues.

In the field of electronic identification (eID), Latvia has a scheme notified under the eIDAS Regulation and already used by 40% of the public. Latvia has four eID means notified at ‘substantial’ and ‘high’ levels of assurance under the Latvian eID scheme, eID karte, eParaksts karte, eParaksts karte+, and eParaksts. As one of the pioneer Member States to notify a mobile eID solution, Latvia has introduced the mobile app ‘eParaksts mobile’ that allows users to sign documents electronically, enter into contracts and receive services from authorities. The application also provides e-identity authentication on various self-service portals for both public and private sector organisations. Latvia has been part of several collaborative projects on eID. They include the ‘Nordic-Baltic eID Project’ (NOBID), which aims to harmonise various eID solutions in eight Nordic and Baltic countries to provide access to cross-border digital services in the region. The NOBID project has jointly adapted the eIDAS Regulation and focuses on the EU Digital Identity Wallet, which is formed by eIDAS 2.0.

The Latvian national digital strategy emphasises the importance of stimulating demand for innovative ICT solutions through public procurement; however, investments are still low.

Best practice: e-form

The ‘e-form’ contains solutions enabling individuals (people or businesses) with an e-mail address to send structured data to state authorities. The solution builds a platform enabling organisations to digitise forms (referred to as ‘e-forms’) without compulsory IT development processes. e-forms help users access to ordinary e-services, enabling them to submit data for further automatic machine processing if needed. e-forms give institutions the option to digitise forms for public service application without the need to make additional investments.

***Latvia should accelerate its efforts to digitalise public services.** In particular, it should continue to ensure that electronic health records are easily accessible and continue to boost digital public services for citizens and digital public services for businesses.*



Digital Decade Country Report 2023

Lithuania

Introduction

Lithuania is expected to make a positive contribution to the collective efforts to achieve the EU's **Digital Decade targets**. It benefits from continuity in the implementation of plans and strategies, which are aligned with the Digital Decade Policy Programme. Significant progress has been made in digital skills, but further effort is needed to contribute to the achievement of the Digital Decade targets, and connectivity, whilst the performance on digitalisation of public services has been consistently good.

Digital policies are managed in a decentralised way in Lithuania. Each ministry is responsible for digitisation activities in its own policy area and has strategy documents for that. The activities contribute to the implementation of the main strategy document, the National Progress Plan 2021-2030, while the main document on digitalisation remains the state Digitalisation Development Program 2021-2030, setting out the priorities for digitalisation. In 2022 implementing legislation for the Program was developed, setting out activities designed to help Lithuania reach the Digital Decade targets.

Lithuania is collaborating with other Member States in exploring the possibility to set up **European Digital Infrastructure Consortia (EDICs)** on: (i) establishing a Alliance for Language Technologies, to develop a common infrastructure in the field of natural language processing and large multi-language models; and (ii) Innovative Massive Public Administration inter-Connected Transformation Services, to develop a new generation of advanced cross-border public services.

Digital in Lithuanian Recovery and Resilience Plan (RRP)

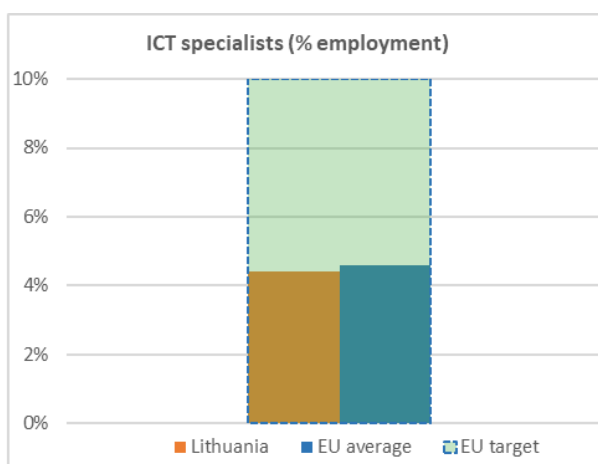
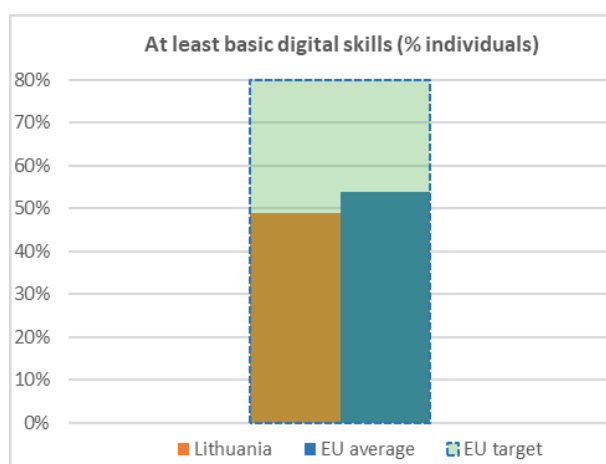
Lithuania's RRP allocates EUR 701 million (31.5%) to measures supporting digital transition. Of this amount, over EUR 660.5 million is estimated to contribute to the Digital Decade targets¹⁶⁰. Over half of the funds are assigned to investment in digital public services and infrastructure. The plan focuses on facilitating the rollout of 5G networks, the digitalisation of public services and creating innovative solutions for transport.

Implementation of Lithuania's RRP is well underway. In May 2023 European Commission disbursed the first payment of €542 million to Lithuania. The milestones related to the digital transition were related to the 5G spectrum auction, measures facilitating the digitalisation of public services (a Competence Centre for Digital Transformation and Open Data) and the preparatory work for a project on innovative solutions in the field of transport.

¹⁶⁰ Each Recovery and Resilience Plan must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plans had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or has no impact (0%) on digital objectives, using Annex VII of the RRF Regulation. Combining the coefficients with the cost estimates of each measure allows assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to allow for an estimation of the possible contribution of RRF measures to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice to potential ongoing revisions of the plan.

1 Digital skills

	Lithuania			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	82%	86%	87%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	49%	49%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	23%	23%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	61%	61%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	14%	14%	13%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	3.3%	3.8%	4.4%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	3.7%	4.0%	4.7%	4.2%	
% graduates	2019	2020	2021	2021	



On digital skills, Lithuania's performance has room for improvement, although it has made an important progress in some indicators over the recent years, in particular in the area of ICT specialists. Still, Lithuania will need to continue the sustained efforts in view of the Digital Decade digital skills' 2030 targets.

Almost half of the Lithuanian population masters at least basic digital skills, slightly below the EU average (49% vs 54%). The data on above basic digital skills show a similar difference, where Lithuania scores 23% against the EU average of 26%. The share of ICT specialists in total employment is 4.4%, below the EU average of 4.6% but significantly higher than last year (3.8%) and thereby converging quickly with the EU average. ICT graduates currently account for 4.7% of all graduates in Lithuania. Notably, the country remains significantly above the EU average in terms of gender balance among in the ICT workforce. Lithuanian enterprises are modestly investing in ICT training: only 13% provided specialised ICT training to their employees, against the EU average of 22%.

Lithuania currently lacks a specific digital skills strategy, but it runs several initiatives to develop the digital skills of its population, including the [2020-2030 Industry Digitisation Roadmap](#), and the [2013-2022 State Education Strategy](#). It has also developed the [National Skills Strategy](#) in cooperation with the OECD. It reviewed the curricula of primary and secondary schools, with the aim of strengthening the development of digital competencies, as well as adult learning. One of the priorities under the [2021-2030 National Digitalisation Development Programme](#) is to improve the digital skills of people in socially vulnerable groups, such as people with disabilities, elderly, and people on lower incomes. As in previous years, Lithuania promoted digital skills at all levels of education and vocational training.

In 2022, Lithuania started to implement an RRF-funded [EdTech project](#), scheduled for 2022-2024 with a budget of EUR 30 million. It promotes the use of the state-of-the-art educational technologies in the education sector, provides training for teachers, and supports the development of digital content and solutions for teaching methods.

Furthermore, Lithuania has several ongoing activities underway, including the management of websites raising awareness of the safer use of internet (www.esaugumas.lt) and trust services (www.elektronisparasas.lt). The Communications Regulatory Authority, the telecom NRA, together with the association INFOBALT, organised several events on digitalisation and its benefits, such as webinars and the DigitBaltic 2022 conference¹⁶¹.

In cooperation with the digital industry, Lithuania continued to provide state-funded education to upskill and reskill workers, including specialised IT vocational education and training (VET) schools in Vilnius and Kaunas.

Several initiatives are underway to include more women in Science, Technology, Engineering and Mathematics (STEM). For instance, several hundred women participated in a mentorship programme **Women Go Tech**, which support women's careers in IT and engineering with funding from large tech companies.

In 2022, as every year, National Digital Coalition coordinator [Langasiateiti](#) runs three public campaigns: **Safer Internet Week**, **All Digital Week** and **Seniors Online Week**. These events included a range of activities encouraging and training people to develop their digital skills. The traditional Safer Internet Day campaign was run that year by Safer Internet Centre Lithuania, featuring an awareness centre, a helpline and a hotline. Another important and active institution among the stakeholders, the digital industry association [INFOBALT](#), also run programmes in this domain.

Age is still a risk factor for social and economic exclusion in Lithuania. For seniors, the lack of digital skills contributes significantly to being excluded, both in terms of being a barrier to accessing e-services and opportunities, and in terms of social exclusion and income inequality. One of the initiatives to prevent exclusion and improve digital literacy is the 'Information Technology Connects Generations' project, where young people share their time and digital skills with seniors.

In 2022, the Public Employment Service launched measures to help people build high value added qualifications and competencies (ALMP measures, support for learning) financed from the RRF funds. They aimed to upskill/reskill almost 20 000 workers, half of whom would develop digital competences. Implementation of the measures started in July 2022 and will run until 2026, with a budget of almost EUR 81 million.

Lithuania organised almost 400 activities during the 2022 **EU Code Week**. Most activities (94%) were run at Lithuanian schools. Over 10 000 participants took part, of whom 47% were women and girls.

¹⁶¹ www.digitbaltic.com

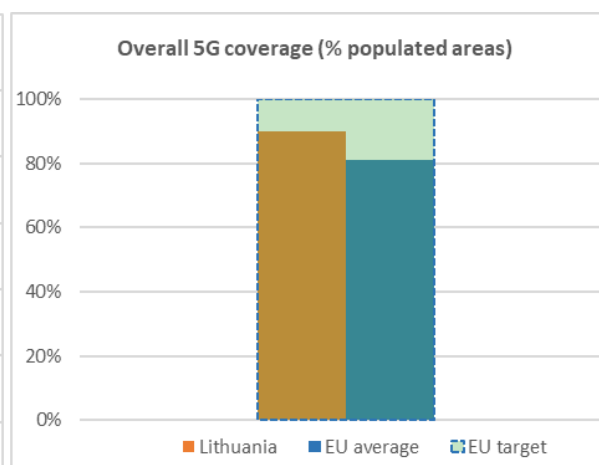
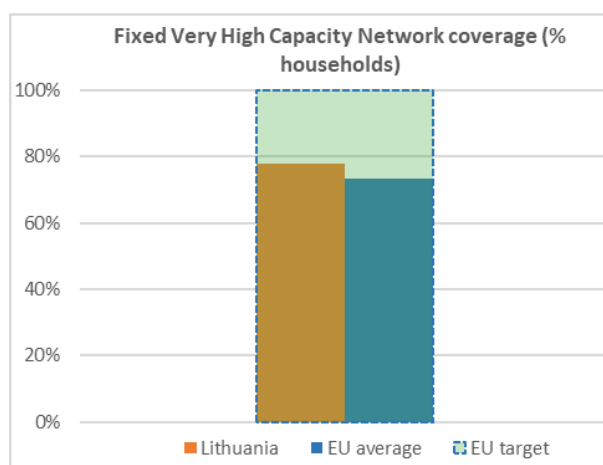
One type of institutions that is particularly important for the spread of digital skills and literacy are **public libraries in Lithuania**. These libraries run a network of 1 200 public internet access points in both urban and rural areas. Operating in a decentralized manner, they organise digital literacy training on their own initiative on a variety of topics for members of their community.

Lithuania should accelerate its efforts in the area of digital skills. In particular, Lithuania still needs to invest substantial funds in formal education and training and carry out upskilling and reskilling efforts for people already active in the labour market¹⁶².

¹⁶² The recommended policies, measures, and actions in this document reflect the Commission Communication 'Report on the state of the Digital Decade' COM(2023) 570.

2 Digital infrastructures

	Lithuania			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up	40%	46%	52%	55%	
% households	2020	2021	2022	2022	
2a2 At least 1 Gbps broadband take-up	0.3%	1.0%	1.7%	13.8%	
% households	2020	2021	2022	2022	
2a3 Fixed Very High Capacity Network (VHCN) coverage	67%	78%	78%	73%	100%
% households	2020	2021	2022	2022	
2a4 Fibre to the Premises (FTTP) coverage	67%	78%	78%	56%	
% households	2020	2021	2022	2022	
2b1 Mobile broadband take-up	74%	85%	85%	87%	
% individuals	2018	2021	2021	2021	
2b2 Overall 5G coverage	0%	33%	90%	81%	100%
% populated areas	2020	2021	2022	2022	
2b3 5G spectrum	5%	5%	47%	68%	
Assigned spectrum as a % of total harmonised 5G spectrum	2021	2022	2023	2023	



Lithuania performs relatively well on digital infrastructure and a positive outlook is noticeable both in fixed and mobile connectivity. The roll-out of Fixed Very High Capacity Network (VHCN) has levelled up, covering 78% of households, above the EU average of 73%. Similarly, fiber-to-the premises (FTTP) coverage reached a plateau at 78% in both 2021 and 2022, again well above the EU average of 56% in 2022. The take-up of 1 Gbps connections increased but is still very low at 1.7% of households compared to the EU average of 13.8%. The take-up of fixed broadband with speed of at least 100 Mbps is only 52%, slightly below the EU average of 55%.

Lithuania continued implementing the main publicly funded investment project 'Development of Next Generation Access Infrastructure', with financial support from the ERDF for 2018-2023, continued being implemented. The plan is to build 25 telecommunication towers and about 1200 km of fibre optic cables lines in remote areas that are currently without high-speed broadband internet.

In 2022, the construction of fibre-optic cable lines was completed with 1 235 km of fibre-optic lines installed, and 310 existing communication infrastructure objects connected. During 2022, construction started on the telecommunication towers, with three towers completed and a few others underway. The remaining towers are due to be built in the first half of 2023.

In areas where it is not possible to build communication towers, Lithuania plans to install Gigabit Passive Optical Network (GPON) compression infrastructure with about 12 000 connection points. It had installed some 9 500 connection points by the end of 2022.

The development of infrastructure is based on the updated National Broadband Plan. Currently, the main measures include the 'Development of gigabit broadband infrastructure for digitally sensitive users' (private companies, non-governmental and governmental organisations, municipalities and municipal companies). The project aims to enable access to gigabit broadband infrastructure to 5 000 digitally sensitive users and receives EUR 49 million RRF funding. In 2022, Lithuania prepared to implementation of this measure, involving surveying ministries, operators, and other institutions on their connection needs. Currently, implementation has started on the high-speed communication infrastructure project, and the public procurement documents needed to implement the project are being prepared.

The RRP allocates EUR 24.5 million to support the roll-out of 5G networks, in particular to create an environment for testing and practical application of innovative communication ideas based on 5G technology. Preparations were made in 2022, calls for proposals were launched in early 2023, and the projects are scheduled to start in 2023 and run for two years. The areas for practical applications can vary from autonomous mobility, drones, the internet of things, virtual reality and robotics.

There has been a significant increase in populated areas with 5G coverage from 33% in 2021 to 90% in 2022, above the EU average of 81%.

Lithuania announced the auction to assign the rights to use radio frequencies from the 713-733 MHz and 768-788 MHz radio frequency bands in October 2021 and adopted the decision in September 2022, with three winners. A block of 2x15 MHz from the 700 MHz frequency band is reserved for the Governmental Emergency Network. One of the problems affecting the smooth operation in the 5G may arise from broadcasting operations in the Kaliningrad Area of the Russian Federation that is run on the same frequencies.

Lithuania also runs the auctions for the 3.6 GHz band in 2022. It concluded in August with three winners of 100 MHz blocks each. The 3.7 GHz sub-band is still reserved for the Governmental Emergency Network. The cross-border coordination agreement for 3.4-3.8 GHz band with the Russian Federation has not been finalised yet and a solution is not forthcoming.

After both auctions were finalised, Lithuania started rolling out 5G services at these bands, and work continued on rolling out the other bands. For instance, one of the major operators completely switched off 3G services in 2022 and transferred the frequencies used for 3G to more advanced 4G and 5G technologies.

On 1 January 2023, the Law on Electronic Communications and the related implementing acts entered into force. In the long run, this will allow all types of devices, including mobile phones, to be sold separately from physical SIM cards, to facilitate the development of smart cities, the internet of things, and thereby more efficient logistics, transport, energy, financial services, environmental sectors, healthcare, etc.

The Rules of Universal service provision also changed in 2022, to include adequate broadband internet access of at least 10 Mbps download and 1 Mbps upload and voice communications services. An analysis of availability of universal service under normal commercial circumstances

started in late spring 2022. Obligations to provide affordable universal services in 5 municipalities (out of 60) of Lithuania were imposed and apply from 1 July 2023.

Lithuania has long been involved in fundamental research and niche technologies of semiconductor physics. Currently, applied research into semiconductors carried out by VU, KTU, VGTU research institutes and FTMC reflects the accumulated scientific achievements and competences. Moreover, following the Commission Recommendation (EU) 2022/210 on a common EU toolbox to address semiconductors shortages, Lithuania carried out in May 2022 a mapping of the local semiconductor value chain and reported its results to the European Commission. The mapping will serve as basis for the future monitoring mechanism implementing the provisions of the upcoming Chips Act. Finally, at the beginning of 2023, a private initiative announced the plan to run operations such as semiconductor chip design, manufacturing, assembly and testing, and power module manufacturing. According to the press releases, domestic semiconductor production is expected to start in 2027 approximately.

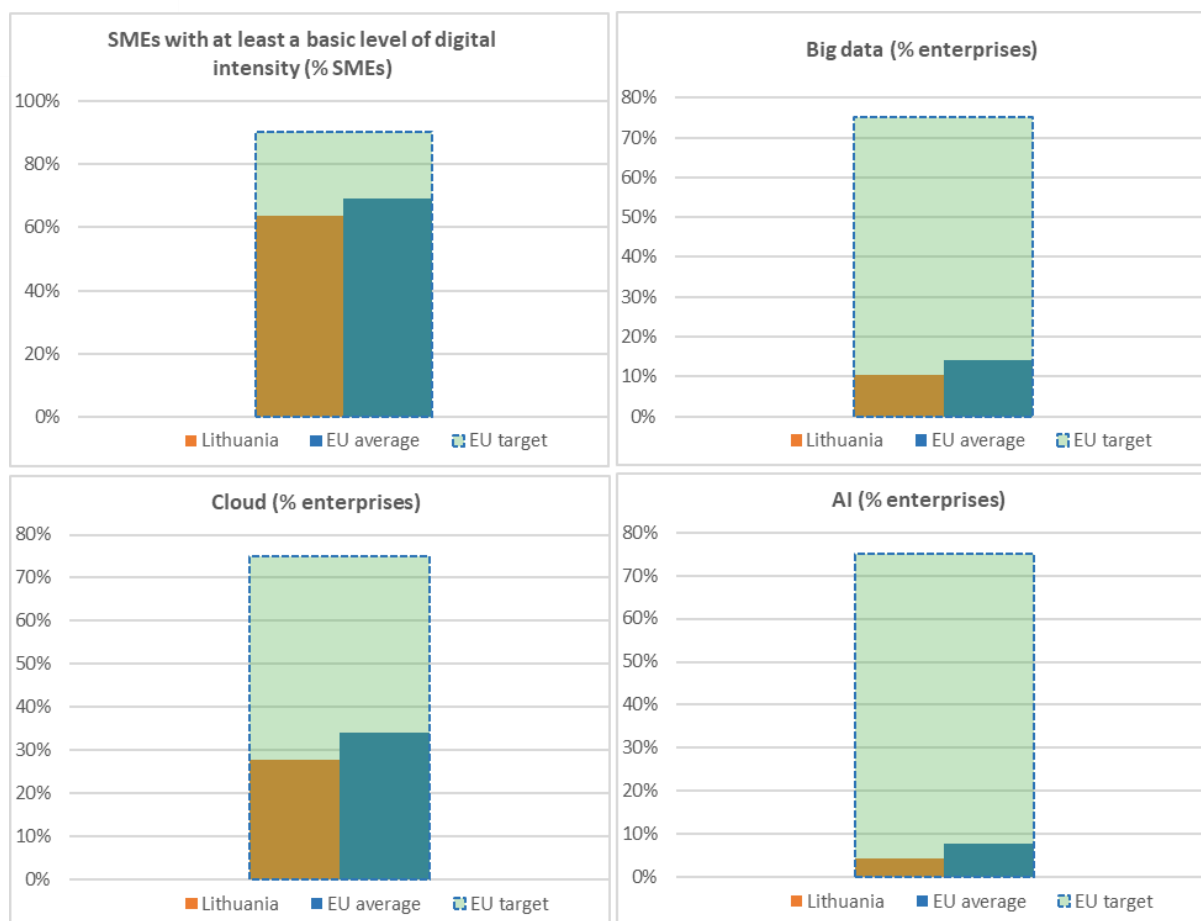
No developments were reported on edge nodes or on quantum infrastructure.

Lithuania should accelerate its efforts on connectivity infrastructure. In particular Lithuania should increase its efforts in rolling out gigabit connectivity, especially fibre to the premises in rural areas, with the assistance of EU funds. Lithuania should take measures to incentivise take-up of high-speed connectivity.

3 Digitalisation of businesses

	Lithuania			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	64%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	48%	45%	45%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	24%	22%	22%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	11%	11%	11%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud¹⁶³	NA	28%	28%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	5%	5%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	27%	27%	27%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	28%	32%	31%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	15%	18%	15%	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	13%	12%	12%	9%	
% SMEs	2019	2021	2021	2021	

¹⁶³ Enterprises buying sophisticated or intermediate cloud computing services indicator, see [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).



Lithuania continues to perform close to the EU average on most indicators tracking the digitalisation of business. The share of SMEs selling online, and overall e-commerce turnover are higher than the EU average. **However, the share of SMEs with at least basic level of digital intensity and the adoption of advanced digital technologies is below average.** In particular, companies' use of social media is at 22% against the EU average of 29%, cloud computing services 28% against 34%, and integrating AI technologies into operations is 5% against 8%. In the longer term, Lithuania would need to take significant efforts to reach the 2030 Digital Decade target of at least 75% of enterprises taking up sophisticated or intermediate cloud services, big data analyses or AI.

Over last few years, Lithuania has indeed taken a few actions to increase the take-up of digital technology by SMEs, to contribute to the EU target of 90% of SMEs with at least a basic level of digital intensity. The **E-komercijos modelis**¹⁶⁴ (e-Commerce model), a measure adopted during the COVID-19 crisis and funded by React EU (EUR 45 million), was implemented in 2022 and 2023, financing over 1 100 projects.

In 2022, Lithuania adopted a progress measure '**Encourage companies to digitise**'¹⁶⁵ including a few budget lines supporting SMEs. Support for the purchase of ICT services has budget of EUR 18.6 million and is being rolled out from 2023. The measure to promote digitisation of SMEs has a budget of EUR 31.5 million, and aims to enable SMEs to integrate e-commerce models that product

¹⁶⁴ [E-komercijos modelis COVID-19 | Ekonomikos ir inovacijų ministerija \(lrv.lt\)](#)

¹⁶⁵ [Pažangos priemonė Nr. 05-001-01-05-05 Skatinti įmones skaitmenizuotis | Ekonomikos ir inovacijų ministerija \(lrv.lt\)](#) [Pažangos priemonė Nr. 05-001-01-05-05 Skatinti įmones skaitmenizuotis | Ekonomikos ir inovacijų ministerija \(lrv.lt\)](#)

digitisation (products made and/or services provided), e-trade and delivery services. Investments are planned to help implement solutions for concluding e-sales transactions, configuration and visualization of services and products.

Other public bodies and industry associations have also taken steps to facilitate the use of digital technologies in the private sector. The Communications Regulatory Authority runs websites raising awareness of aspects of digitalisation and trust services (www.elektronisparasas.lt), and of safer use of internet (www.esaugumas.lt). Together with the association INFOBALT, it organised several events promoting digitalisation (e.g. www.digitbaltic.com). In digital finance, the Bank of Lithuania created a regulatory sandbox enables developers of innovative financial products and business solutions to test them in a real-world environment, under the supervision and in consultation with the Bank of Lithuania.

In the near future, the European Digital Innovation Hubs (EDIHs) will provide access to technical expertise and experimentation for enterprises. Following the successful bid for three Lithuanian EDIHs, the administrative process of rolling-out the network of EDIHs is ongoing.

In 2022, Lithuania took steps to **increase the number of digital start-ups in the country**. The Agency for Science, Innovation and Technology ran several projects focused on creating new start-ups. It created a learning platform, supported co-working hubs the Spiečiai ('beehives'), and published e-guides on the subject. Lithuania's RRP also includes financial incentives (EUR 15 million) to be distributed to more than 100 start-ups and spin-offs to develop artificial intelligence products and solutions. Funding will be provided for the development of the AI products and services at an initial stage of maturity to identify market needs, develop a concept for a technological solution, create a minimally viable product and achieve partial market-ready status.

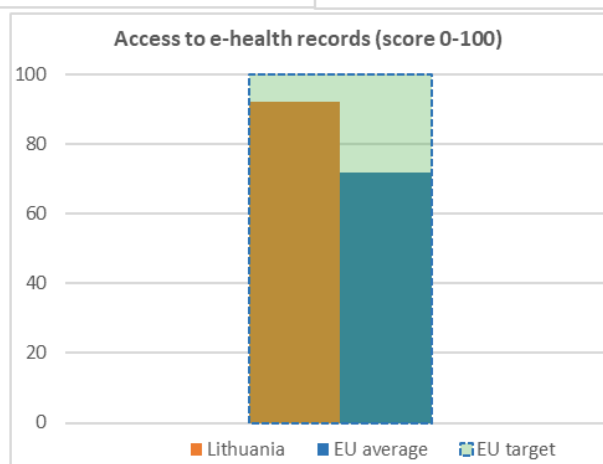
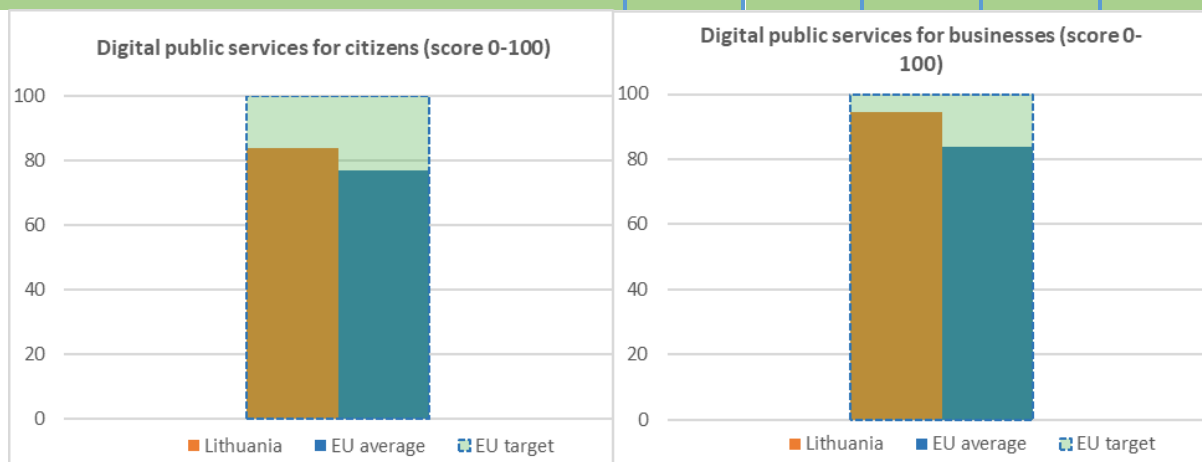
The Bank of Lithuania continues to pursue **the goal to make Lithuania a fintech hub** with light regulations, responsive bureaucracy and tailored licensing processes. The Newcomer programme helped potential financial market participants evaluate opportunities in Lithuania, giving insight into legislative and licensing requirements for businesses aiming to start operations in the country.

Lithuania has made progress in integrating and developing of digital technologies. However, further significant action is needed to reach the 2030 Digital Decade target of at least 75% of enterprises taking up cloud services, big data or AI.

Lithuania should accelerate its efforts in the area of digitalisation of businesses. It is important that Lithuania matches its investments with strategic reforms and balances the investments made in the public and private sectors, with a special focus on SMEs.

4 Digitalisation of public services

	DESI 2021	Lithuania		EU	EU
		DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	83% 2022	74% 2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	82 2021	84 2022	77 2022	100
4a3 Digital public services for businesses Score (0 to 100)	NA	93 2021	94 2022	84 2022	100
4a4 Pre-filled forms Score (0 to 100)	NA	92 2021	93 2022	68 2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	75 2021	78 2022	65 2022	
4a6 User support Score (0 to 100)	NA	81 2021	83 2022	84 2022	
4a7 Mobile friendliness Score (0 to 100)	NA	91 2021	97 2022	93 2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	92 2022	72 2022	100



Lithuania continues to perform well above the EU average in providing digital public services for both individuals and businesses. It is thus well positioned to reach the Digital Decade target on public services by 2030 for both businesses and citizens. The number of e-government users has increased to 83% against the EU average of 74%. On pre-filled forms, Lithuania scores significantly above the EU average (93 versus 68). It also scores very well on transparency of service delivery, design and personal data (78 compared to the EU average of 65).

Lithuania is implementing the **Reform of the digitalisation of public and administrative services**, in line with the plan set out in the RRP. It aims to transform national and local government processes by automating the interinstitutional data exchange. To this end, it integrates systems and public registers, enables the reuse of data, and digitalises public services that until now were only delivered in the physical form. The budget for the project is EUR 115 million. In a recent stage of the implementation of this plan in March 2023, over 56 applications were submitted for digitalisation projects delivered by central level institutions and municipalities. They included a project to modernise the State Information Resources Interoperability Platform ([Electronic Government Gateway](#)) by enabling users to do an advanced search for information on public and administrative services. The reform is expected to be completed by 2026, with the improvement of the level of maturity of existing digital services along the way.

The e-Government system provides compound services that are user-oriented, proactive, and designed following the *once only* principle. It means that the system automatically retrieves data available in the country's information systems or public registers and users do not need to provide it manually. Given the discrepancies and gaps in the registers, this is not a trivial task. Compound e-services consist of a few related procedures that users can choose according to their needs or circumstances. They are very demanding from the governmental back-office perspective, sometimes requiring the use of sometime heterogeneous data sets. Compound e-services were made available for citizens to be used in the national [Electronic Government Gateway](#) in Spring 2023 and the quality of this service is being improved continuously.

The portal provides access to many e-services that were already available in previous years. In 2022, three new and one modernised e-services were added (birth certificate, job search documents, move to another country documents). Of particular importance to the labour market, the portal launched the functionality *eRezidentas*, which allows foreigners with a business interest in Lithuania to use and request public, administrative and commercial services. This has effectively digitised the process as foreign workers can now apply for an *eRezidentas* card with identity and electronic signature certificates that enables them to take on employment.

In terms of the objective of a public, digital, interoperable identification solution, Lithuania already has the public key infrastructure needed, and a personal ID card for both electronic identification and electronic signature. These solutions were set up in line with Regulation 910/2014 on electronic identification and trust services for electronic transactions in the internal market. Over 15 Member States currently accept Lithuania's system. Lithuania also offers a large supply of qualified trust services (5 out of 9 possible types) for its citizens.

The Lithuanian government uses digital solutions to communicate with stakeholders on various policies. The [e-citizen](#) service makes it easier to contact government agencies electronically, and to monitor the progress of petitions, applications, or public consultations. On legislation, the [e-Seimas](#) service enables the public to register public legislative initiatives, and also to comment on the legislative acts being processed by the Parliament.

Lithuania excels in providing online medical records, with a score of 92, which is the second highest score in the EU. The Electronic Information System of Health Services & Cooperation Infrastructure

(ESPBI IS) hosts currently almost 100% of Lithuanian healthcare providers, as well as pharmacies. All national healthcare subjects in Lithuania are required to use the system when providing health-related services. This system is extensively used. For instance, in December 2022, alone 7.6 million medical records were uploaded to the ESPBI IS. The system is under continuous development.

This national online access service provides the public with a wide array of health data. They can access data via an online portal that enables over 80% of the population using a (pre-)notified eID compliant with the eIDAS Regulation with a level of assurance classified as 'high' or 'substantial'.

Lithuania seems to be on track to meeting the Digital Decade target of 100% citizens' with access to electronic health records by 2030. There are only a few private sector geriatric nursing homes and mental health facilities that have yet to be connected to the system.

Opening access to public data for commercial and non-commercial reuse is one of the Lithuania's strategic goals. It is included in the Digitization Development Programme for 2021–2030. The Open Data Portal¹⁶⁶ became fully operational in June 2020 and remains the single access point for all open datasets. The portal currently provides almost 2000 types of metadata, including 1657 linked to data sources and described using the DCAT dictionary requirements. In the 'Open Data Maturity 2022', Lithuania was ranked 13th, scoring above the EU average.

Lithuania set itself an ambitious target to dedicate 20% all public procurement in the country to innovation procurement. A national guidance was created to encourage public entities to use such type of procurement for the digitalisation of public services.

Lithuania's **cybersecurity policy** is currently set out in the 2018-2023 National Cyber Security Strategy (NCSS). Lithuania plans to update the Policy and possibly replace this strategy with the National Cyber Security Development Programme in 2023. Cybersecurity has also been identified as a key element of the National Security Strategy presented in December 2021.

Lithuania, together with other Member States, continued implementing the EU project 'Cyber Rapid Response Teams and Mutual Assistance in Cyber Security'. The aim of the project is to provide support to tackle cyber threats in time of need, with the participation of Member States, EU institutions, CSDP Missions and Operations as well as other partners. Lithuania also runs the Kaunas Regional Cyber Defence Centre, monitoring and analysing threats in the region, including partners from Ukraine and Georgia.

Lithuania runs a **Safer Internet project** under the Digital Europe Programme aiming to promote safer use of the internet and new online technologies, particularly for children, and to combat illegal and unwanted content. Currently the project is being implemented by a consortium of four partners: the Lithuanian Centre of Non-formal Youth Education (LMNSC), the alliance 'Langas į ateitį' (Window to the Future), the NGO 'Child Line' and the Communications Regulatory Authority (RRT). LMNSC and 'Langas į ateitį' are implementing different awareness activities, 'Child Line' is responsible for the helpline operations (giving emotional and psychological support to children who encountered negative experience online), and RRT is responsible for operating the internet hotline 'Švarus internetas' (Clean Internet). The objective of the hotline is to log reports of internet users who encounter content as sexual abuse of children, violence or bullying, pornography, distribution of narcotic substances, incitement of racial or ethnic hatred, and other unlawful or harmful information. In 2022, the RRT started using a tool developed with a private company based on artificial intelligence to search for harmful content (pornography and child sexual abuse material) on Lithuanian internet sites. A project 'Creating a safe electronic environment for children' with budget

¹⁶⁶ [Lithuanian open data portal | Joinup \(europa.eu\)](https://open.data.europa.eu/)

of EUR 3.5 million from the European Social Fund, continued to finance 2000 Wi-Fi hotspots in the country to improve connectivity in schools.

The Project “Data Lake” that aims at linking the registries and enabling the public institutions to access the required data seamlessly should be swiftly implemented as it will provide a necessary upgrade of the currently existing e-Government services to the next level.

Best practice: GovTech sandbox

The mission of the GovTech sandbox project is to find innovative digital solutions that improve policy making. During 2022, a structured experimentation program has been launched by the administration in cooperation with SMEs and start-ups. Within the project, 29 successful prototypes that provide solutions to the challenges of the public sector were developed, ranging from using satellite images and AI to measure damage done in the countryside by cows, to mobile app for people with mental disability assisting in purchasing goods, to a program using AI to model effective policing of road, and to visualizing spaces of industrial enterprises and factories with virtual reality.

Lithuania should continue implementing its policies to digitalise public services.



Digital Decade Country Report 2023

Luxembourg

Introduction

Luxembourg is expected to make an important contribution to the collective efforts to achieve the EU's Digital Decade targets. It is progressing well in its digital transformation with positive effects in the surrounding regions, notably in terms of innovation in data centers and digital administration as well as a more skilled workforce.

In recent years, digital issues have gained political traction notably with the adoption of several key strategies and the launch of many individual measures discussed below, sometimes at a low scale and in many cases with multi-country involvement. While Luxembourg has an overview of the digital strategies run by each Ministry, it lacks a consolidated strategic document for digitalisation towards 2030.

Luxembourg is collaborating with other Member States in exploring the possibility to set up a **European Digital Infrastructure Consortium (EDIC)** on Genome, to enable effective and secure cross-border access to repositories of personal genomic datasets.

Digital in Luxembourg's Recovery and Resilience Plan (RRP)

Luxembourg's Recovery and Resilience Plan amounts to EUR 82.7; 30% of this (EUR 24.5 million) is devoted to digital transformation and is expected to contribute to the Digital Decade targets¹⁶⁷.

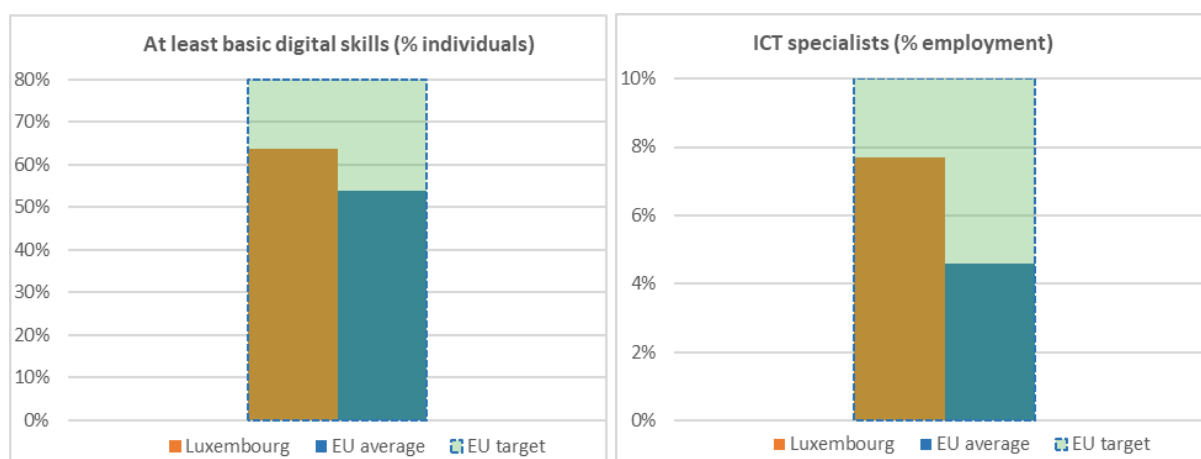
Digital reforms and investments that were meant to be implemented in 2022 were: (i) the launch of the single digital register of health professions, with at least 5 000 professionals registered; (ii) the launch of the national e-health platform of the 'IdeoPHM' tele-monitoring solution replacing the previous 'Maela' solution and allowing for remote medical follow-up between doctors, dentists or midwives and patients; (iii) the successful connection of at least two sites in the framework of the Luxembourg Quantum Communication Infrastructure (LuxQCI) Laboratory through creating a terrestrial network; (iv) the successful connection of the space and terrestrial segments of the QCI through a Key Management System (KMS); (v) the creation of a cross-border connection to demonstrate a land-based quantum key distribution system; (vi) the integration of a videoconference appointments functionality into the MyGuichet.lu e-government portal and the implementation; and (vii) availability of 12 new services for the public and for businesses, accessible via MyGuichet.lu.¹⁶⁸

¹⁶⁷ Each Recovery and Resilience Plan must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plans had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or has no impact (0%) on digital objectives, using Annex VII of the RRF Regulation. Combining the coefficients with the cost estimates of each measure allows for assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to allow for an estimation of the possible contribution of RRF measure to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice of potential ongoing revisions of the plan.

¹⁶⁸ The verification process of proper implementation of these initiatives has not yet been launched.

1 Digital skills

	Luxembourg			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	96%	97%	95%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	64%	64%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	32%	32%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	80%	80%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	21%	21%	22%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	6.3%	6.7%	7.7%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	5.0%	6.4%	7.4%	4.2%	
% graduates	2019	2020	2021	2021	



Luxembourg is performing well in view of the Digital Decade targets on digital skills¹⁶⁹, with 64% of the population possessing at least basic digital skills, above the EU average of 54%. The country also scores above EU average for individuals with above basic digital skills (32% of people in Luxembourg versus 26% of people in the EU) and at least basic digital content creation skills (80% of people in Luxembourg compared to 66% of people in the EU). The country is also well above the EU average for the number of ICT specialists represented in total employment (7.7% vs. 4.6%). The share of women among ICT specialists is, at 20.7%, also above the EU average of 18.9%.

Luxembourg is currently implementing several measures intended to increase the level of basic and advanced digital skills. It is expected that the initiatives in the area of digital inclusion and those

¹⁶⁹ See [Decision EU 2022/2481 establishing the Digital Decade Policy Programme 2030](#), article 4(1)(1a)

to support jobseekers will have the most substantial impact in the short run, while initiatives focussing on the educational system will have the potential to create solid long-term effects.

In autumn 2022, the new subject of 'Digital Sciences' was introduced in Luxembourg's lower secondary education. The subject has six key strands: 'My digital world and me', 'The World Wide Web, it is network and me', 'Do you speak 'Informatics'', 'The game, analogue or digital, alone or together, a whole program', 'Robots, partners for better or worse', 'A machine smarter than me, does that exist'. To tackle inequalities in access to digital technologies and understanding, the course is offered in both classical and technical educational pathways, with materials available in German, French and English.

Digital Sciences in High Schools is the follow-up programme to the 'Einfach Digital' strategy, where from 2019 all primary school pupils participate in specific child-friendly workshops on computational thinking, logic and coding. Primary school teachers are required to deliver these intra-curricular workshops and have the option to be supported by a team of experts.

These actions are rooted in the 'Medienkompass' national media literacy framework, which was drawn up in 2020 to provide an overview of the digital media skills needed for a responsible, critical and creative use of media.

The [Digital Learning Hub](#) (DLH) which aims to reduce the digital skills gap offers short term training courses in different fields of ICT and is aimed at IT experts, novices, jobs seekers and youngsters as regards upskilling and reskilling. Among other initiatives, university curricula have been created to educate IT specialists while labour market needs are carefully monitored.

Together with the National Research Fund and Lux Tech School and in the frame of the Digital Skills Matchmaking programme, the Luxembourg Government is actively promoting and co-financing IT mentoring programmes for female students.

The ministry in charge of digital government has implemented the [National Action Plan for Digital Inclusion](#) highlighting three strategic levers to support the digital inclusion of all people in Luxembourg thereby contribute helping implement the Declaration on Digital Rights and Principles in this area: (1) increasing digital motivation and building digital confidence, (2) facilitating digital access and (3) developing basic digital skills. The plan currently includes 40 initiatives, focusing on the development of skills and digital citizenship to enable individuals to navigate the digital world in a more autonomous and safer way, regardless of their age, level of education, gender or potential disabilities. In order to support the digital familiarisation of older adults, analogue, audio-visual and digital resources are included and training courses are adapted to suit different levels of abilities and provided in different languages. By offering a multitude of decentralised initiatives across the country and building on existing structures, opportunities are provided for retraining and strengthening everyone's digital skills, in developing basic digital skills, e-banking, digital inclusion and the safe use of the Internet. Digital skills modules are integrated into adult education programmes, and training in basic digital skills and an introduction to several specific digital skills is available for job seekers. The plan aims to improve the digital inclusion of everyone in Luxembourg, eliminating also the gender gap that currently exists in digital skills.

In addition, some private sector initiatives provide additional support to increase the level of basic digital skills level. The National Action Plan for Digital Inclusion includes a call for projects to finance pilot projects to promote digital inclusion in Luxembourg for 2022-2023, addressed to associations, private organisations, public institutions, municipalities, inter-municipal unions, professional chambers, training centres and public research institutes.

ICT specialists represent 7.4% of the workforce¹⁷⁰, which is higher than the EU average of 4.2%. However, this is mainly due to the significant role in the Luxembourg economy held by the banking, data centre and public sectors, which employ a substantial numbers of ICT specialists. 22% of companies provide ICT training, in line with the EU average. 6.4% of graduates graduated in ICT programmes, well above the EU average of 3.9%. A number of initiatives in academic education can be expected to further increase the share of ICT specialists in the workforce in the longer term.

An important player in this field is the [University of Luxembourg Competence Centre \(ULCC\)](#), a centre for continued and vocational university-level training programmes. The ULCC has, among other priority areas, a portfolio of digital skills trainings, specifically designed to meet the needs of businesses and to upskill and reskill the workforce.

The University of Luxembourg is also enhancing its offer of immersive learning and virtual reality knowledge and has created a new hub for financial innovations. Luxembourg provides funding and support in terms of human resources and infrastructure to the DLH which has created a network of ICT partners to monitor the needs of the labour market in terms of skills and training needs. In 2022, Luxembourg made also training available to everybody interested in AI. For example it co-financed the deployment of an [online course on elements of AI](#), a joint project of the University of Helsinki and a technology company aimed at explaining what AI is, its basic principles and its limits. In September 2022, the first students on the newly created started their two years program. The programme was launched under the auspices of the European HPC Joint Undertaking. Eight European graduating universities¹⁷¹ and 60 public and private sector participants make up the consortium led by Luxembourg. In addition, Luxembourg University will launch its own master's in HPC, high-performance data analysis and AI, supported by the Ministry of the Economy. This master's programme will complement the digital and HPC ecosystem in Luxembourg, following the first major milestone of acquiring the Meluxina supercomputer.

Best practice: Luxembourg's Digital Skills and Jobs Coalition

Luxembourg's [Digital Skills and Jobs Coalition](#) promotes basic skills and ICT specialist's skills.

The Coalition's 60+ members, all of whom share a commitment to promoting digital skills, meet every 3 months. In 2020-2022, there have been a range of events, and workshops for groups of 80 students, held in the premises of major tech companies.

In 2023 Luxembourg launched the new interoperable [Digital Skills and Jobs Platform](#).

Luxembourg should continue implementing its policies in the area of digital skills. In particular, Luxembourg should encourage employers to strengthen the digital skills of employees (public and private) and workforce participation in digital training.¹⁷²

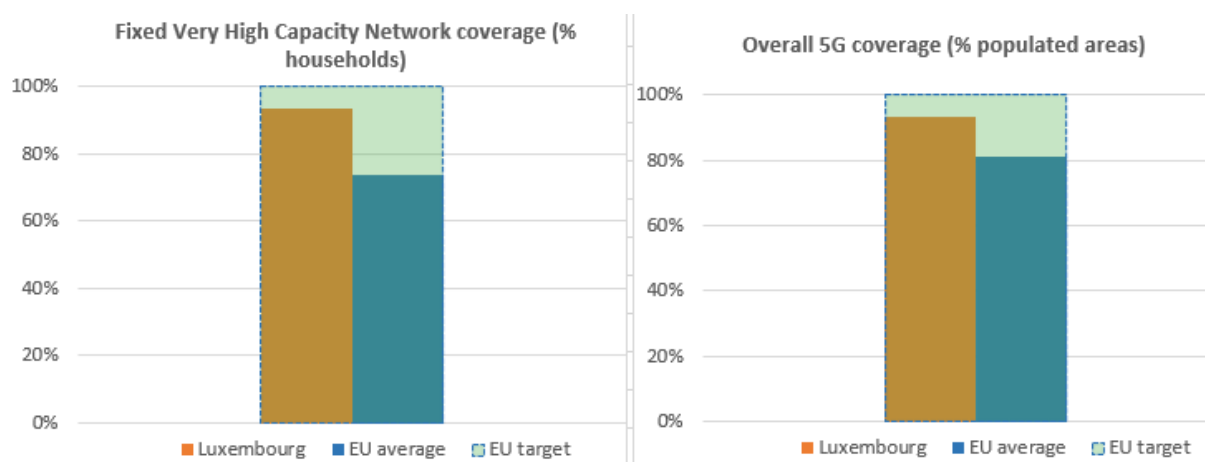
¹⁷⁰ See [Decision EU 2022/2481 establishing the Digital Decade Policy Programme 2030](#), article 4(1)(1b)

¹⁷¹ FAU (Nürnberg), KTH (Stockholm), Polimi (Milan), UniSofia (Sofia), Sorbonne (Paris), UniLu (Luxembourg), UPC (Barcelona), USI (Lugano)

¹⁷² The recommended policies, measures, and actions in this document reflect the Commission Communication 'Report on the state of the Digital Decade' COM(2023) 570.

2. Digital infrastructures

	Luxembourg			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up	56%	69%	74%	55%	
% households	2020	2021	2022	2022	
2a2 At least 1 Gbps broadband take-up	1.9%	4.4%	6.7%	13.8%	
% households	2020	2021	2022	2022	
2a3 Fixed Very High Capacity Network (VHCN) coverage	92%	93%	93%	73%	100%
% households	2020	2021	2022	2022	
2a4 Fibre to the Premises (FTTP) coverage	72%	75%	76%	56%	
% households	2020	2021	2022	2022	
2b1 Mobile broadband take-up	94%	96%	96%	87%	
% individuals	2018	2021	2021	2021	
2b2 Overall 5G coverage	0%	13%	93%	81%	100%
% populated areas	2020	2021	2022	2022	
2b3 5G spectrum	61%	61%	61%	68%	
Assigned spectrum as a % of total harmonised 5G spectrum	2021	2022	2023	2023	



Luxembourg is one of the EU's best performers in digital infrastructure making an important contribution to reach the EU targets.

There has been a steady increase in VHCN coverage, from 91.7% in 2020 to 92.6% in 2021 and 93.3% in 2022. Further roll-out of fibre will have a key role to play in meeting the 'Gigabit for everyone' target¹⁷³, as cable networks have followed their upgrade to the DOCSIS 3.1 standard. Luxembourg performs very well on overall Digital infrastructure. The main reasons for this are the high VHCN and FTTP coverage.

¹⁷³ See [Decision EU 2022/2481 establishing the Digital Decade Policy Programme 2030](#), article 4(1)(2a) (fixed)

Thanks to the wide availability of VHCNs, Luxembourg performs very well in the uptake of fixed broadband services of at least 100 Mbps: 74% of households have opted for such subscriptions, well above the EU average of 55%. Uptake of 1 Gbps services is, however, much lower than the EU average¹⁷⁴ 6.7% of households in Luxembourg compared to 13.8% at the EU level. The calculated monthly retail price for a 100 Mbit/s fixed internet subscription is in the range of EUR 29.00 to EUR 60.28 for a cable connection and EUR 58.57 to EUR 60.28 for a fibre connection. The price range for a 1 Gbit/s subscription, based on a cable or fibre connection is EUR 53.90 to EUR 109.38. As a result, people need to pay only double the price for a tenfold increase in capacity.

Broadband services (based on representative baskets of fixed, mobile and converged broadband offers, adjusted for national household income levels) are more expensive than the EU average.

The [National strategy for ultra- high-speed networks for 2021-2025](#) was published in October 2021. Its goals include deploying VHCN networks (1 Gbps downstream and 200 Mbps upstream) to all households in the country and all households in Luxembourg being subscribed to a service offering a minimum connection speed of at least 100 Mbps downstream and 20 Mbps upstream by 2025. Luxembourg still lacks a roadmap for how to achieve the Gigabit target by 2030. The strategy also aims to improve transparency and strengthen consumer protection as well as develop Luxembourg as the launchpad of choice for ICT service providers. For 2023, the priority will be to promote the take-up of Gigabit subscriptions and eliminate white spots, targeting areas with no VHCN connectivity. At the end of 2021, the government created a new structure called “MyConnectivity”, with a specific team devoted to implementing the strategy’s objectives, notably with regard to white spots.

Despite there being no public funding for broadband roll-out, the 100% state owned incumbent operator is the only significant contributor to fibre-roll-out. Cable operators increase the coverage of their Gigabit-capable networks.

On planning and co-ordinating civil works, operators and administrations work together in a transparent way and exchange information on a mutual basis. The national permit granting procedure is still an issue to be tackled to achieve fast and efficient deployment of broadband. Furthermore, operators reported difficulties with access to public property to install network equipment. More than 67% of households are connected to the incumbent’s fibre optic network and have access to ultra high-speed services of up to 1 Gb/s. Its network is an open access, multi-fibre network. The slowdown in the annual increase of FTTP coverage may reflect higher real roll-out costs in areas which are not (fully) covered yet, overall inflation and more specifically the increase in prices for raw materials, components and for civil works. Switch-off of the copper network where fibre is available will start in spring 2024.

By mid-2022, 5G coverage figures stood at 51% in the 3.4-3.8 GHz band and 93% (total), well above the EU averages of 41% in the 3.4- 3.8 GHz band and 81% (total). With further roll-out of 5G, Luxembourg would be on track to meet the [EU target for 2030](#)¹⁷⁵. On mobile connectivity, Luxembourg scores 61% on the 5G spectrum indicator. 5G services were commercially launched relatively late, in the second half of 2020. Following a public consultation at the end of 2020, no imminent spectrum demand in the 26 GHz band has been identified. Accordingly, no rights of use have been assigned for that band, mainly due to a lack of interest from stakeholders. This was again informally confirmed by one of the mobile operators in March 2023. While the long-term award of

¹⁷⁴ According to [ILR figures](#), FTTP technology had a share of 56.3% of all broadband subscriptions in Luxembourg by mid-2022.

¹⁷⁵ See [Decision EU 2022/2481 establishing the Digital Decade Policy Programme 2030](#), article 4(1(2a) (wireless)

the spectrum has been postponed, temporary licences are available to interested parties. The three national mobile network operators have increased their efforts to reduce the environmental footprint, mainly through the sunset of the legacy 2G and 3G networks. The largest mobile operator stopped operating its 3G network in 2022.

In addition, the not-for-profit association 'Digital inclusion' is operating a '[mobile bag](#)' initiative, which consists of a number of ready-to-post envelopes distributed all over Luxembourg allowing people to return any kind of mobile device to this association. Phones that are still usable will be refurbished by the association and provided to people in need. Phones that are too old or out of order to be reused are recycled.

National stakeholders are taking part in study and work projects on 5G cross-border corridors co-funded through the EU's Connecting Europe Facility (Digital). For example, the 5G MELUSINA project will prepare to put 5G infrastructure in place along a cross-border section of the North Sea Mediterranean rail link between Metz (France) and Luxembourg City (Luxembourg), to improve train passengers' connectivity and the digitalisation of rail operations. The 'Seamless cross border mobility 5G DeLux' project aims to support uninterrupted coverage along the cross-border corridor between Saarbrücken (Germany) and Frisange (Luxembourg).

Luxembourg is participating in the Important Project of Common European Interest – Cloud Infrastructure and Services (IPCEI) on [Cloud Infrastructure and Services](#) (CIS), currently involving 12 Member States. It will create a cloud-edge-continuum and grant the right for applications and data to freely "roam" from one cloud-provider to another. Luxembourg provides a focus on open source cybersecurity tools generating synergies and on privacy and trade secrets preserving technologies. Luxembourg has also focussed on cross-company and cross-border collaboration and the creation of synergies. All documentation, products and services will be published as open source via the Luxembourg Open Source Promotion Office. The connected data lakes will be running on edge cloud to guarantee low latencies for large users and contributors. Luxembourg is financing the IPCEI-CIS initiative with a national state aid funding of a maximum of EUR 25 million for the next 3 years. Of this, EUR 2 million envisaged for the development of the edge node with the open cybersecurity data lake in close proximity to MeluXina to enable secure machine learning. A side budget for private companies of roughly EUR 1.5 million will be invested in cloud and edge cloud technologies. This will assist Luxembourg in contributing to the EU-wide target of 10 000 edge nodes by 2030. The GAIA-X initiatives Luxembourg started, foster the creation of edge-cloud nodes coordinated under the governance of the data space. The most advanced is a project by the hospital 'Hôpitaux Robert Schuman' (HRS) in cooperation with the NTT Luxembourg to create a proof of concept. Luxembourg has allocated EUR 25 million for GAIA-X projects in the next three years.

In the context of the European initiative EuroQCI, Luxembourg has started the national project LuxQCI, to develop and build a quantum communication infrastructure in Luxembourg to be interconnected with the EuroQCI. The national experimental testbed began operating in November 2022, set up by the government and the University of Luxembourg. The connection of two geographically distant points on the ground with end-to-end quantum communication by using Quantum Key Distribution (QKD) was scheduled for the first half of 2023. Luxembourg has dedicated EUR 10 million from the Recovery and Resilience Facility (RRF) to the LuxQCI project. Luxembourg has also signed a grant agreement with the European Commission for additional cofunding under the Digital Europe Programme (DEP), to extend research and development activities for the terrestrial segment. Luxembourg also intends to develop and construct one of the first national optical ground stations, needed to create the link between the terrestrial segment and the first European quantum satellite Eagle-1, the only way to bridge long distances for QKD. With the DEP funding, the University

of Luxembourg intends to provide courses for students in the field of quantum technologies, expected to start in September 2023.

Luxembourg is active in the area of HPC with a new university master programme to complement the HPC ecosystem in Luxembourg after the first major milestone of acquiring the Meluxina supercomputer.

In autumn 2022, Luxembourg published a specific high performance computing call for projects with a budget of approx. EUR 8 million, intended to make HPC accessible to SMEs.

Blockchain technology is currently being integrated into the process of applying for financial aid for higher education. The DLH focusses on Blockchain and FinTech among other areas. Together with the Luxembourg Blockchain Lab, the hub identities job profiles and offers relevant training in this area. The range goes from elementary classes on digital and distributed transaction ledgers and cryptocurrencies, up to the legal aspects of a blockchain and to programming a blockchain in a secure environment.

Luxembourg supports the deployment of the European Blockchain Services Infrastructure (EBSI), including through hosting two validator nodes, one hosted by the Ministry for Digitalisation and one hosted by Infracrain. There were no reported developments and initiatives on **quantum computing** and on **semiconductors** in Luxembourg.

Best practice: Cybersecurity

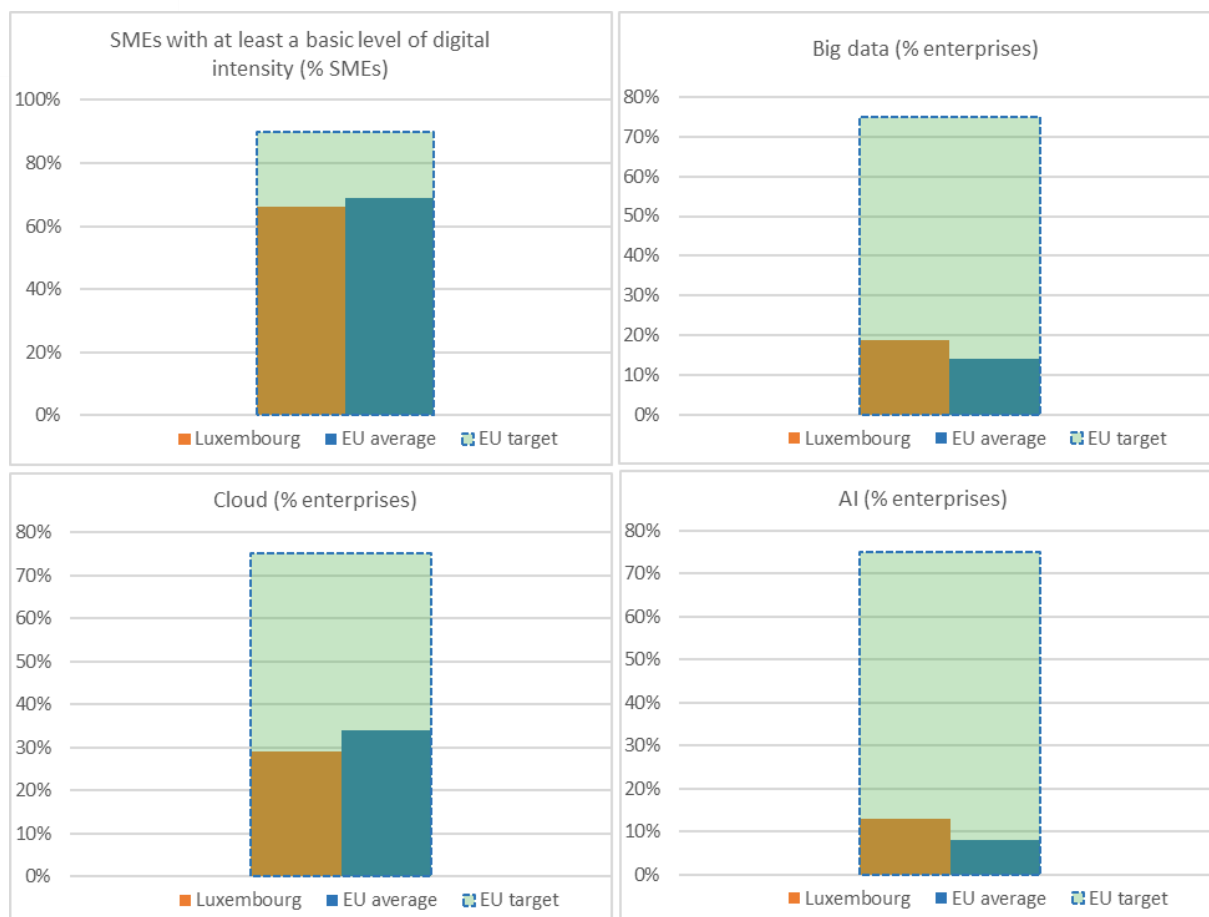
As part of Luxembourg's data driven innovation strategy, cybersecurity requirements are considered to be increasingly discriminatory in terms of complexity and costs and unaffordable to the majority of economic actors. SMEs can neither afford nor operate effective tools while larger companies mostly use external providers to operate the tools for them. Providers have created a closed data economy for [Indicators of Compromise](#) (IOC) that they collected from their customers. Data are not accessible for research and are only provided to paying customers. Luxembourg authorities believe that there is a market failure due to lack of coordination exists and they are financing the creation of an open cybersecurity data space accessible to any entity that can demonstrate a legitimate interest. The data will also be made available for research to promote innovation in unattended AI based cybersecurity tools for SMEs. In the context of the IPCEI-CIS, Luxembourg is financing a public entity to create this open cybersecurity data space in accordance with EU law. Luxembourg has a lot of experience with this type of threat information systems as it is a core developer for [MISP](#), a threat sharing platform co-financed by the EU.

Luxembourg should continue implementing its policies on digital infrastructure. In particular, it could take additional measures to incentivise the take-up of gigabit and 5G connectivity and continue efforts on the roll-out of gigabit connectivity, in particular streamlining the permit procedures and facilitating access to public property to extend fixed and densify mobile networks. Luxembourg should also develop further actions in the field of edge nodes and quantum in order to help the EU become a strong market player in these areas.

3 Digitalisation of businesses

	Luxembourg			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	66%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	41%	40%	40%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	29%	34%	34%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	19%	19%	19%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud¹⁷⁶	NA	29%	29%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	13%	13%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	14%	14%	14%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	9%	9%	8%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	NA	NA	NA	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	8%	7%	7%	9%	
% SMEs	2019	2021	2021	2021	

¹⁷⁶ Enterprises buying sophisticated or intermediate cloud computing services indicator, [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).



Luxembourg shows room for improvement on the digitalisation of businesses. 66% of SMEs in Luxembourg have at least a basic level of digital intensity and it is slightly below the EU average of 69%. In line with the country's ambition for a transition to a data-driven economy, Luxembourg performs well on the share of businesses that (1) have implemented electronic information sharing (40% versus the EU average of 38%), (2) use social media (34% versus the EU average of 29%), (3) analyse big data (19% versus the EU average of 14%) and (4) use AI (13% versus the EU average of 8%). By contrast, the share of businesses using cloud services remains at 29%, below the EU average of 34%. Luxembourg also continues to perform well below the EU average on the share of SMEs selling online, with only 8% compared to the EU average of 19%. The share of SMEs selling online cross-border continues to stand at 7%, below the EU average of 9%.

Industry supports the European Commission in its political will to simplify and reduce reporting requirements in the proposed [Cyber Resilience Act](#). As part of the [European Digital Innovation Hubs Network](#), Luxembourg has [one hub](#) which supports the digital transformation of its manufacturing sector.

SMEs in Luxembourg tend to be relatively small or even very small. Digitalisation of businesses is concentrated in large companies that are active in sectors such as banking or data centres. These structural factors explain why the digitalisation of SMEs remains slightly below the EU average. The Ministry of Employment is preparing a new draft law for a skills plan, to be submitted to the government council at the end of April, providing aid to SMEs for training their staff for future challenges. The first budget will be EUR 6 million. Upskilling and reskilling resulting from of the digital transition are the main focus of the plan. The 'Fit 4 Digital' programme is an example of an initiative which already contributes to increased digital intensity among SMEs. It is managed by the economic

interest grouping (GIE) and helps SMEs to assess their level of digital maturity in terms of IT infrastructure, cybersecurity and software and to identify actions and investments to improve the business's digital readiness. A grant of EUR 5 000 covers 100% of the cost of an analysis carried out by an independent third party. Up to 50% of the consultancy fees and up to 20% of the implementation costs are funded by the state.

'SME Packages - Digital', an initiative managed by the House of Enterprises and the Chamber of Skilled Trades and Crafts provides a fixed grant of EUR 5 000 to companies carrying out a project costing between EUR 6 650 and EUR 25 000 to implement a tool related to digital marketing, a management system or electronic invoicing. In 2022, approximately EUR 1.7 million in aids was disbursed by the General Directorate for SMEs of the Ministry of the Economy. The online sales platform [Letzshop.lu](https://www.letzshop.lu) continued to support the retail and hospitality sectors by familiarising merchants with online trading and by promoting sales through online channels allowing national merchants to sell their goods online. In 2022, Letzshop had a budget of EUR 1.6 million and 478 companies were registered as sellers on the platform.

19% of enterprises in Luxembourg analyse big data. This is well above the EU average of 14%.

None of the 249 unicorns in the EU were located in Luxembourg. However, at least one out of the EU's over 300 start-ups with a market capitalisation between USD 100 million and USD 1 billion is located in Luxembourg and actively producing additives for materials such as lithium and glass.

Luxembourg will join the 'Europe Start-up Nations Alliance', ensuring optimal framework conditions for setting up and funding a company, attracting and retaining talent, accessing financial instruments and use of finance. In 2022, the Young Innovative Enterprise funding scheme has continued to support ambitious start-ups in any sector in their scale-up phase with up to 70% of the financing need, limited to EUR 800 000. The aim is to support the international expansion of technology companies with scalable business models and a potential impact on the economy. In addition, start-ups and scale-ups investing in research, development and innovation projects can receive grants from the Ministry of the Economy, covering between 50% and to 80% of the eligible costs.

The national credit and investment institution [SNCI](https://www.snci.lu) also provides direct loans for research, development, and innovation projects to innovative SMEs. The [Catapult: Kickstarter](https://www.catapult.lu) acceleration programme, developed and operated by the [LHoFT Foundation](https://www.lhoft.lu) and supported by the Ministry of the Economy, runs twice a year and supports start-ups that provide digital innovative solutions for Luxembourg's financial sector. The two 2022 editions of the programme attracted 320 project proposals of which 20 were invited to participate in the bootcamps. Of those, ten selected projects can now apply for financial aid of up to EUR 50 000 to develop their business outside Luxembourg.

The [Digital Tech Fund](https://www.digitaltechfund.lu) is a EUR 20.33 million seed venture capital fund created in 2016 by the government with a group of private investors to support the financing and development of ICT start-ups. By the end of 2022, the fund managed by [Expon Capital](https://www.exponcapital.lu) had made a total of 13 Investments.

The [Luxembourg Future Fund](https://www.luxembourgfuturefund.lu) is a EUR 150 million fund stimulating the diversification and sustainable development of the Luxembourg economy, set up by the EIF and the SNCI. The Luxembourg Future Fund invests directly or indirectly in Venture Capital funds and SMEs to support the sustainable development of Luxembourg strategic sectors.

In 2022, the Ministry of the Economy and Luxinnovation, in collaboration with Belgian and Dutch public and private partners, organised a US-focused internationalisation programme for start-ups. Run by [BelCham](https://www.belcham.com) New York, the [Benelux Catalyst programme](https://www.beneluxcatalyst.com) allows selected start-ups from Luxembourg, Belgium and The Netherlands to discover the US market from New York, to establish commercial contacts and to evaluate the suitability of their products for the American market. The

two-week programme, physically held in the US includes workshops, lectures and individual sessions on product market fit, fundraising, pitching to investors, go-to-market and growth strategies.

The [Start-up Luxembourg](#) is a public initiative established to promote Luxembourg's start-up ecosystem at national and international level. The web platform, the social networks and the start-up mapping were complemented in 2022 by a [start-up directory](#) facilitating matchmaking with potential financial, technical or business partners. The Luxembourg Startupstart-Association, created in July 2022 by a group of private entrepreneurs to represent innovative Luxembourg start-ups at all stages, aims to support the emergence of digital champions and supporting entrepreneurs in Luxembourg. Luxinnovation regularly updates its sectorial mappings for HealthTech, Cybersecurity, Manufacturing and Creative Industries. In 2022, [AutoMobility Ecosystem](#) and [Sustainability Enablers](#) mappings were added. [Start-up mapping](#) also facilitates monitoring of the start-up ecosystem in Luxembourg and the key technologies used by start-ups. Currently, big data solutions, software and applications, (cyber) security and risk management are the most used technologies.

The [Fit4Start](#) acceleration programme, initiated in 2015 by the Ministry of the Economy and organised by Luxinnovation, focuses on innovative, technology and data-driven start-ups in ICT, space and health tech that use information technology such as IOT, blockchain, big data, AI, machine learning, robotics, cybersecurity and open source technology at the core of their business. Fit4Start offers a 6-month coaching and mentoring programme, free incubation and financial aid of up to EUR 150 000. The two 2022 editions of the programme attracted 517 projects from over 60 countries. 35 start-ups were finally selected to participate in the programme.

Two Luxembourg-based start-ups received EIC accelerator funding to further develop and scale-up their solutions: [Arspectra](#), a global pioneer in the development of medical augmented reality glasses and automated battery upcycling specialist [Circu Li-ion](#). Both companies are graduates of Luxembourg's Fit4Start acceleration programme, demonstrating the high quality of this initiative.

In 2023, the Start-up Genome published an analysis of the start-up ecosystem in Luxembourg prepared on behalf of the Ministry of the Economy. The study¹⁷⁷, which is based on research done in 2022, found that there has been a significant increase in performance on some metrics (such as number of venture capital deals) over the past decade. There also remain several obstacles to ecosystem growth, which act as deterrents in realising its potential as a highly productive engine for economic impact.

Best practice: Supporting the development of the commercial space industry

Luxembourg has built a thriving space industry, currently comprised of 60 companies and research labs and including a growing number of firms that build solutions for the commercial exploration and utilisation of space resources. It supports further development through several initiatives.

The [European Space Resources Innovation Centre's](#) start-up Support Programme ([ESRIC SSP](#)), launched at the end of 2021, is fully dedicated to **utilisation of space resources** and supports early-stage ventures and start-ups who design novel technologies for space resources applications when refining their business plan, attracting customers and securing their initial investments. Specific support is provided for prototype development of terrestrial and space applications along the value chain, with access to technical laboratories from the [Luxembourg Institute of Science and Technology](#) and the [European Space Agency](#). In the first 3-months phase of ESRIC SSP, five start-ups were

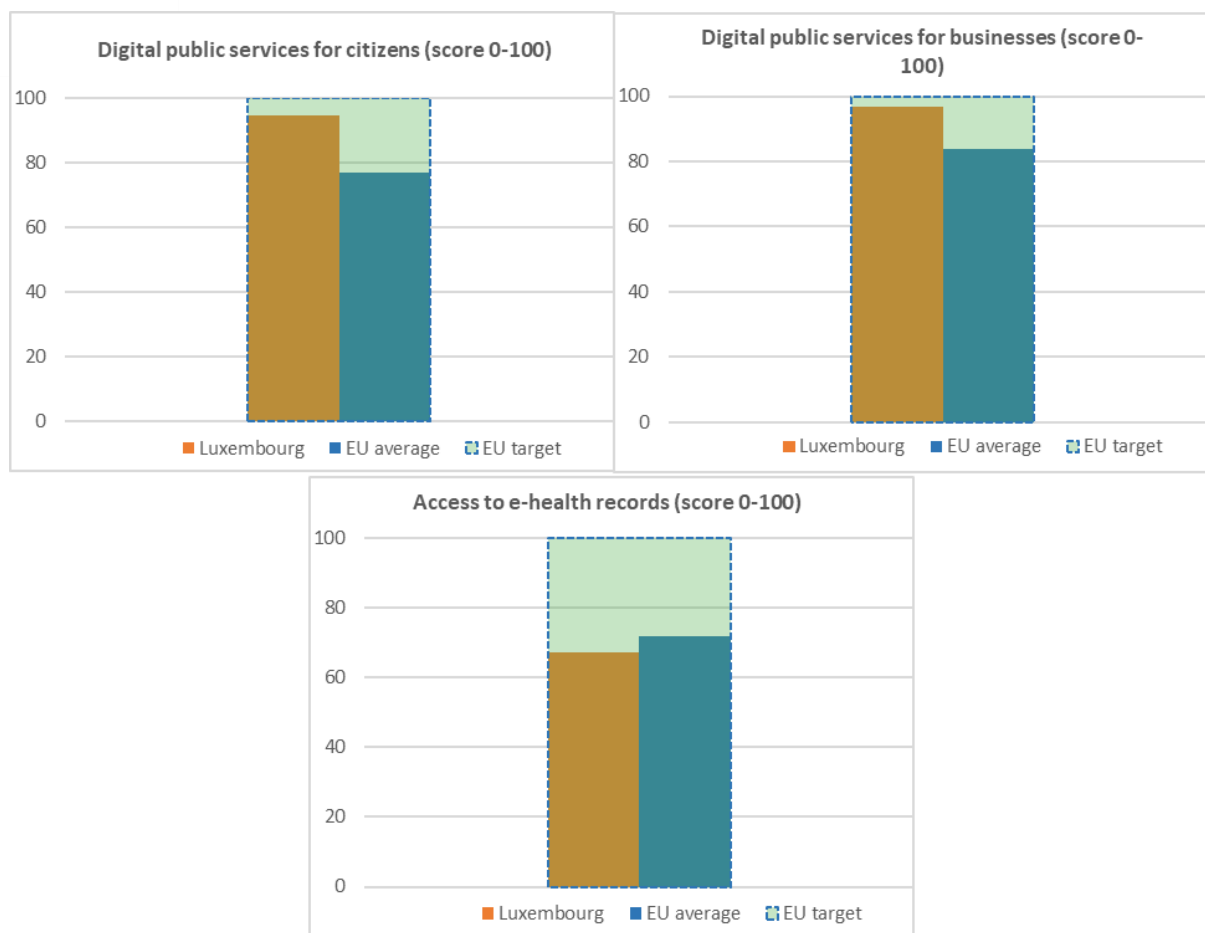
¹⁷⁷ <https://gouvernement.lu/dam-assets/fr/publications/rapport-etude-analyse/minist-economie/luxembourg-start-up-ecosystem/luxembourg-startupstart-uptem-assessment-and-benchmarking-study.pdf>

selected remotely by validating the proposed technical project in light of expected market opportunities. In the second phase, launched in January 2023, one start-up was selected to receive EUR 200 000 in funding to prove the technical value of the proposal and to conduct initial pilot customers/field tests in Luxembourg for a period of up to 24 months. The business development phase is the last step, allowing follow-up on technical developments and to supporting the increase of the pool of sales and customers for a period of up to 36 months at the [Technoport incubator in Luxembourg](#). In 2021, the Luxembourg government and the [European Investment Fund](#) (EIF) already invested alongside private investors in [Orbital Ventures](#), a EUR 120 million venture capital fund managed by [Promus Venture](#), focusing on early-stage, space-related companies.

Luxembourg should step up its efforts in the area of digitalisation of businesses. Particular attention should be paid to supporting the development and deployment of advanced technologies, including AI, big data, and especially cloud computing among enterprises, in particular in SMEs, including through incentives for investment, as well as capacity and knowledge building. Luxembourg should also reinforce the dissemination and exploitation efforts and the implementation of strategies jointly developed by both public and private actors to strongly boost the use of new advanced cloud solutions among SME ecosystems.

4 Digitalisation of public services

	Luxembourg			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	91% 2022	74% 2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	93 2021	95 2022	77 2022	100
4a3 Digital public services for businesses Score (0 to 100)	NA	97 2021	97 2022	84 2022	100
4a4 Pre-filled forms Score (0 to 100)	NA	69 2021	72 2022	68 2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	88 2021	90 2022	65 2022	
4a6 User support Score (0 to 100)	NA	98 2021	98 2022	84 2022	
4a7 Mobile friendliness Score (0 to 100)	NA	95 2021	97 2022	93 2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	67 2022	72 2022	100



Luxembourg is one of the EU's frontrunners in the roll-out of digital public services to people and businesses and in the use of e-government services The country performs particularly well in providing digital public services with a score of almost 100 for key public services available for citizens (score of 95) and businesses (score of 97), very close to the Digital Decade target score of 100. This significant offer of services has been well received by internet users, standing at 91% of Internet users using e-government services, compared with an EU average of 74%. Luxembourg also performs above – and in many cases significantly above - the EU average on pre-filled forms, transparency of services, on user support and on mobile friendliness of e-government services.

The Ministry for Digitalisation's central coordination role has led to further improvements in digital public administration. Almost all services are available online and cross-border. Features to improve convenience such as videoconferencing with the administration, the possibility of using mobile apps and electronic wallets are being added.

However, Luxembourg ranks particularly low on [open data maturity](#). This indicator measures progress on publishing public sector information and on facilitating its use by people, businesses, research, and the general public. The creation of the Luxembourg National Data Service (LNDS), in July 2022, should help to improve open data maturity, because this organisation was set up to address problems of governance between multiple institutions and the technical challenges of data platforms at scale to enable a more efficient and secure secondary use of public sector data.

The governance strategy and the portal through which e-government services are made available was outlined in the [2022 report](#). A new version of the [portal](#) is being developed, with improved user guidance, better access to [online procedures](#) and better visibility for easy language. A dedicated [web portal for digital inclusion](#) was launched in 2022. The government has also begun [a legal and](#)

[technical feasibility study](#) on the introduction of a digital proxy to enable a third party to carry out digital administrative procedures on behalf of a relative.

In 2022, Luxembourg took a number of good initiatives to further improve the provision of e-government services. In order to facilitate and accelerate the transmission of administrative documents, between the government and the various state administrations and services, and between state services and the public, a new draft law provides for the possibility of affixing electronic signatures or seals to administrative documents and sending these electronically. The digital identifier will allow the individual to whom the document is addressed, and any administration to which a person presents a copy to access the place where the original document is stored.

In addition, a new electronic signature verification and validation platform will allow state representatives to verify and validate electronic signatures in accordance with the requirements of the [eIDAS Regulation](#). The user uploads the document to the platform that validates the signatures, stamps and electronic timestamps present on the document, allowing a detailed report to be downloaded. The document is automatically deleted on the platform after the validation report has been issued.

The official national [geographic data and information platform](#) has been integrated into the [MyGuichet.lu](#) portal as a geolocation function, allowing users to display maps, select elements, embed geoinformation in drawings and transmitting geoinformation to the administration.

With the [MyGuichet.lu app](#) the users can now connect from their smartphone or tablet, whenever or wherever they wish, to the functionalities that were previously only available via computer. This includes the possibility of electronically signing every procedure where a signature is required, while an online payment functionality allows fees for such procedures to be paid directly. Administrative documents can be stored in the individual's or businesses' private e-space for use as supporting documents in procedures on MyGuichet.lu. A smartphone push notification function can notify users of new procedure-related communications. The MyGuichet.lu app has been installed on 280 000 mobile devices. With the GouvID app, citizens can use their Luxembourg electronic identity card (e-ID) in conjunction with their smartphone to identify themselves on a PC or tablet with online public services. No card reader or other authentication product is necessary. At the beginning of 2022, the GovTech Lab launched an innovation partnership to implement a **videoconferencing solution enabling a person to interact with the administration** in complete confidentiality and to attend appointments virtually a physical presence at the administration is currently required. The implementation of this solution was not yet complete by at the time this report was drafted. For **cross-border administrative procedures**, Luxembourg participates in the European project aiming to set up a large-scale pilot in 2023 involving many EU Member States, to simplify administrative procedures and more specifically for cross-border procedures that will become mandatory in the coming years. Luxembourg contributed in terms of solution design and document proofreading and quality assurance. Since February 2022, an electronic assistant, available on MyGuichet.lu, guides the citizen through the different stages of his **digital personal income tax declaration**.

Luxembourg has a national e-ID scheme in place, to which all citizens have access, in line with the [eIDAS Regulation](#), ensuring that [citizens and businesses can access public online services also in other EU Member States](#). **Luxembourg is well prepared for the proposed amendments¹⁷⁸ to the eIDAS Regulation.** The above-mentioned mobile ID app (GouvID), which can be used with the Luxembourg administration was launched in February 2022. A proof of concept is envisaged by the Luxembourg administration to change the cryptographic certificates currently implemented in the (physical)

¹⁷⁸ currently under examination by the European Parliament and the Council

Luxembourg identity card and based on the [RSA algorithm](#) by [elliptic curve certificates](#). This could increase the validity period of eID certificates to 10 years, from 5 years currently.

A national **electronic wallet** is being developed allowing users to manage and present digital certificates of official documents on their smartphones, with a first version supporting the identity card. In addition, the GouvCheck app checks the authenticity of an official document, allowing users to print electronically signed documents and to verify the electronic signature and the authenticity of the information on the document, based on a QR code on a document such as a certificate of residence. An update of GouvCheck is being developed to read and verify the codes used in the eWallet. Person A will be able to show the code of his e-ID stored in the e-wallet and person B will be able to verify it with the GouvCheck app. The government taking part in the 'Pilots for European digital identity wallet ([POTENTIAL](#))' consortium. 148 participants from 19 Member States and Ukraine join forces to pilot the new prototypes of the EU Digital Identity Wallet (EUDIW) through six use cases (e-government services, bank account, mobile driving license and remote qualified electronic signature), allowing citizens to store their ID in a secure digital wallet valid across borders.

In December 2021, the amending law on [e-invoicing in public procurement](#) and concession contracts came into force. Since then, the electronic invoicing has become obligatory for all economic operators in the context of public procurement. The invoices have to be submitted via the Peppol eDelivery network or via one of the two types of web forms made available on MyGuichet.lu. Numerous communications, awareness-raising and training measures accompanied the introduction of this requirement and the gradual introduction of mandatory e-invoicing over a one-year period started in March 2022. In 2022, public sector bodies received more than 120 000 e-invoices, while nearly 1 million is expected in 2023. By June 2023, around 700 public sector bodies were connected to Peppol and could receive e-invoices.

Since autumn 2022 the new **digital class diary** [e-bichelchen](#) has facilitated the exchange of information, with teachers, educators and parents able to [supervise the pupil](#), when the teacher enters the homework and the pupil checks off the tasks once completed.

For access to electronic health records, the national gateway to health data is the Dossier de Soins Partagé (DSP). It is accessible for doctors and other health professionals, health funds/companies and the person whose health report it is. It includes electronic prescriptions and allows electronic retrieval of prescriptions and reporting that the medicine has been given out to the patient. The national e-ID scheme serves as a secure means of authentication. Luxembourg does not provide a **secure means of authentication**, using of an eIDAS (pre-)notified eID scheme. **The range of data that is accessible remains limited** and does not yet assure that access to electronic health records is provided with a timely updated minimum set of health-related data stored in public and private electronic health-record (EHR) systems. Currently only Patient Summary data, e-Prescription and e-Dispensation data or electronic lab results are available while hospital discharge reports, imaging reports and medical imaging are not included. For the moment, only private and public primary, secondary and tertiary healthcare providers are connected to the services and provide the relevant health data. While [Luxembourg law](#) provides that the DSP is automatically created – by opt-out mode – for any citizen affiliated to the Luxembourg social security system, there is only an access rate of 80-100% of the population to the DSP online portal and mobile application. All Luxembourg citizens and cross-border workers can access their DSP, and an electronic vaccination record functionality is gradually being rolled out to all vaccinating doctors. Different technical solutions are being considered for using the MyGuichet.lu platform to allow the exchange of documents between doctors and other health professionals, individuals and health funds/companies. These documents will include invoices for direct payment, electronic prescriptions, certificates of incapacity for work and vaccination documentation.

Luxembourg should continue implementing its policies to digitalise public services. In particular, Luxembourg authorities should continue their digital public administration initiatives and keep their high level of ambition. Access to open data should be improved. Luxembourg should improve access to electronic health records, ensuring a timely updated minimum set of health-related data stored in public and private electronic health-record systems.



Digital Decade Country Report 2023

Malta

Introduction

Malta is expected to make a very strong contribution to the collective efforts to achieve the EU's Digital Decade targets and objectives. Malta has made significant progress, especially on connectivity and digital public services, but more targeted efforts are needed for Malta to further contribute to the Digital Decade targets on digital skills and the digitalisation of businesses. Developing people's basic digital skills is crucial for ensuring Maltese citizens and businesses can use the ubiquitous gigabit internet connections and digital public services in Malta to their greatest advantage, e.g. to participate in democratic life or implement innovative business ideas, helping Malta to advance on the general objectives of the Digital Decade. Maltese enterprises identify skills shortages as one of the main barriers to investing more in digitalisation. Encouraging the development of more advanced and specialist digital skills is therefore crucial for them to be able to fully digitalise and to realise their full innovation potential, and for enabling small and medium-sized enterprises (SMEs) to remain the pillars of a sustainable and competitive economy.

Malta's digital transformation got fresh impetus in 2022 with the launch of the [Malta Digital Strategy 2022-2027](#) and efforts to improve the overall coordination of digital policy initiatives. The new digital strategy establishes clear links to the Digital Decade Policy Programme 2030. It sets out a list of actions to improve the lives of Maltese citizens, enable businesses to thrive, make government services more accessible, and innovate for economic growth and environmental sustainability. Stakeholders from society, business and government are represented on the newly established *Malta Digital* Governance Board set up to oversee its implementation. Malta has also set up a Digital Initiatives Coordination Committee to facilitate collaboration in the Ministry for the Economy, EU Funds and Lands and between it and other Ministries as needed. Taken together, these measures are expected to result in a more coordinated approach to digital policy development and implementation, including the implementation of Malta's sectoral digital strategies, with a view to strengthening the country's contribution to the 2030 Digital Decade targets and objectives in close cooperation with stakeholders. As a frontrunner in digital, Malta is in a good position to play a leading role in promoting digital rights and principles for a human-centric, inclusive, and sustainable digital transformation at national and Union level.

Malta is currently only involved as observer in the work aiming at the set-up of a **European Digital Infrastructure Consortium (EDIC)** on the Innovative Massive Public Administration inter-Connected Transformation Services, to develop a new generation of advanced cross-border services.

Digital in Malta's Recovery and Resilience Plan (RRP)

Malta's amended RRP devotes EUR 67.6 million (26%) to the digital transformation. A large part thereof is expected to contribute to the Digital Decade targets¹⁷⁹, in particular the digitalisation of public services, followed by the digital transformation of businesses and, to a lesser extent, digital

¹⁷⁹ Each RRP must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plans had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or has no impact (0%) on digital objectives, using Annex VII of the RRF Regulation. Combining the coefficients with the cost estimates of each measure allows assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to allow for an estimation of the possible contribution of RRF measure to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice of potential ongoing revisions of the plan.

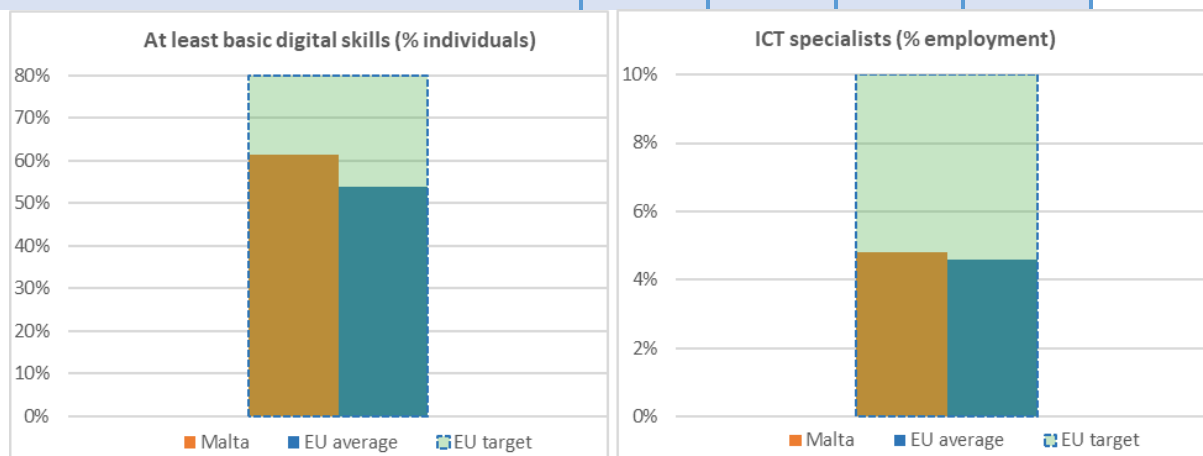
skills. None of the RRP measures is dedicated to digital infrastructure targets. In the context of the first payment [disbursed](#) in March 2023, Malta achieved two digital milestones:

- In 2021, Malta adopted a [Smart Specialisation Strategy](#), which i) identifies digital technologies as a priority area for investment (see section 3), ii) calls for more international cooperation on research and innovation (R&I) activities, and iii) recommends strengthening synergies between public and private investments, in line with Digital Decade objectives.
- To further advance the digitalisation of the public administration, Malta made legislative amendments allowing for people to appear in court through live video conferencing links and for judicial documents to be filed by electronic means (see section 4).

Other RRP commitments due by the end of 2022 included launching a scholarship scheme to support graduate studies in AI, data science, and related fields (see section 1), launching a grant scheme for businesses seeking to invest in digital technologies (see section 3) and further investing in digital hardware and software for the public administration (see section 4).

1 Digital skills

	Malta			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	86%	87%	91%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	61%	61%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	35%	35%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	71%	71%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	28%	28%	28%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	4.3%	4.7%	4.8%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	6.0%	6.5%	6.6%	4.2%	
% graduates	2019	2020	2021	2021	



Addressing Malta's remaining skills gaps and shortages is key to ensuring Malta's progress towards achieving the Digital Decade targets and objectives across all dimensions: Maltese businesses depend on skilled employees to digitalise (see section 3), and at least a basic level of digital skills is required to use Malta's digital public services (see section 4). The updated [National eSkills Strategy 2022-2025](#) provides a framework for existing and new initiatives, which aim to promote the inclusive and equitable development and use of basic, advanced and specialised digital skills in line with the 2030 EU targets. Its implementation is being coordinated by the eSkills Malta Foundation, which is the national coalition of digital skills and jobs with representatives from government, industry and education.

Malta performs above the EU average on basic digital skills, but gaps remain, particularly among disadvantaged groups. Looking at the overall population, 61% of people in the country have at least basic digital skills, compared to 54% in the EU. The percentage is similar among women (61%) and men (62%). However, Malta's lead is less pronounced among people who are older, have a lower level of education and/or are not part of the workforce. For example, only 40% of people in Malta

with at least one of these three characteristics possess basic digital skills, which is the same percentage as in the EU overall¹⁸⁰. Therefore, while Malta is expected to make an important contribution to the 2030 target of having at least 80% of the population equipped with basic digital skills, a key challenge is to ensure that its contribution aligns with the Digital Decade objective to bridge digital divides.

Malta provides several opportunities to learn digital skills, including specific training for vulnerable groups. For example, in the academic year 2022/23, the Ministry for Education, Sport, Youth, Research and Innovation, as part of the 'one tablet per child' project, launched training on using an online, cloud-based solution for students in compulsory education as well as their teachers and parents to share projects and interact in real time on one platform. The Ministry also started a series of courses for 21st century skills, which includes digital literacy training for more than 400 people over the age of 15 who are not covered by compulsory education in the academic year 2022/2023. To further promote gender convergence, the public-private partnership Tech.mt trained 87 women in 2022 to develop basic and advanced digital skills for job profiles ranging from customer service support to junior web developer as part of its ongoing participation in the Europe-wide multi-stakeholder partnership [Women4IT](#). In April 2023, the eSkills Malta Foundation launched the first version of the online Malta Digital Skills and Jobs Platform to provide one single access point to available courses, jobs, events and best practices related to digital skills in Malta. The platform is linked with a European core system to exchange data, presenting a multi-country approach.

Malta's RRP addresses persistent digital divides with the Digital Connect Scheme. According to the interim report submitted by the Maltese authorities, the 2-year-pilot scheme concluded in August 2022 after providing 1 664 individuals from low-income households with a laptop and an internet connection, and 63 with an internet voucher. A participant survey suggested low interest in complementary training offers. While Malta will only analyse the scheme's impact on the digital literacy of low-income households in a following step, the above country-level data suggests that complimentary training offers could still be useful in helping disadvantaged individuals develop basic digital skills. Overall, Malta's RRP only dedicates EUR 2.6 million (below 4% of its overall digital expenditure) to digital skills.

Malta is investing in digital teaching and learning resources as well as digital competences for educators. To facilitate remote learning, the Ministry for Education, Youth, Sport and Innovation has committed to investing EUR 209 000 annually over the next 5 years (2022-2027) in an educational app store that will enable teachers and students in state schools to download licensed educational software to their own devices. To equip educators with digital competencies, the University of Malta added a Master's programme in 'Open Networked Learning in Higher Education' to its existing offer of digital-focused programmes for educators. The University also introduced a professional development programme for educators and social workers on the topics of problematic internet use and digital citizenship. Moreover, Malta is participating in the CybARverse strategic partnership project, launched in November 2022 and funded by the Erasmus+ programme, which will train teachers on how to recognise and react to cyberattacks. This is a significant important bottom-up contribution to achieving the general Digital Decade objectives of improving the resilience to cyberattacks in public and private organisations across the Union and fostering digital capacities within horizontal education systems.

¹⁸⁰ [Indicator DSI 2.0](#) - Individuals with at least basic overall digital skills, broken down by Individuals with at least one of the three following characteristics: 55 to 74 years old; low education; unemployed or inactive or retired.

Malta has a higher share of ICT graduates and ICT specialists than the respective EU averages but shortages in its labour market persist. The percentage of ICT specialists in the Maltese workforce is 4.8%, slightly above the EU average of 4.6%. However, there is still a significant gender gap, as women in Malta make up 18% of employed ICT specialists compared to 19% in the EU overall. Malta's performance is significant for collective EU efforts to increase the number of employed ICT specialists to 20 million¹⁸¹ by 2030 with an increased gender convergence, but more needs to be done to satisfy the demand of Maltese enterprises: 69% report hard-to-fill vacancies for jobs requiring ICT specialist skills, compared to 63% in the EU overall and up 3 percentage points since 2020¹⁸².

Malta Enterprise, the country's economic development agency, offers financial incentives for upskilling including on digital skills. For example, in 2022, the [Skills Development Scheme](#) supported 290 businesses with approximately EUR 2.5 million in cash grants and tax credits to train their employees in digital skills. However, the number of Maltese enterprises providing ICT training to their employees stagnated at 28% since 2020. Another ca. EUR 9.5 m in tax credits were invested in 2022 rewarding a total of 5084 individuals for successfully completing a certification, diploma or university degree as part of the [Get Qualified](#) scheme, with 664 beneficiaries qualifying in computing studies.

The mismatch between the supply of and demand for ICT specialist skills is being partially addressed at secondary school and university levels. The share of ICT graduates slightly increased to 6.6% in 2021. This lies above the EU average (4.2%) but has still not returned to 2014 levels (10%), even though the number of university graduates overall in Malta has increased steadily during this period¹⁸³. To address this, Malta extended ICT as a compulsory subject to upper secondary level in the 2022/2023 academic year, having introduced the subject at lower secondary level in 2018/2019. In parallel, the eSkills Malta Foundation enabled 80 students aged 14-15 to shadow ICT jobs under its Career Exposure Scheme, and provided ICT career sessions to around 50 teachers and 250 students in secondary schools with the aim of sparking interest early on. As part of the [2022 EU Codeweek](#), the foundation organised 516 coding related activities with more than 8 000 participants (81% of whom at in schools), resulting in Malta ranking second in terms of activities organised per population. At university level, in 2021, Malta launched the [Pathfinder MDIA Digital Scholarship](#) scheme as part of its RRP to support studies in AI, data science and information studies, among others. According to the Maltese authorities, a total of 19 students have since benefited from the scholarship (13 in 2021 and 6 in 2022). The Demand and Supply Monitor, issued biennially by the eSkills Malta Foundation, remains an important source for identify gaps in the ICT sector.

Malta should continue its efforts in the area of digital skills. To further narrow the digital divide, Malta should encourage people to take part in digital skills training by raising awareness and facilitating access, with a special focus on vulnerable groups. Moreover, Malta should continue skill forecasting and improve cooperation with industry and civil society to regularly evaluate and adjust education and training offers to labour market needs and encourage women to become ICT specialist¹⁸⁴.

¹⁸¹ Corresponds to about 10% of the workforce.

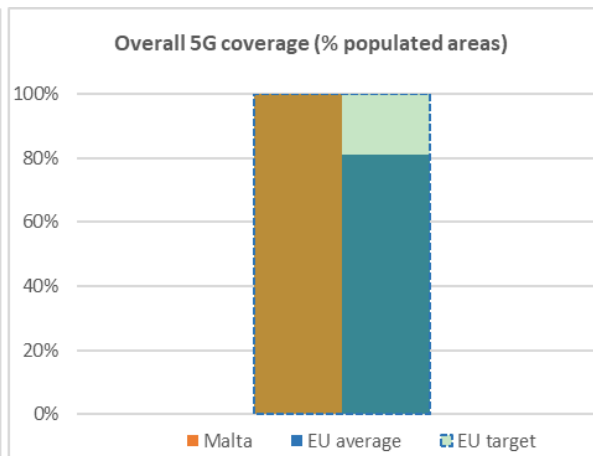
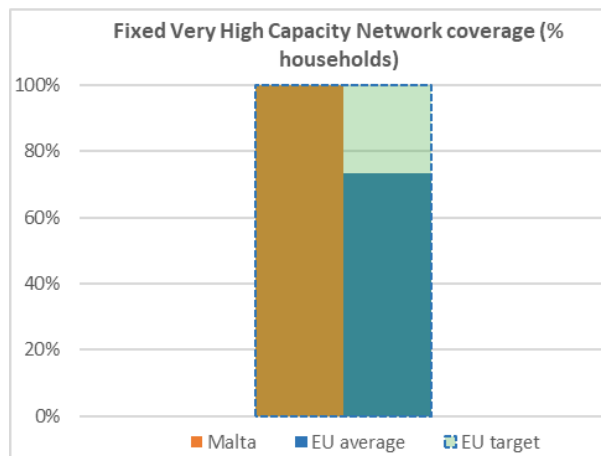
¹⁸² [Eurostat: ICT specialists - statistics on hard-to-fill vacancies in enterprises \(as % of enterprises which recruited/tried to recruit ICT specialists\)](#), 2022.

¹⁸³ [2022 Education and Training Monitor](#)

¹⁸⁴ The recommended policies, measures, and actions in this document reflect the Commission Communication 'Report on the state of the Digital Decade' COM(2023) 570.

2 Digital infrastructures

	Malta			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up % households	45%	54%	60%	55%	
2a2 At least 1 Gbps broadband take-up % households	1.2%	2.5%	6.4%	13.8%	
2a3 Fixed Very High Capacity Network (VHCN) coverage % households	100%	100%	100%	73%	100%
2a4 Fibre to the Premises (FTTP) coverage % households	41%	48%	56%	56%	
2b1 Mobile broadband take-up % individuals	79%	87%	87%	87%	
2b2 Overall 5G coverage % populated areas	0%	20%	100%	81%	100%
2b3 5G spectrum Assigned spectrum as a % of total harmonised 5G spectrum	17%	25%	25%	68%	



Malta has reached the Digital Decade targets for connectivity and is well placed to collaborate with other Member States in the area of semiconductors and quantum. Investing in relevant use cases for connectivity would enable Maltese businesses to further leverage the existing infrastructure for productivity gains. Furthermore, Malta could capitalise its strengths in digital infrastructure and technologies to support its green transition.

Substantial progress on 5G and fibre coverage strengthened Malta's overall connectivity performance. Since 2019, all Maltese households have had access to very high capacity networks (VHCNs) offering download speeds of up to 1Gbps since 2019 provided by a hybrid fibre-coax network based on the DOCSIS 3.1 standard. In 2022, fibre-to-the-premises (FTTP) coverage caught up with the EU average of 56%, as the incumbent operator continues to invest in its fibre network with

the aim of reaching full coverage over the coming years. In parallel, a recent entrant in the fixed market has started to deploy fibre-to-the-home (FTTH) in selected localities after securing [a EUR 20 m loan from the European Investment Bank](#) (2021) with the commitment to cover 25% of Maltese households by 2024. On 28 April 2023, the Malta Communications Authority (MCA) opened a public consultation on its proposal for a review of the wholesale local access market¹⁸⁵, as the regulatory measures currently in force were imposed on the basis of a market analysis adopted in 2013. Moreover, in December 2022, the MCA deregulated the wholesale dedicated capacity market¹⁸⁶ after finding it to be effectively competitive.

While Malta has already reached the gigabit connectivity target for the Digital Decade, remaining obstacles to deployment weaken network efficiency and resilience and may inhibit further progress to symmetric gigabit speeds. To date, a large part of the connectivity networks in Malta is aerial and bringing it underground would, according to operators, require improved access to physical infrastructure and coordination of civil works, not least to minimize the risk of outages from accidental cable cuts. Operators also call for clearer procedures regarding access to in-building infrastructure. Transport Malta is still working to integrate all relevant network data in one place, as provided for in Malta's [Connectivity Toolbox](#) Roadmap.

Take-up of very high speeds continued to improve, but is far from corresponding to the available nationwide coverage. In 2022, 60% of households subscribed to fixed internet services of at least 100 Mbps, up 6 percentage points from the previous year and above the EU average of 55%. Take-up of gigabit speeds increased from 2.5% of households in 2021 to 6.4% in 2022, but still lies significantly below the EU average of 14%.

Malta is implementing measures to drive the take-up of higher speeds by public institutions. This includes Tech.mt's efforts to upgrade the free wi-fi provided in public buildings to higher speeds as part of the [WiFi4EU initiative](#). Moreover, through national and ongoing exploration of potential EU funds, Malta is investing at least EUR 33 million over a 7-year period to prepare the network infrastructure in schools for higher speeds and data volumes, including by installing new wi-fi (6E). A subset of the initial 7 selected schools is expected to benefit from new infrastructure by the end of 2023.

Malta already achieved nationwide 5G coverage in 2022, but there is room for improving coverage on essential bands for enabling advanced applications requiring large spectrum bandwidth. One mobile operator already operates a nationwide 5G network, and the other two operators plan to reach full coverage by the end of 2023, in line with [spectrum assignment conditions](#). Spectrum in all three 5G pioneer bands was made available in 2021 and the three Maltese mobile operators are each assigned a contiguous frequency block of 100 MHz in the 3.5-3.8 GHz band. The residual 100 MHz in the 3.6 GHz pioneer band (3.4-3.5 GHz) remains unassigned. The MCA has to date not assigned spectrum in the 700 MHz and 26 GHz bands, pointing to the lack of market demand, possibly stemming from the small size of the country and its market. As of 2022, 5G coverage on the 3.4-3.8 GHz pioneer spectrum band stands at 20%, significantly below the EU average of 41%. 5G services are being delivered using spectrum in the 800 MHz, 900 MHz, 1800 MHz, 2.1 GHz, 2.5 GHz and 3.6 GHz bands. Operators cite a lack of relevant use cases and end users being locked into bundled offers with lower speeds as possible reasons for the continuing low demand for 5G services. Moreover, some end users seem unable to benefit from available 5G services because some

¹⁸⁵ Corresponding to Market 1/2020 (wholesale local access provided at a fixed location) under the [2020 Recommendation on Relevant Markets](#).

¹⁸⁶ Corresponding to Market 2/2020 (wholesale dedicated capacity) under the [2020 Recommendation on Relevant Markets](#).

handsets manufacturers do not prioritise Malta in their handset customisation schedule. In 2023, [the MCA plans](#) to further develop the licensing framework of the 26 GHz band to prepare it for new applications and use cases.

Migrating from legacy networks to more energy-efficient technologies is the next step to improve the environmental impact of Malta's electronic communications networks. The three Maltese operators currently run multiple concurrent mobile (2G, 3G, 4G, 5G) and fixed networks. The MCA works closely with them to manage the efficient migration from legacy networks to newer and more efficient technologies, while protecting competition and end-users at all stages of the process. One operator has started to gradually decommission its copper-based network in areas where it has deployed fibre. Consultations with all operators will continue throughout 2023 with a view to switching off the legacy networks and improving the sustainability of the sector more broadly, e.g. by including environmental objectives in spectrum reassignment decisions.

Malta's new [National Cyber Security Strategy 2023 – 2026](#) responds to the growing threat cyberattacks pose to the country's digital infrastructure. In line with EU overall trends, Maltese telecom operators report an increase in cyberattacks on their connectivity networks. In this context, the new cybersecurity strategy outlines actions to increase Malta's cyber defence capacity and strengthen cybersecurity awareness and skills in the public and private sector. The strategy also encourages collaboration and information sharing between Maltese stakeholders and their European and international counterparts. The Malta Information Technology Agency (MITA), recognised as the country's [National Cybersecurity Coordination Centre](#)¹⁸⁷, has been allocated almost EUR 3 m in [Digital Europe](#) funds to implement the strategy. Moreover, the MCA is currently consulting on measures to enhance the security and integrity of electronic communication networks and services (e.g., minimum security requirements and reporting obligations, security audits, incident reporting, etc.) with the aim to develop a revised security framework for the sector in Malta to be adopted before the end of 2023.

Malta currently has no known edge node deployment plans but could benefit from additional computational capacities to complement its powerful connectivity infrastructure and contribute to the Digital Decade target of deploying at least 10 000 climate-neutral highly secure edge nodes in the EU by 2030.

Malta is part of the European semiconductor ecosystem, specialising in back-end packaging operations which mainly cater to the automotive and telecommunications sectors. The country takes part in the IPCEI on Microelectronics and Communication Technologies with its largest semiconductor back-end operator. Furthermore, following the conclusions of the negotiations on the European Chips Act, Malta is looking to strengthen the cooperation between educational institutions to attract design operations to the country. In this way, it can contribute to collective EU efforts to increase the production of cutting-edge semiconductors in the EU to at least 20% of world production in value.

Malta is helping to pave the way for the EU to be at the cutting edge of quantum capabilities by 2030. Since 2021, Malta is active in the [QuantERA programme](#), a European network of public organisations funding transnational R&I projects in quantum technologies. Moreover, Malta was one of the seven initial signatories to the [EuroQCI Declaration](#) in 2019 and the [EUROQCI initiative](#) is now well underway to developing and deploying a quantum communication infrastructure (QCI) across the EU.

¹⁸⁷ Under [EU Regulation 2021/887](#).

Best practice: leveraging digital technologies for sustainability

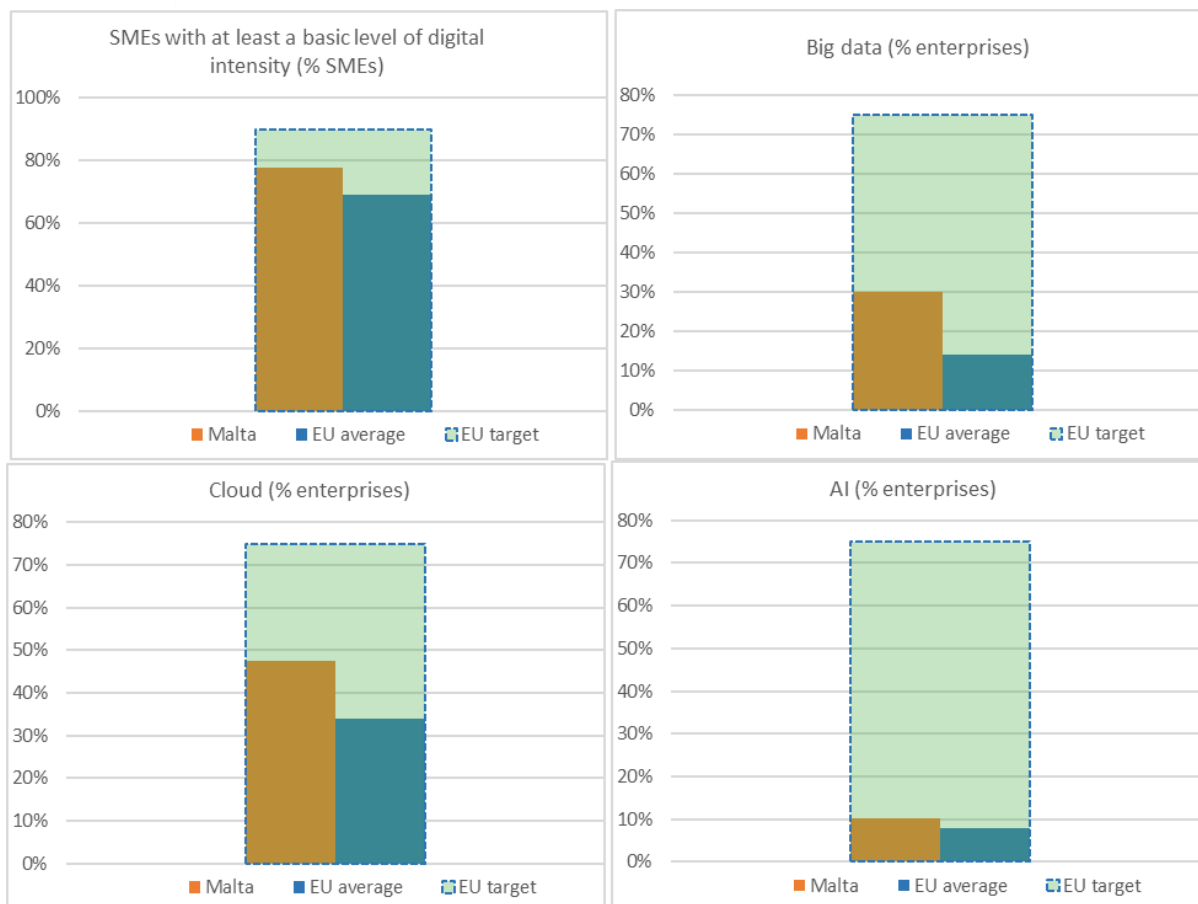
Malta and Italy are partners on the [GIFLUID](#) project (2021-2023), partially funded by the European Regional Development Fund (ERDF), which uses computational models to simulate the effect of different green infrastructure designs on how rainwater drains in urban and sub-urban areas. The replicable computational model provides a useful tool to help identify the best climate change green adaptation strategies for Mediterranean Countries suffering from flooding due to increased variability in precipitation due to climate change. This is a good example of using advanced digital technologies to innovate for sustainability, in line with the European Green Deal as well as the Digital Decade objectives and principles.

Malta should continue implementing its policies on digital infrastructure. Malta should regularly assess emerging market demand in the 700 MHz and 26 GHz bands. In parallel, Malta should step up efforts to incentivise the take-up of gigabit and 5G connectivity, including by accelerating the development of 5G ecosystems throughout the country. Malta should cooperate with other Member States, for example, on using digital technologies to address environmental challenges, facilitate traffic and energy management as well as long-term sustainable city planning. Malta's activities in the development of infrastructure for advanced technologies such as semiconductors and quantum computing should be sustained in order to help the EU become a strong market player in these areas.

3 Digitalisation of businesses

	Malta			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	78%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	32%	39%	39%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	43%	43%	43%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	30%	30%	30%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud¹⁸⁸	NA	48%	48%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	10%	10%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	22%	22%	22%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	24%	26%	30%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	9%	7%	8%	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	NA	13%	13%	9%	
% SMEs	2019	2021	2021	2021	

¹⁸⁸ Enterprises buying sophisticated or intermediate cloud computing services indicator, see [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).



Maltese businesses boast a high level of digitalisation compared to the EU average. However, a shortage of skilled workers is inhibiting an even greater contribution to the targets and objectives of Europe's Digital Decade. The Maltese business community cites attracting and retaining skilled workers is cited as a main challenge and barrier to digitalisation, preventing businesses from investing more in using and developing innovative digital technologies to make their operations more resource and energy efficient and prevent loss of productivity due to labour shortages. Addressing this is key to strengthening the competitiveness and sustainability of Malta's economy in the face of an ageing workforce, environmental challenges, and increased international competition for skilled workers.

The share of SMEs that have reached a basic level of digital intensity is higher in Malta (78%) than in the EU overall (69%). With 78% of SMEs making use of basic digital technologies and digital-technology-enabled features, Malta is well placed to contribute to the EU target of 90% by 2030. Zooming in on e-commerce, a comparatively high percentage of Maltese SMEs sells online (30% compared to 19% in EU overall), yet only 8% of total SME turnover was generated through online sales according to the 2022 EU survey on ICT usage and e-commerce 2022 (compared to 11% in the EU overall), 1 percentage point below 2020 levels. Numbers may increase as more individuals from start-ups and SMEs get certified in "e-commerce practices" as part of the next round of [e-Biznify](#) courses organised by the eSkills Malta Foundation and the Malta Communications Authority.

The Maltese RRP supports investments in the digitalisation of businesses with two grant schemes with a total budget of EUR 15 million. The schemes were launched in summer 2022 and applications are open on a rolling basis. According to the Maltese authorities, as of June 2023, 52 enterprises were selected under the [SME Digitalisation Grant Scheme](#) to receive grants of up to EUR 50 000 for acquiring ICT hardware and software and/or developing customised software solutions using AI and

cloud computing. The [Digital Intensification Scheme](#) offers the same (relatively low) support to larger enterprises, which may explain why the Maltese authorities report no successful applications as of June 2023. To reach its RRP target of supporting 360 undertakings by Q2 2026, Malta issued a third scheme in Q2 2023 targeting Micro Enterprises in Q2 2023. The scheme is called 'Digitalise your Micro Business' and three grants have been awarded as of June 2023.

The use of advanced digital technologies is significantly more widespread among enterprises, including SMEs, in Malta than in the EU overall. This is especially the case for the use of big data analytics (30% versus 14%) and cloud computing (48% versus 34%). The use of AI lies slightly above EU average (10% versus 8%), but far below the Digital Decade target of having at least 75% of Union enterprises take up one or more of these three advanced digital technologies in line with their business operations.

Malta Enterprise, the country's economic development agency, runs several schemes which can help Maltese enterprises digitalise their business operations. The [Business Re-engineering & Transformation Scheme](#) (2020-2023) complements the RRP funding for hardware and software with a total of 2.5 million in funding for SMEs to get expert advice on business reengineering and transformation processes. The [Smart and Sustainable Investment Grant](#) (2021-2023), updated in 2022, funds projects to make business activities more sustainable and resource efficient with a total budget of EUR 3.3 million. Both schemes can be used for integrating advanced digital technologies in business operations.

Despite a comparatively good performance in the uptake of digital technologies, Malta falls further behind the EU average in R&I in the [European Innovation Scoreboard 2022](#). This can be traced in particular to a lack of skilled workers and low public and private R&I investments. Malta's RRP seeks to address this with the [2021-2027 Smart Specialisation Strategy](#) adopted as part of the first payment request, which identifies digital technologies (e.g. AI, high-performance computing, distributed ledger technologies) as one of six priority areas for investment. Moreover, the [Malta Digital Strategy 2022-2027](#) emphasises the importance of accelerating digital R&I for ensuring sustainable economic growth despite the country's small size and resource limitations.

Malta's digital innovation hub (DIH) will focus on making high performance computing as well as other advanced digital technologies accessible to SMEs and public sector organisations¹⁸⁹. The hub was selected to participate in the [network of EDIHs](#) in 2022 and will benefit from funding through the Digital Europe Programme. The [Malta-EDIH](#) is expected to house its own high-performance computer as well as the necessary technical expertise to allow businesses to test the technology before investing in high-performance computing (HPC) and other advanced digital technologies like AI and virtual reality.

In 2022, Malta was home to three unicorns suggesting steady but slow progress since the first Maltese unicorn was registered in 2017¹⁹⁰. To compare, the number of unicorns in the EU has increased by over 4.5 times from 55 in 2017 to 249 in 2022. Malta has ambitions to speed up the positive trend by establishing itself as Europe's start-up hub, as announced by Prime Minister Abela in the 2023 budget speech, in which he specifically earmarked aviation, the maritime sector, eSports and video game development as drivers of future economic growth.

¹⁸⁹ The hub is made up of Malta Communications Authority (MCA), University of Malta, Malta College of Arts, Science & Technology (MCAST), Malta Information Technology Agency (MITA) and the Malta Chamber of Commerce.

¹⁹⁰ Dealroom (date of extraction 24/03/2023). 'Unicorn' means undertaking with a valuation of over USD 1 billion. 'Potential unicorn' means undertaking with a market valuation between EUR 100 million and EUR 1 billion.

Regarding its ambition to become Europe's start-up hub, Malta is most advanced in gaming, including iGaming¹⁹¹. This sector had been one of the drivers of Malta's strong economic performance before the pandemic and of its swift recovery afterwards. It benefits from a proactive regulatory framework and well-developed connectivity infrastructure, which continues to attract large gaming operators as well as innovative video game and eSports start-ups seeking to integrate digital technologies like virtual reality, AI and blockchain into their offers. The Gaming Malta Foundation, an independent non-profit set up by the Maltese Government and the Malta Gaming Authority (MGA), runs an incubator facility, Basecamp, to facilitate start-up growth. Moreover, Malta can leverage the research on games conducted at the [Institute for Digital Games](#) at the University of Malta as well as existing partnerships between industry and education institutions to give its businesses a head start in helping to develop virtual worlds, in line with [EU ambitions](#).

Malta's attractiveness for digital start-ups is bolstered by its strategic approach to innovative digital technologies as well as several public support measures. Since 2018, Malta has a dedicated strategy and legal framework for distributed ledger technologies and, as a member of the European Blockchain Partnership, has progressed throughout 2022 in implementing a node of the [European Blockchain Services Infrastructure \(EBSI\)](#) with completion expected in Q4 2023. Under the [AI Strategy](#) launched in 2019, Malta continues its initiatives to position the country as a hub for AI applications. For example, between 2022 and 2023, the Malta Digital Innovation Authority (MDIA) received five applications for the Technology Assurance Sandbox which provides a safe environment for individuals or companies developing AI-based solutions. Moreover, Malta is in the process of joining the Europe Start-up Nations Alliance (ESNA) to benefit from funding and shared best practices to facilitate start-up growth. In 2022, Malta Enterprise updated Start-up Finance 2020, a scheme providing up to EUR 800 000 in repayable grants to innovative start-ups that have successfully expanded their economic activity. As of June 2023, the scheme has awarded a total of approximately EUR 6.7 million and is expected to run until the end of the year. Start-ups in an early development phase can also apply to [Business Start 2021](#), a seed funding scheme updated in 2022, to receive cash grants of up to EUR 10 000 for developing their business proposals. As of June 2023, the scheme has awarded a total of approximately EUR 1 million and is also expected to run until the end of the year.

Best practice: improving cybersecurity awareness and measures of local businesses

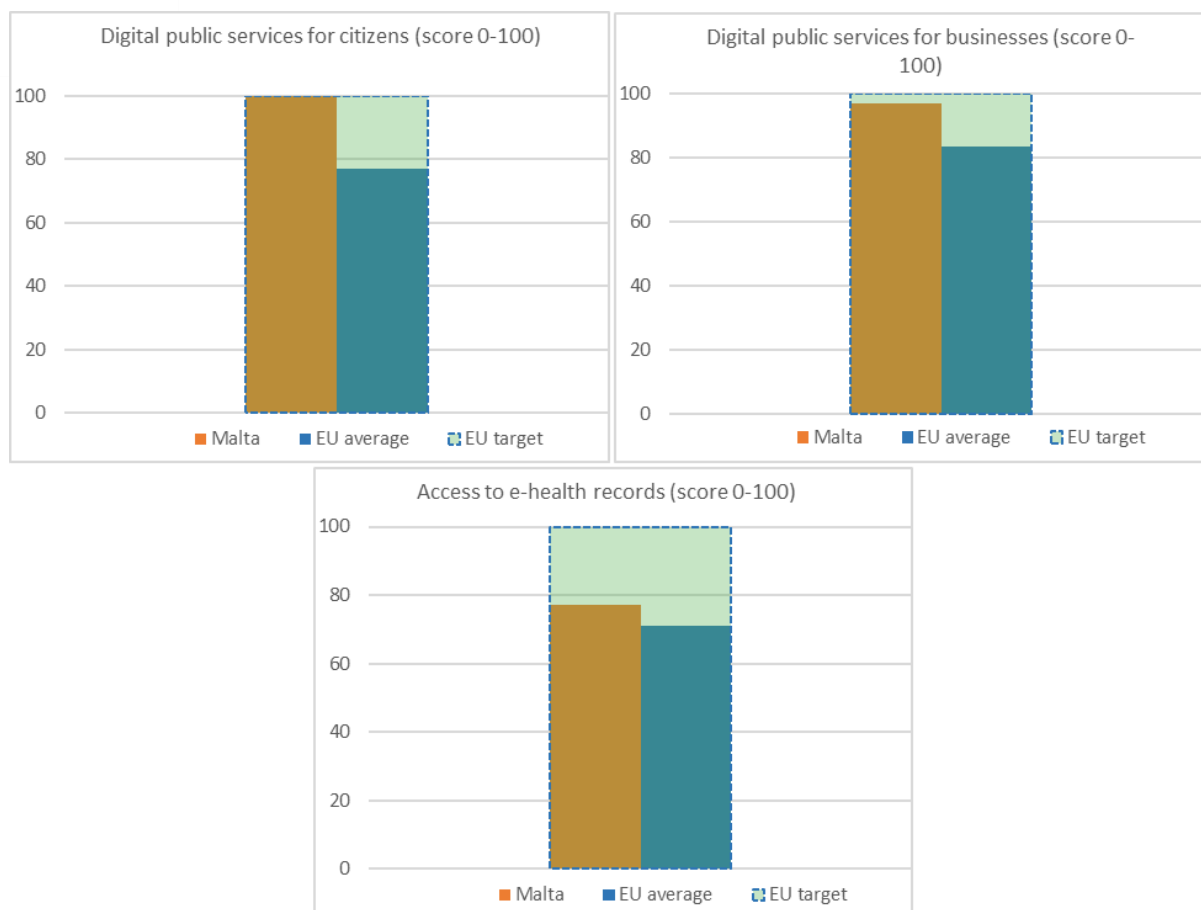
In 2023, Malta introduced Mind the Gap, a project with a self-assessment and funding component to help e-Commerce service providers improve their cybersecurity levels. In a first step, businesses can use a free self-assessment tool provided by the MDIA to identify their cybersecurity strengths and weaknesses, with the option to obtain a certificate of participation for public display. Businesses who have completed the assessment can then apply for funding under the Cybersecurity Improvement Scheme. The EUR 10 000 budget is managed by Tech.mt and promoted together with the MCA. As of June 2023, nine applicants completed the self-assessment. This is a good example of national authorities working together to improve the cybersecurity awareness and measures of local businesses, thereby helping to improve the cybersecurity resilience of the EU overall in line with Digital Decade objectives and principles.

¹⁹¹ iGaming or online gaming involves betting money on the outcome of an event or a game using the internet, including, e.g. casino games and sports betting.

Malta should continue implementing its policies in the area of digitalisation of businesses. In particular, Malta should further facilitate access to secure and sovereign advanced digital technologies and solutions and encourage investment in digital research and innovation. It should raise awareness about the benefits of digital technologies and to increase participation in existing funding schemes, especially among the many family-owned micro, small and medium-sized businesses making up Malta's economy.

4 Digitalisation of public services

	Malta			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	83% 2022	74% 2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	100 2021	100 2022	77 2022	100
4a3 Digital public services for businesses Score (0 to 100)	NA	97 2021	97 2022	84 2022	100
4a4 Pre-filled forms Score (0 to 100)	NA	87 2021	88 2022	68 2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	98 2021	98 2022	65 2022	
4a6 User support Score (0 to 100)	NA	100 2021	100 2022	84 2022	
4a7 Mobile friendliness Score (0 to 100)	NA	98 2021	99 2022	93 2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	78 2022	72 2022	100



Malta makes a very strong contribution to EU’s targets on the digitalisation of public services.

Considering Malta’s strong performance and investment in this dimension, there are opportunities to pilot the use of advanced digital technologies in public administration to stimulate overall demand for innovative ICT, as set out in Malta’s digital strategy. The Committee for the Digitalisation of the Public Administration¹⁹², established in 2022, provides a governance structure to consolidate Malta’s leadership role in providing digital public services in Europe, as outlined in the 5-year strategy ‘[Achieving a Service of Excellence](#)’ (2022-2026). The strategy recognises digital technologies as a key enabler to improve the quality, accountability and sustainability of the public service, and, among other things, promotes the use of AI and distributed ledger technologies to make public services more personalised, accessible and accountable.

Malta is a leader in digital public services and has already reached the Digital Decade target of providing 100% of key public services to citizens online. Citizens can access all key digital public services (score 100/100) and businesses almost all key public services (score 97/100) through the government’s one-stop-shop portal [servizz.gov](#). The services offered score well on transparency and allow users to manage their personal data (score 98/100). Online support, help features, and feedback mechanisms are widely available (score 100/100). This is reflected in user satisfaction: in 2022, 79% of Maltese people found the provision of public services to be good, a 10 percentage point

¹⁹² The Committee will be chaired by the Principal Permanent Secretary and will have representation from the Ministry Chief Information Officers, Malta Information Technology Agency, [servizz.gov](#), and the Ministry for the Economy, European Funds and Lands.

increase compared to 2021 and well above the EU average of 52%¹⁹³. As of 2022, 83% of internet users in Malta make use of e-government services, above the EU average (74%), but there is still room for improvement.

Malta's RRP includes several investments in digital technologies to further improve the usability and security of digital public services. Planned measures include using AI solutions to improve the user experience on servizz.gov, a platform to facilitate property ownership transfers, and registers for data sharing and reuse to simplify administrative processes and avoid duplication. The plan also includes investments in the government's IT infrastructure to strengthen overall security and performance, e.g. by improving the capacity and resilience of data centres, implementing tools to monitor cloud security, and providing cybersecurity tools and training to public officers.

Malta is piloting the use of innovative digital technologies in public administration. Proposed initiatives under the 'Achieving a Service of Excellence' strategy include using AI to deliver more personalised services through an online portal, introducing chatbots and integrating an AI-based voice recognition system to receive and interpret user instructions, gather feedback and implement targeted improvements. A national language technology platform has been launched with the aim to support the integration of the Maltese language in various digital solutions using voice to text converter technology. Moreover, Malta is currently implementing the six pilot projects launched under the 2019 [AI Strategy](#) to develop AI-based tools in the fields of transport, education, health, customer care, tourism, and water and energy. These projects are supported by a budget of over EUR 3.9 million and with contractual timelines ending in late 2023 and 2024. After this, their viability for wider roll-outs will be assessed.

In stark contrast to the country's top performance in online public services, Malta scores lowest in the EU on facilitating the access to and use of open data¹⁹⁴. The [National Data Portal](#), launched in 2019, is still in beta version and only provides access to a limited set of data. This seriously inhibits the ability of businesses to use public sector data to develop innovative new services as well as people's ability to hold government institutions to account, therefore obstructing key objectives of the Digital Decade. Malta's new [Public Administration Data Strategy 2023-2027](#) is expected to provide a framework for fostering open data policies and practices in the country.

Malta scores 78 out of 100 on citizen access to electronic health records, compared to an average of 72 in the EU. Citizens in Malta have online access to most electronic health data as part of a minimum health data set, but medical images still need to be made available to citizens in a usable digital format. Malta only scores 36 out of 100 regarding healthcare providers connected and supplying relevant health data, significantly lower than the EU average score of 55, as health data are mainly supplied by government-owned healthcare institutions. Social partners report that hospitals often still work with paper records and that it remains difficult in practice for public and private hospitals to transfer digital records between each other. The National Electronic Health Records platform is expected to facilitate the exchange of data between the government-owned and other healthcare institutions in the future.

The [National Health Systems Strategy 2023-2030](#) earmarks the digital patient portal, myHealth, for further development and expansion to fulfil the target of 100% of citizens having access to electronic health records data by 2030. According to data provided by the Maltese authorities, over 177 000 people (39% of the population over 14) used the portal to access their electronic health records in 2022, up 16% from the previous year. To further increase take-up, the Ministry of Health is

¹⁹³ [Standard Eurobarometer 97](#)

¹⁹⁴ [2022 Open Data Maturity Report](#) (based on country self-assessment survey)

planning to invest around EUR 500 000 to enable extra functionalities for patients and doctors until 2026. This includes making more health data available through the myHealth portal and helping private practitioners provide an improved and wider range of services, thereby reducing demand on public hospitals and improving the efficiency of Malta's health system overall.

Malta is also investing in the digitalisation of the justice system. As part of first RRP payment request, the country implemented legislative amendments allowing presence in court through live video conferencing links and for electronic filing of judicial documents. This will pave the way for a EUR 10 million digitalisation investment in a system which, to date, still faces serious challenges to its efficiency.

Malta has notified to the Commission one electronic identification (eID) scheme under the eIDAS Regulation and is advancing on cross-border use. According to [2022 eGovernment Benchmark](#), eID can be used to log in to 91% of online public services. There are plans to create a formal framework to boost the use of eID for digital signatures and to implement a 'digital wallet' that can store an electronic version of all official documents. The authorities report they have completed the technical work allowing residents to use their electronic identity to access e-government services in other Member States, in line with the EU's Single Digital Gateway Regulation¹⁹⁵ and the Digital Decade objective to promote interoperable digital services that are accessible to all, everywhere in the EU.

Malta should continue implementing its policies to digitalise public services. In particular, Malta should monitor the effective use of digital public services as well as possible divides. Regarding e-health, Malta should continue efforts to connect additional types of healthcare providers to e-health records. Moreover, it should promote digital skills development among public officers, particularly in the health and justice system. Significant measures are needed to make more and higher quality public sector data available, both by developing open data policies and expanding the national data portal.

¹⁹⁵ [Regulation \(EU\) 2018/1724](#)



Digital Decade Country Report 2023

The Netherlands

Introduction

The Netherlands has historically been an EU frontrunner in digital transformation and is expected to make a very strong contribution to the collective efforts to achieve the EU's 2030 digital targets, as established in the Digital Decade Policy Programme ("DDPP"). The government believes that digitalisation will increase economic welfare through innovative products, efficiency gains and the rise of new enterprises, as well as society's welfare in a broader sense. Its national digital transformation revolves around four themes: (1) digital foundation, (2) digital economy, (3) digital government, and (4) digital society. Within these themes, working agendas have been developed with the Digital Decade in mind.

Capitalising on its strong position, the Netherlands has set national ambitions to progress beyond some Digital Decade targets. For example, the government has set a target of 95% of SMEs in the Netherlands having a basic level of digitalisation by 2030, which goes beyond the 90% target set out in the Digital Decade Policy Programme.

The performance of the Netherlands benefits the EU's overall digital transformation. However, for the Netherlands to keep reaping the benefits of this transformation, it needs to stay on course. The government is aware of most of its shortcomings, for example in the use of AI by businesses, and the availability of ICT-specialists and graduates in the Dutch labour market. Furthermore, the Netherlands still lags behind in the allocation of all available 5G spectrum. Finally, it is the last in the EU in terms of the take-up of gigabit connectivity.

In terms of policy developments, the Netherlands has continued to implement various measures to advance its digital transformation. These vary from large scale initiatives such as AiNed, for the advancement of artificial intelligence in the Netherlands, to relatively small-scale subsidy schemes such as one to help employers retrain employees with ICT skills. Finally, private industry and educational institutions play an important role in implementing measures put in place by the Dutch government. Public-private partnerships that have proven their added value are being scaled up to increase their impact.

On achieving the Digital Decade objectives, the Netherlands is making progress notably in human-centric digital transformation. Examples of this progress are the national strategy for the digital economy, as well as in specific measures, such as making government websites more accessible.

The Dutch approach to cybersecurity is also being implemented at all levels of government. Most recently, the government presented the new Agenda Coalitions for a Digital Society focusing on how to address societal challenges with the help of digitalisation. The first iteration of this annually updated agenda refers, among other things, to digital ethics, sustainability and digitalisation.

The Netherlands has also adopted a general policy on open strategic autonomy which includes, among other things, the monitoring of dependencies and vulnerabilities in the digital sphere. The policy will also see the Netherlands seeking to lessen these dependencies, both in the digital sphere and in the area of raw materials and export control. Finally, it is doing research on emissions in the stack of the digital economy in the Netherlands in order to propose new policy in this area.

The Netherlands is collaborating with other Member States in exploring the possibility to set up **European Digital Infrastructure Consortia (EDICs)** on: (i) establishing an Alliance for Language Technologies, to develop a common infrastructure in the field of natural language processing and to develop large multi-language models; and (ii) Mobility and Logistics Data, to enable the access, sharing and reuse of data in these domains.

Digital in the Dutch Recovery and Resilience Plan (RRP)

The Recovery and Resilience Plan by the Netherlands was approved by the Council of the European Union in October 2022. **Under the EUR 4.7 billion plan, 25.6% of the total envelope will be geared towards digital measures.** EUR 834.4 million will aid in the progress towards Digital Decade targets¹⁹⁶. The Netherlands has yet to submit a first payment request.

The component dedicated to accelerating the digital transformation is divided into **three categories; investments to promote innovative technologies and digital skills, future-proofing the mobility sector, and future-proofing the government's IT infrastructure.** In this first category, measures relating to artificial intelligence and quantum technology can be found, further detailed in this country report. Furthermore, an investment to give an impulse to digitalisation in education is part of the plan.

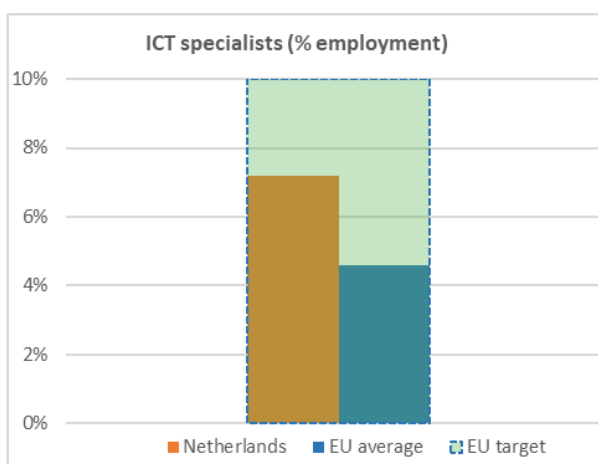
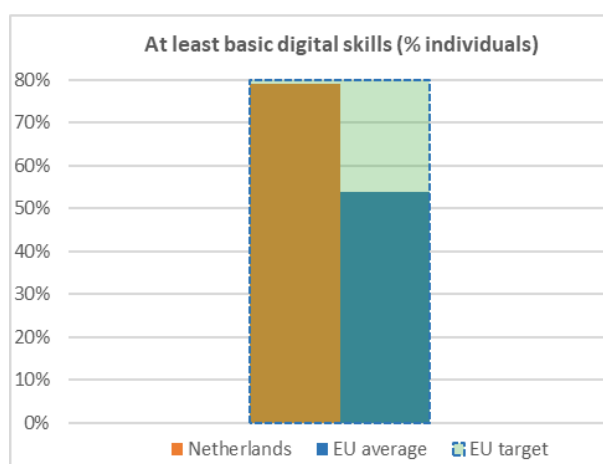
Full implementation of the first investment under the RRF, namely digitalisation of the criminal justice chain, is planned for December 2023. Completion of the project will allow citizens to file police reports and perform actions during pending criminal proceedings digitally.

Other milestones and targets meant to be fulfilled in 2023 are those relating to future-proofing the mobility sector, namely; ensuring the installation of 591 intelligent roadside stations and finalising the design of European Rail Traffic Management System for North Netherlands. These milestones and targets are based on the Council Implementing Decision on the Netherlands Recovery and Resilience Plan.

¹⁹⁶ Each Recovery and Resilience Plan must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plans had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or has no impact (0%) on digital objectives, using Annex VII of the RRF Regulation. Combining the coefficients with the cost estimates of each measure allows assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to allow for an estimation of the possible contribution of RRF measures to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice to potential ongoing revisions of the plan.

1 Digital skills

	Netherlands			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	93%	94%	94%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	79%	79%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	52%	52%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	83%	83%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	24%	24%	29%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	5.9%	6.7%	7.2%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	3.1%	3.4%	3.7%	4.2%	
% graduates	2019	2020	2021	2021	



Digital skills are crucial for solving and preventing digital divide so that everyone benefits from digital transformation as well as for enabling a digitally skilled workforce that meets the demands of today's labour market.

The Netherlands performs very well on digital skills. 79% of individuals in the country have at least basic digital skills, close to the 80% EU 2030 target for basic digital skills. In response to an observed decrease in foundational literacy and numeracy, the government has established a [Masterplan on basic competencies](#), which includes actions to improve digital literacy from a young age. A first step in this masterplan is to identify shortcomings in the current curriculum in digital literacy, and define adequate targets on the basis of these monitoring efforts. A general reform of the school curricula is expected to be implemented from the school year 2024-2025 onwards. Once implemented, these actions are expected to positively affect the level of digital skills for those at a young age.

In addition, in 2022, 712 'Code Week' activities were organised in the Netherlands. In the 2022 edition of Code Week, the Netherlands ranked 7th among the 78 participating countries, with 2.009

activities, most of which were organised in schools (95%), attracting 51 660 participants, 50% of whom were girls.

These actions complement measures taken as part of the National Growth Fund which financed four projects in the field of digital education in 2022. One project, [Npuls](#), which has been allocated EUR 560 million, will run for 8 years and involves all 108 public vocational education institutions, higher education institutions and universities in the Netherlands. Among the actions, each institution will establish its own centre for teaching and learning supporting educators in using current innovative digital tools. It is expected that this will improve functional and key digital skills of both learners and educators.

EUR 210 million from the National Growth Fund has been conditionally allocated to upscaling current public-private partnerships in vocational education, focusing on partnerships that have an explicit link with the climate and energy transition, or the digital transition. Furthermore, the STAP (*Stimulerend Arbeidsmarkt Positie*) initiative, which provides funding to encourage people to enter the Dutch labour market, was very popular in 2022. The available budget of EUR 160 million was fully used. The programme is not set to continue after 2023 due to cuts in the overall government budget. For the remaining funds allocated to the STAP budget, the Dutch government plans to explore how these can be allocated in a more targeted way. Both of these measures have not specifically targeted the training and retraining of ICT professionals, but rather they have a more general focus.

In 2022, the Ministry of Economic Affairs and Climate Policy continued with a EUR [10 million subsidy scheme](#) for employers launched in 2021, where businesses were able to request funding to retrain employees towards jobs in the engineering or ICT sector, sectors which have a considerable labour shortage. For the general adult population, the country also takes action regarding basic digital skills. For instance, through the Count on skills programme, the Netherlands aims to improve basic digital skills among adults with courses and training, e.g. at libraries and via employers. In addition, municipalities receive EUR 80 million a year to fund courses in basic digital skills for adults.

At 7.2%, the Netherlands is performing above the EU average when it comes to availability of ICT specialists on the labour market. At the same time, the inflow of new talent on the labour market in the form of ICT graduates stands at 3.7%, below the EU average. Moreover, with the proportion of women ICT specialists standing at 19.4% (which is only slightly above the EU average), a gender balance in ICT specialists is far from being reached.

The extent to which the actions mentioned in the previous paragraph will address specific shortcomings in the availability of ICT specialists on the Dutch labour market is to be seen, as the initiatives are still relatively new.

However, action carried out under the '[Human Capital Agenda ICT](#)' must be acknowledged. This programme, in force since 2015, aims to increase the number of ICT specialists in the country. This has led to at least 80 regional public-private partnerships, with intermediate and higher vocational education institutions included. In April 2021, an action plan to scale-up this collaboration was presented. The Ministry of Economic Affairs and Climate Policy has invested around EUR 600 000 in the agenda and is planning to invest an additional EUR 700 000 in 2023.

In a new action, in February 2023, five industry associations in the field of ICT launched a proposal – [Aanvalsplan Chronisch Tekort ICT'ers](#) – to tackle the chronic shortage of ICT specialists in the Dutch labour market. It describes the challenges that the sector will face and measures it will take, focusing on scaling up existing initiatives. For example, an apprenticeship initiative, [Cloud IT Academy](#), has already been in place for several years to match students with employers in the field of cloud and software engineering during their studies. The action plan launched by five industry associations calls upon the government to assist the associations in their current and future efforts.

The government has laid out its own plans for the labour market shortage in the engineering and ICT sector in its Action Plan Green and Digital Jobs ([Actieplan Groene en Digitale Banen](#)). It measures that currently almost 36 000 vacancies in ICT need to be filled, and this number is expected to rise to over 58 000 by 2026. Solving these shortages is an essential step in successfully undergoing Europe's digital and green twin transition: helping the Dutch government achieve its ambition to become climate neutral by 2050 and having 1 million digitally educated people by 2030. The action plan by the government proposes specific actions across four dimensions, namely: (1) actions to increase STEM education, (2) maintaining and increasing enrolment into the specific labour market, (3) increasing labour productivity, and (4) strengthening governance and preventing fragmentation.

To promote women's access to the ICT sector, in 2021 the government helped develop a [taskforce on diversity & inclusion](#) for the ICT sector. Over the course of 2.5 years, EUR 385 000 has been invested. The taskforce works together with businesses to increase the participation of girls in tech education and the associated labour market, as well as advancement and retention of women active in the sector. It is estimated that only 19% of employed ICT specialists are women.

Best practice: Digital inclusion in the Netherlands

A successful digital transformation means no person should be left behind in enjoying the benefits that digitalisation can bring to society. The government has proposed further actions on closing the digital gap and on ways to ensure a value driven digital transformation in the [work agenda on value-driven digitalisation](#). Under the pillar of closing the digital gap, several initiatives are already in place such as i) [DigiHulplijn](#), a helpline for questions on digital issues, and ii) [#allemaaldigitaal](#), which involves the collection of used digital devices to be passed onto people without sufficient means to acquire a device themselves .

Furthermore, the Digital Society Alliance (*Alliantie Digitaal Samenleven*), a public-private collaboration with civil society organisations, aims to take the steps needed to prevent a digital divide. One of their actions was to organise the Day for Digital Inclusion, a conference on digital inclusion that first took place in 2022. During the first conference, the Alliance presented a manifesto for a joint approach to achieving a digital society for all.

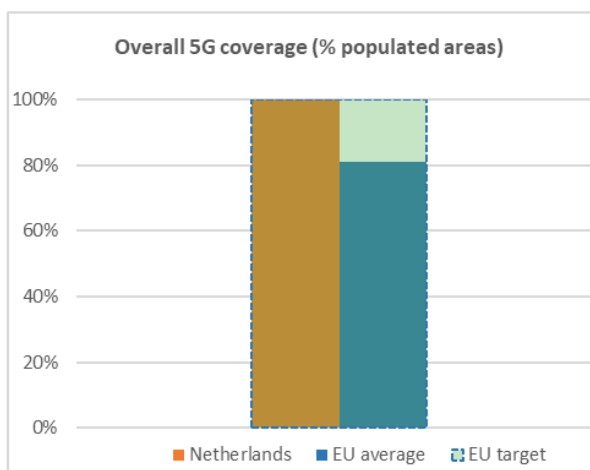
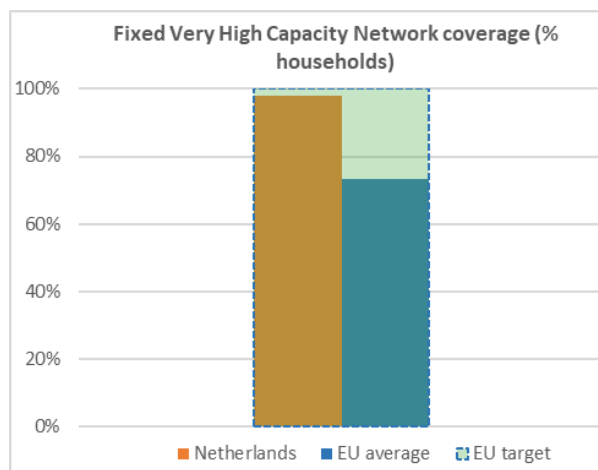
The Netherlands' position in the field of digital skills remains strong. The Dutch government is aware of shortcomings preventing further progression in digital skills and has proposed several actions to increase and maintain digital literacy across all generations of society. In addressing labour shortages in the ICT sector, a strong focus is put on scaling-up existing public-private partnerships that may have proven their potential in early stages. Successful digital transformation in the Netherlands, with a strong ICT workforce as one of its key enablers, is at risk if this bottleneck is not sufficiently and effectively resolved.

The Netherlands should continue implementing its policies in the area of digital skills. In particular, action is encouraged to step up upskilling and reskilling in the field of digital skills in the labour market as well as to achieve a more gender balanced specialist ICT workforce¹⁹⁷.

¹⁹⁷ The recommended policies, measures, and actions in this document reflect the Commission Communication 'Report on the state of the Digital Decade' COM(2023) 570.

2 Digital infrastructures

	Netherlands			EU	EU
	DESI 2021 2020	DESI 2022 2021	DESI 2023 2022	DESI 2023 2022	2030 target
2a1 At least 100 Mbps broadband take-up % households	44%	47%	53%	55%	
2a2 At least 1 Gbps broadband take-up % households	<0.1%	<0.1%	<0.1%	13.8%	
2a3 Fixed Very High Capacity Network (VHCN) coverage % households	90%	91%	98%	73%	100%
2a4 Fibre to the Premises (FTTP) coverage % households	36%	52%	63%	56%	
2b1 Mobile broadband take-up % individuals	90%	94%	94%	87%	
2b2 Overall 5G coverage % populated areas	80%	97%	100%	81%	100%
2b3 5G spectrum Assigned spectrum as a % of total harmonised 5G spectrum	33%	33%	33%	68%	



The Netherlands has traditionally shown a strong performance on digital infrastructure. On connectivity, it is already close to reaching the targets set for 2030 taking into account 5G coverage in all spectrum bands. However, it remains far below the EU average in terms of fixed broadband take-up for speeds of at least 1 Gbps. The Netherlands is also contributing to the EU's digital advancement in the field of edge nodes and quantum computing. Successfully contributing to the EU targets in these fields would bring to life the government's ambition to become the digital intersection of the EU.

The Netherlands is closing in on full gigabit coverage across the country, with near complete VHCN coverage and continuously increasing FTTP coverage. The increase in VHCN coverage can be attributed to further modernisation of the national cable network infrastructure, enabling gigabit speeds, as well as roll-out of fibre-to-the-home (FTTH). In December 2022, one of the operators completed its transformation of its nationwide cable network to support DOCSIS 3.1 technology that enables gigabit speeds. In addition, it announced plans to start testing DOCSIS 4.0 technology in 2023.

Data collected by national regulatory authority ACM in 2022 showed strong infrastructure competition: as of Q3 2022, the incumbent operator, as well as smaller fibre operators **provided 5.34**

million households with FTTH coverage. According to the Dutch industry association for fibre and broadband, in 2022 alone one million new homes were connected to a fibre network.

Despite near-complete access to gigabit speeds, most households do not yet opt for higher speeds: the take-up of 1 Gbps speeds currently stands at 0% compared to the EU average of 13.8%. However, as of 2022, 63% of households in the Netherlands are covered by fibre-to-the-premises, up from 53% in 2021. Despite this advancement, take-up of higher speeds remains low in the Netherlands, with take-up of speeds of at least 100 Mbps just below EU average at 53%, and there is no take-up of gigabit speeds throughout the Netherlands.

While 98% of Dutch households are covered by a fixed VHCN, [according to a study commissioned by the Ministry of Economic Affairs and Climate Policy](#), **without public intervention it is expected that close to 19 000 households will ultimately remain without coverage of a fixed network providing at least 100 Mbps by the end of 2023.** The study presented in March 2022 estimates that public measures amounting to a maximum of EUR 195 million would be required to ensure fibre connectivity to these houses, assuming there is an additional EUR 55 million funded by private parties. The Ministry of Economic Affairs and Climate Policy is exploring to what extent this investment could be made using public funds. However, the actual number of underserved households and the moment market roll-out in rural areas will come to a stop depends on market dynamics. To facilitate that market parties can include underserved households in their roll-out plans as much as possible, the government has given them access to a list of addresses that, as of the end of 2022 according to the most recent broadband mapping exercise, were still not covered by a fixed network providing at least 100 Mbps.

Overall 5G coverage has reached 100% in the Netherlands in 2022, mainly making use of the 700 MHz and 1 800 MHz bands. However, **the country has a complete lack of 5G coverage in the 3.4-3.8 GHz band due to obstacles in the course of assigning this band.** In early 2023, the Ministry of Economic Affairs and Climate Policy expected that the licenses in the 3.6 GHz band could be auctioned off in the second half of 2023, but uncertainty surrounding the move of a satellite service provider to Greece to free up frequency, together with a new appeal to the National Frequency Plan, have caused further delays.¹⁹⁸ **The Netherlands has a clear understanding of the possible scenarios towards the introduction of additional 5G coverage through the 3.6 GHz band. It must assign this band without further delay, in line with EU law.** The issues surrounding current and future local use standing in the way of this assignment needs be resolved swiftly. The lack of a prompt roll-out in the 3.6 GHz band will not only have negative consequences for future user experience but will also hamper future development by industry of new and innovative local network use cases.

An assessment of the commercial interest in the 26 GHz band will be launched in the second half of 2023. The 2020 public consultation showed no market interest in the band in the Netherlands. [According to its outline policy on digitalisation](#), the government still aims to allocate the 26 GHz band during its current period in office.

The Netherlands is the only Member State with an entire semiconductor value chain within its borders and its semiconductor equipment industry holds a key position worldwide. However, within the semiconductor industry, the country does not yet fully capture the benefits of the most

¹⁹⁸ Plans to make available the band for mobile communication use as early as September 2021 were delayed due to conflicting use of the band. An advisory committee appointed to find a solution on how to make this band available for mobile communications was published in May 2022. The committee advised that the operations of a satellite service provider should be moved to Greece so the 3.6 GHz band, with 300 MHz assigned for national 5G licenses, can be made available for mobile communications use. The newly revised National Frequency Plan, published in February 2023, is currently being challenged in court.

valuable element of the value chain. The Dutch network of semiconductor businesses, Holland Semiconductors, describes how the Netherlands is not fully reaping the benefits that the semiconductor design branch can bring to the country, for example by capturing the value chip design created within its own borders. The association has developed a national agenda that includes ambitions to i) improve the process for producing semiconductors from their design to application, ii) better respond to market demand, iii) attract more critical personnel for the sector, and iv) improve the Dutch industry environment. In the years to come, these ambitions will be developed into a concrete industry action programme. **In 2022, EUR 450 million from the National Growth Fund was allocated to a consortium that will develop a high-tech equipment ecosystem.** The consortium NXTGEN HIGHTECH will help develop new equipment that among others can be used to improve the manufacturing process of photonic chips. **Another EUR 471 million from the same fund was granted to PhotonDelta**, which combined with private investments results in an additional investment of EUR 1.1 billion in the development of the photonic semiconductor industry in the Netherlands.

In line with the government's ambition to become the Union's digital intersection, the Dutch government is also taking part in the IPCEI Cloud Infrastructure and Services. **A co-investment of EUR 70 million is planned which will allow dozens of edge nodes to be set up.** A prerequisite for the investment is that the edge nodes must be sustainable in order to help the EU develop 10 000 climate-neutral edge nodes, which are intended to be deployed by 2030.

Similar to its global position in the semiconductor industry, the Dutch quantum industry can be considered to play a key role worldwide. In the Netherlands, Quantum Delta NL is a national programme that advances Dutch quantum technologies. It has been awarded EUR 615 million to implement the national quantum agenda over an 8-year period, originating from the 2021 call for projects for the National Growth Fund. Funding is complemented by investments by industry partners. Quantum Delta NL implements various research programmes, for quantum computers, internet, and sensors. Under the quantum computing development programme, it funds Quantum Inspire developments, a quantum computing platform providing user access to various technologies to perform quantum computations and insights into principles of quantum computing. Just like with semiconductors, the Netherlands also has access to the entire supply chain for quantum computing components within its borders, with start-ups and SME's capable of supplying different components required to build quantum computers.

The Netherlands also plays an important role in European Quantum Projects such as EuroQCI, the Quantum Flagship and EuroHPC. Also Quantum Delta NL's project on quantum networking will soon be connected to other networks within the European Union as part of EuroQCI.

On digital infrastructure, in April 2023, the Dutch government signed a [pact for innovation and sustainable growth](#) with the French government. In this pact, the governments set out their intention to further advance and strengthen cooperation in the field of semiconductors and quantum computing.

The Netherlands' ambition to be Europe's digital infrastructure intersection is coming to life: it is already an important hub for internet cables, data centres and internet exchanges. **However, the benefit of gigabit connectivity for households has yet to be unlocked.** Apart from connectivity, the Netherlands fosters a very strong ecosystem for advanced digital infrastructure.

The Netherlands should accelerate its efforts on connectivity infrastructure, in particular Gigabit coverage. The Netherlands should take all steps necessary to assign the 3.6 GHz band for mobile

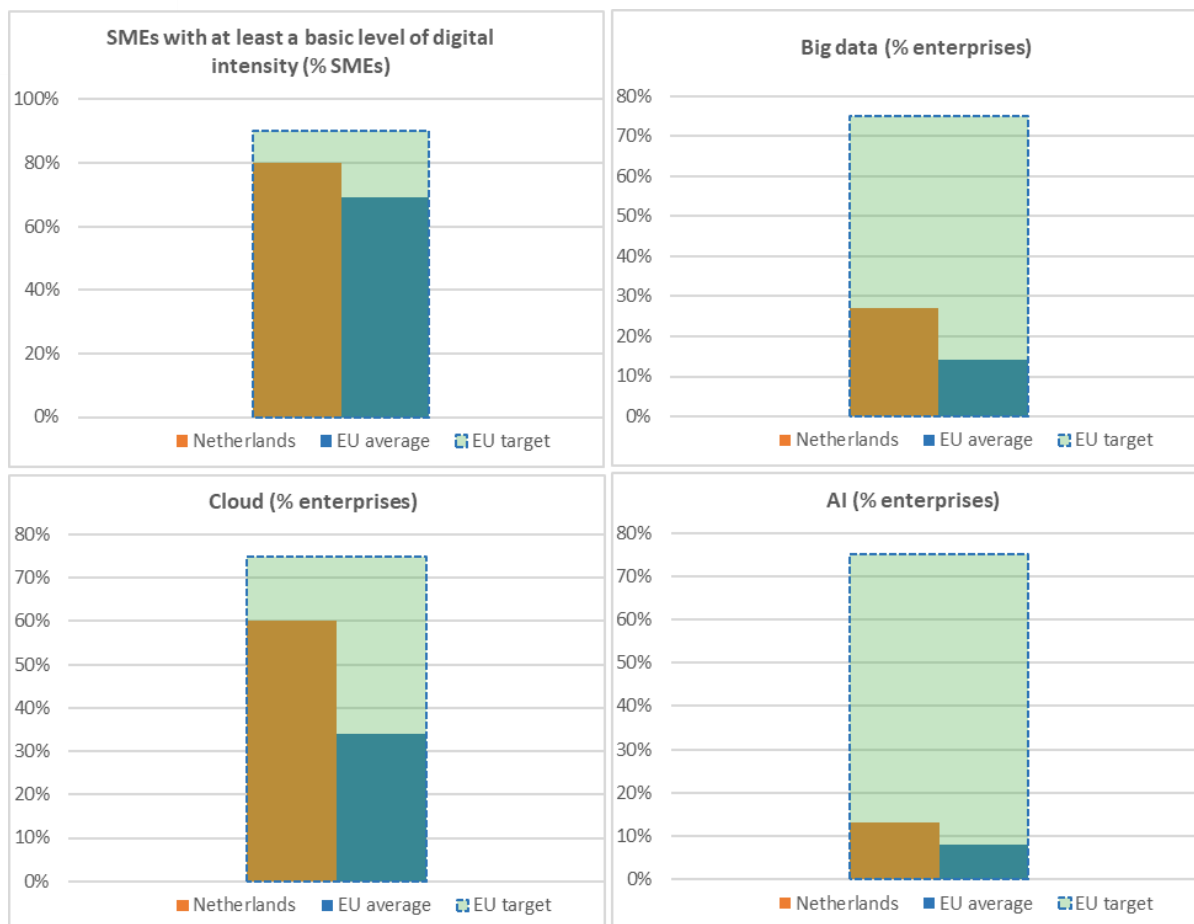
communications without any further delay, in line with its obligations under EU law. It should furthermore consider taking measures to incentivise the take-up of gigabit connectivity.

Measures taken by the Netherlands in the field of semiconductors, edge nodes and quantum computing should continue in order to help the EU to become a strong market player in these areas.

3 Digitalisation of businesses

	Netherlands			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	80%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	47%	43%	43%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	37%	49%	49%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	27%	27%	27%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud¹⁹⁹	NA	60%	60%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	13%	13%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	25%	25%	25%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	19%	23%	25%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	13%	15%	16%	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	13%	13%	13%	9%	
% SMEs	2019	2021	2021	2021	

¹⁹⁹ Enterprises buying sophisticated or intermediate cloud computing services indicator, see [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).



Many Dutch enterprises are already taking advantage of the benefits of digitalisation, with 80% of SMEs having at least a basic level of digital intensity. In November 2022, the Dutch government presented a strategy for the Digital Economy, aiming to bring about a resilient and prospering digital economy. The strategy lays out the ambition to speed up the digital transformation of enterprises and to create the right environment for digital markets and services. In this strategy the government also announced its ambition to exceed the digital decade target of 90% of SMEs to reach at least a basic level of digital intensity by at least five percentage points: 95%. The Netherlands aims at the same time to remain within the top three countries in the European Union for this indicator.

Various actions are already being implemented to ensure SMEs increase their basic level of digital intensity under a specific programme to advance SME digitalisation. As part of a public-private partnership, governments, educational institutions, and regional businesses have already set up 20 Digital SME workspaces. These workspaces bring together students and businesses, to help businesses adopt digital technologies. New workspaces can be set up with financial aid in the form of co-financing from the Ministry of Economic Affairs and Climate Policy, with EUR 7.4 million allocated for a 5-year period.

From June 2022 to November 2022, the Ministry of Economic Affairs and Climate Policy together with private and public stakeholders also provided subsidies to micro retailers to invest in IT technologies as part of a pilot of the My Digital Store (*Mijn Digitale Zaak*) programme. Entrepreneurs could request up to EUR 2 500 out of the EUR 1.7 million programme to be used for advice on and implementation of digital technologies in their business. The subsidy was offered to help SMEs to achieve a basic level of digitalisation, with eligible digital solutions ranging from setting up a web shop to making use of point of sale systems.

Furthermore, the third Smart Industry Programme was introduced. This aims to improve the SMEs digitalisation in the manufacturing industry. One of its goals is to improve digital skills of employees through Smart Makers Academies, which are regional hubs where employees can receive such training. Businesses in the industry will be helped in digitalising parts of their production process to, among other things, increase efficiency and production quality.

Enterprises are less developed when it comes to making use of advanced digital technologies in the field of big data and AI. The Netherlands is already advanced compared to European peers, with 60%, 27%, and 13% of Dutch enterprises already making use of respectively cloud, big data and AI, respectively

In the field of big data, existing projects such as the Data Sharing Coalition are complemented by sector specific projects, such as the Digital Infrastructure Logistics programme. This project received EUR 51 million funding through the National Growth Fund in 2022 to support data sharing between actors in the logistics chain, a chain in which the Netherlands fulfils an important role given its numerous transport ports. EUR 36.2 million for this project will be drawn from the RRF, if milestones for this project are reached.

Projects in the field of AI also continue to be rolled out. **The AiNed National Growth Fund Investment Programme started in 2021 and in 2022 it received EUR 116.5 million of its allotted investment of EUR 276 million from the National Growth Fund.** The Dutch AI coalition has set up seven regional hubs that create networks between stakeholders making use of AI. Additional funding for AiNed will be drawn from the RRF, under which Applied AI Learning Communities have been proposed, connecting SMEs with questions on AI with students. At the same time the learning communities should serve to improve education and research in the field of AI at participating universities. If all RRF targets are met, the Netherlands will receive EUR 59.85 million of which EUR 15.85 million specifically for the purposes of the Applied AI Learning Communities.

On cloud computing, as mentioned above, the Netherlands is one of the Member States which, together with hundreds of European companies, take part in the Important Project of Common European Interest on Next Generation Cloud Infrastructure and Services (IPCEI-CIS) which forms part of the Multi-Country Project on a Common Data Infrastructure and Services. The IPCEI-CIS aims to equip the European Union with the next generation of advanced, distributed, secure, sustainable, and innovative cloud-to-edge capabilities that individuals and businesses need. It aims to support Dutch businesses in the uptake of cloud and contribute to the Netherlands's effort towards fulfilling the Digital Decade's cloud uptake target via its businesses which is set at 75% by 2030. **It could foster the exploitation of new advanced cloud solutions among enterprises, in particular SMEs, and contribute to cloud upskilling including on cloud security and environmental performance while paying attention to gender equality.**

Six European digital innovation hubs (EDIH) have been established and began work in early 2023. The EDIHs are to receive a combined investment of EUR 30 million. Each regional EDIH specialises in a field of interest specific to its region, complementing the work of the smart industry hubs established under the smart industry programme mentioned above.

Techleap.nl, previously known as Start-upDelta, aims to foster a strong ecosystem for innovative scale-ups. There are already 24 unicorns in the Netherlands, contributing significantly to the increase of the number of unicorns within the European Union. A further 39 enterprises can be considered potential future unicorns, meaning that they have a valuation between USD 250 million and USD 1 billion. However, the government is aware of various bottlenecks that pose a threat to the development of this ecosystem, such as the shortage of digitally skilled professionals mentioned above, and the ability of Dutch companies to access growth funding. On a European level, the

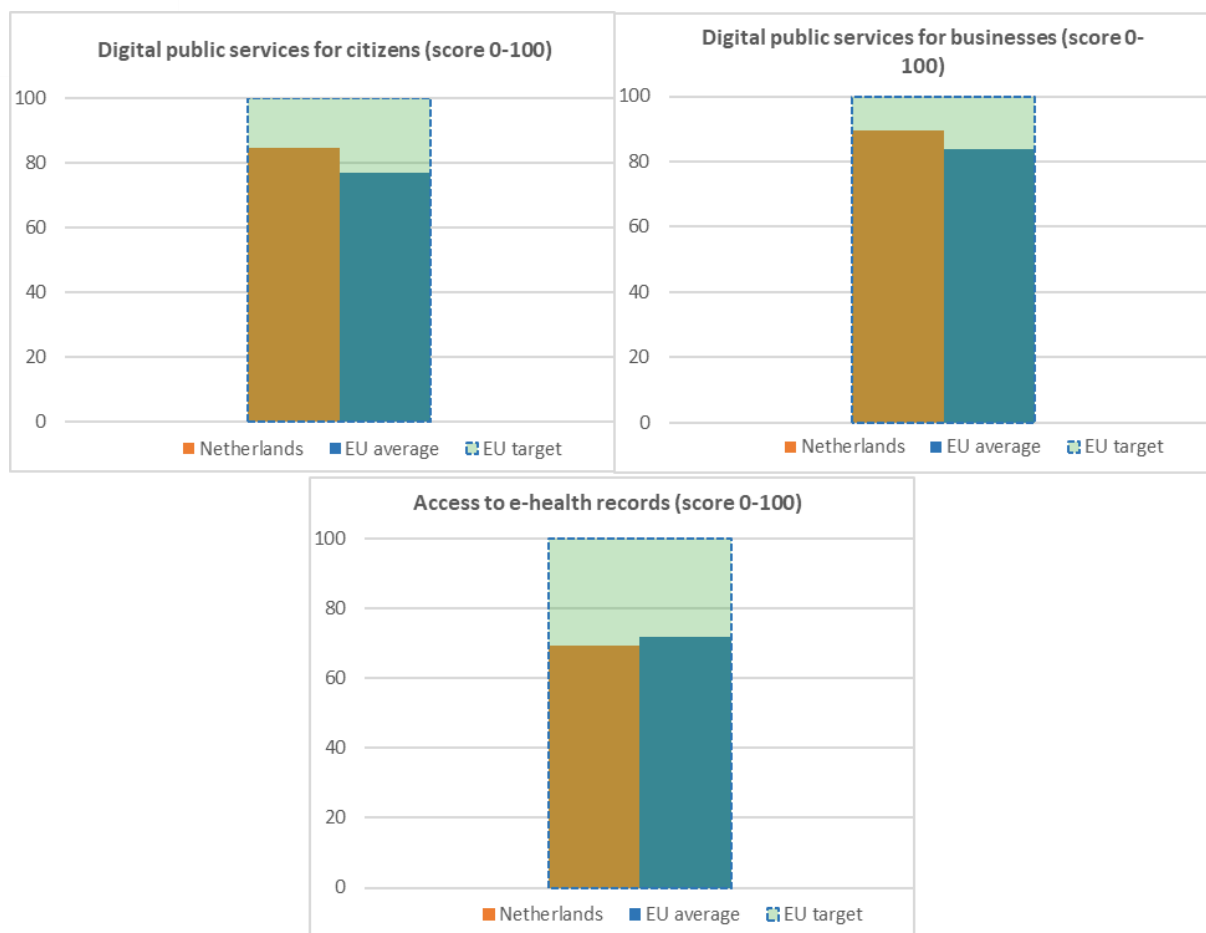
Netherlands has signed the Joint Declaration for a pan European scale-up initiative launched by the French Presidency of the Council. However, while also a signatory to the Europe Start-ups Standard, it has not yet identified a legal entity to represent the country.

The Netherlands possesses a strong ambition to bring the benefits of digitalisation to enterprises, with its national-level targets surpassing those at European level. Various partnerships and funding schemes are in place to further advance the position of SMEs on the development and use of digital technologies. Use of advanced digital technologies is generally still low, but actions are in place that aim to advance the Netherlands' position in this regard.

The Netherlands should continue implementing their policies in the area of digitalisation of businesses. In particular, the Netherlands should continue helping SMEs to access advanced technologies, especially big data, cloud and AI, through sustained measures to promote their development and take-up.

4 Digitalisation of public services

	Netherlands			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	97% 2022	74% 2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	85 2021	85 2022	77 2022	100
4a3 Digital public services for businesses Score (0 to 100)	NA	88 2021	89 2022	84 2022	100
4a4 Pre-filled forms Score (0 to 100)	NA	94 2021	94 2022	68 2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	81 2021	81 2022	65 2022	
4a6 User support Score (0 to 100)	NA	99 2021	99 2022	84 2022	
4a7 Mobile friendliness Score (0 to 100)	NA	95 2021	98 2022	93 2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	69 2022	72 2022	100



In the digitalisation of public services, the Netherlands scores high across the board. Following the *NL Digibeter Agenda* (Digi-‘better’) and the Dutch digital strategy, at the end of 2022, a new agenda was presented to, among other things, further develop the digitalisation of public authorities and their services. In its [value-driven digitalisation](#) agenda, the Netherlands sets new goals to improve the government’s information governance and systems, as well as information management for individuals and businesses. Furthermore, specific attention is given to the position of the Caribbean part of the Kingdom of the Netherlands. In this area, one of the goals is to ensure equivalent access to public services between the Caribbean part and the European part of the Netherlands.

The Netherlands has submitted three reforms under the RRF to make IT at government level future-proof, with a budget of almost EUR 170 million. One of these plans is called *Information Management Government*, which aims to improve public access to government documents. If properly implemented, this plan should ultimately result in the target of a minimum of 330 000 available documents becoming available on the *Open Government* platform, ranging from laws and parliamentary papers to decision memos on government policies. This should lead to a more open and transparent government, with more transparent decision making as well as increased democratic accountability. This would be in line with the European Declaration on Digital Rights and Principles, which states that wide accessibility and re-use of public sector information should be ensured.

With a score of 85 and 89 respectively, the Netherlands is well above the EU average: many digital public services are available both for citizens and businesses. Notably for citizens, a digital transformation of the criminal justice judicial system is taking place, benefiting from a EUR 91 million

investment from the RRF. As part of this transformation, people will be able to file police reports and carry out actions during pending criminal proceedings digitally.

All citizens and enterprises in the Netherlands can use a national eID: DigiD and *eHerkenning* (eRecognition) respectively for citizens and enterprises.

Public authorities that use authentication means are obliged to use DigiD, which has had a positive effect on the uptake of this scheme. In the 'My Government' portal individuals have an overview of data stored by public authorities, as well as access to an online message box containing digital mail from public authorities. As of May 2023, the portal had over 10 million active accounts. However, it only serves as a front office for government interaction, not a one-stop shop for direct interaction between the public and all levels of administration.

The role of DigiD and *eHerkenning* for authentication purposes is being formalised on a national level through the new Digital Government Law. It lays down rules for the means of authentication with public authorities and semi-governmental organisations as well as for specific designated organisations of public interest, such as universities and healthcare providers.

Furthermore, as part of the Ministry of the Interior's European digital identity programme, the development of an open-source Dutch digital wallet is underway. The first demo version of the wallet was presented in January 2023. With this project, the government hopes to gain experience and set an example for national organisations and other Member States.

Work on improving digital availability and exchange of medical records is underway in the Netherlands, with still some room for progress to reach the Digital Decade target. Currently, patients are able to view medical records digitally, mainly through patient portals provided by their healthcare providers. According to the [Dutch e-healthmonitor 2022](#) produced by the National Institute for Public Health and the Environment (*RIVM*), 88% of general practitioners and 80% of medical specialists provide patients with a digital portal to view available medical records. Specifically, private primary, secondary and tertiary healthcare providers (physicians, community centres, hospitals, clinics) and pharmacies make electronic health data accessible. With a fully decentralised and market-based healthcare system and IT infrastructure, people are provided with several ways to access their electronic health records. **According to the report mentioned above, the estimated number of patients using a specialised digital environment to collect their medical records from various sources centrally is significantly lower.** *Medmij*, a Dutch online service for the exchange of medical records between patients and healthcare providers, allows transfers of records through such personalised digital health environments. However the spectrum of accessible and updated health data remains limited and fragmented.

The Ministry of Health, Welfare and Sport has set aside a budget of EUR 180 million in the coming years to support the decentralised developments of these central personal health records environments. It aims at onboarding between 1 and 2 million users on the available environments by 2025. Additionally, EUR 1.4 billion in funding is made available until 2028 for accelerating health data availability through the Coalition Accord. Furthermore, the Netherlands takes part in the MyHealth@EU programme that allows patient summaries to be received from other connected EU Member States, as well as in a joint action under the European Health Data Space and the xShare project to improve interoperability across Europe.

The new law on the electronic exchange of information in healthcare (*Wet elektronische gegevensuitwisseling in de zorg*), aims to regulate the use of digital medical records between healthcare providers, sets standards to be applied for these exchanges, and allows patients to receive medical records through their personal digital healthcare environment where possible. Implementation of this new law will take place gradually following a multiannual agenda, which

gradually mandates certain types of medical record exchanges to take place digitally. These developments should prove beneficial for people in the Netherlands as they will have wider online access to medical records.

The new framework laws setting rules on digital interaction with public authorities and the digital exchange and availability of medical records are a welcome step to further digitalising public services in the Netherlands. However, its success and added value to people will depend on the detailed rules that are to follow and that the stakeholders involved, both public and private, properly and promptly implement them.

Best practice: Accessibility of digital government

The European Declaration on Digital Rights and Principles includes to a commitment to leave nobody behind in the digital transformation, including in particular persons with disabilities. The design, development, deployment and use of technological solutions should, among other things, promote solidarity and inclusion.

The Netherlands has introduced the Dutch Digital Accessibility Law, based on the UN Convention on the rights of persons with disabilities and Directive 2016/2102 on the accessibility of the websites and mobile applications of public sector bodies. To monitor the status of digital accessibility of government organisation websites and apps, a central register was developed which houses all published accessibility declarations. Some 3 822 accessibility statements have been published so far.

The dashboard [Digitoegankelijk](#) complements the accessibility declaration registry, by giving their websites and apps different statuses depending on the degree of accessibility. In contrast to the registry, the dashboard also makes visible the websites and apps that do not yet comply with accessibility requirements. A first step to addressing the shortcomings in accessibility is making the accessibility gap visible, with the dashboard serving as aid for organisations themselves as well as supervisory authorities. Initial accessibility measures have already been taken for 1 034 government websites and 26 apps to make sure they will fully meet all accessibility requirements over time.

The Netherlands should continue implementing its policies to digitalise public services.



Digital Decade Country Report 2023

Poland

Introduction

Poland has scope to improve its performance in the digital transition and to contribute to the collective efforts to achieve the EU's Digital Decade targets. There has been progress in the digitalisation of public services, with notable improvements to the flagship e-Government app and in e-health. Poland has also made progress on skills, but it should strive further to achieve the Digital Decade targets. Efforts in digital infrastructures also need to be stepped up, as 5G core spectrum bands are still not available, and the EU regulatory framework is not in place. At the same time, operators have continued to invest in fixed connectivity.

Poland's performance in the area of digitalisation of business remains below the EU average with important progress still needed in terms of the uptake of advanced technologies.

The coordination of digital policies was moved to the newly re-created Ministry of Digital Affairs on 1 May 2023.

In cybersecurity, an update of National Cybersecurity System in Poland, that has been for a few years in the making has yet to be adopted and would be a necessary counterpart of the actions undertaken by the public administration bodies.

Poland is collaborating with other Member States in exploring the possibility to set up **European Digital Infrastructure Consortia (EDICs)** on: (i) establishing an Alliance for Language Technologies, to develop a common infrastructure in the field of natural language processing and to develop large multi-language models; and (ii) Innovative Massive Public Administration inter-Connected Transformation Services, to develop a new generation of advanced cross-border services. Poland is one of the Member States that have jointly submitted a formal application to set up the European Blockchain Partnership and the EDIC on European Blockchain Infrastructure, supporting EU-wide cross-border public services.

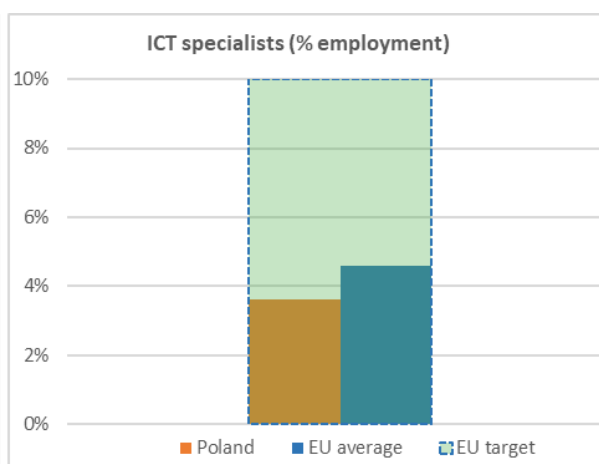
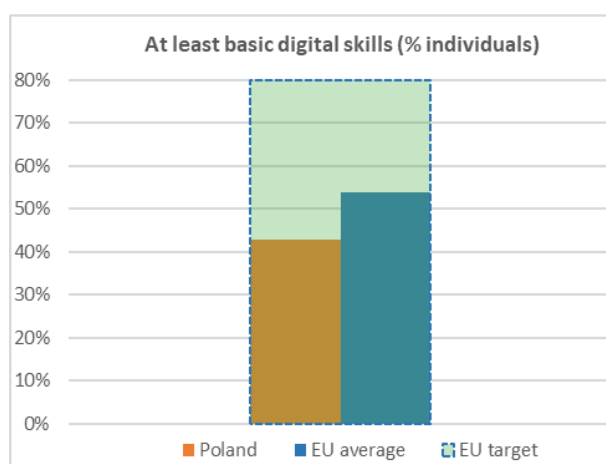
Digital in Poland's Recovery and Resilience Plan (RRP)

Measures contributing to the digital transition account for 21.3% (over EUR 7.5 billion) of the plan's total allocation which EUR 6.8 billion is expected to contribute to achieving the Digital Decade targets²⁰⁰. The comprehensive set of measures is expected to have a lasting impact on Poland's digital transformation, especially in (i) developing the broadband and 5G network, (ii) improving the delivery of public services to businesses and citizens, digitising public administration, and strengthening resilience and cybersecurity. They will also help digitalising of the education system and the development of digital skills. This is also true for other sectors: the digitalisation of electricity networks should contribute to better integration of renewables and to reducing energy losses and emissions; making greater use of e-health digital solutions is also expected to strengthen the efficiency, accessibility and quality of health services. Poland has yet to submit a payment request for the first instalment of the RRF money.

²⁰⁰ Each recovery and resilience plan must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plans had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or has no impact (0%) on digital objectives, using Annex VII of the RRF Regulation. Combining the coefficients with the cost estimates of each measure allows assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to allow for an estimation of the possible contribution of RRF measures to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice to potential ongoing revisions of the plan.

1 Digital skills

	Poland			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	81%	84%	86%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	43%	43%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	21%	21%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	57%	57%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	18%	18%	25%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	3.4%	3.5%	3.6%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	3.8%	3.7%	4.1%	4.2%	
% graduates	2019	2020	2021	2021	



In the digital skills dimension, there is significant room for improvement for Poland. Figures for digital skills remain lower compared to the EU average, with 43% of people aged between 16 and 74 having at least basic digital skills (EU 54%) and 21% having above basic digital skills. On at least basic digital content creation skills, Poland scores 57%, below the EU average of 66%. In addition, ICT specialists account for a slightly lower percentage of the workforce in Poland compared with the EU average. On the other hand, ICT graduates currently account for 4.1% of all graduates in Poland, equal to the EU average. That said, Poland has more enterprises investing in ICT training for their employees than the EU average (25% vs 22%). The AI4Youth pilot project, which was run by the Ministry of Economic Development and Technology in cooperation with a private company, concluding in November 2022, helped young people develop competences in artificial intelligence.

In 2022, the governmental institutions rolled out final projects that started under the 2014-2020 [Operational Programme Digital Poland](#), funded by the European Regional Development Fund (ERDF). This included the [Zdalna Szkoła+](#) (Remote School) project that provided grants to almost 2 800 Polish

municipalities and districts to purchase equipment for pupils and teachers. The [Lekcja:Enter](#) project implemented by three non-profit entities: Orange Foundation, Fundacja Rozwoju Społeczeństwa Informacyjnego and Instytut Spraw Publicznych, provided support to teachers involved in remote education.

Besides comprehensive, long-term programmes, ad hoc courses and conferences took place in 2022. The largest event was the [Digital Festival](#) comprising over 100 events. For pupils, students and teachers in Poland, the EU Code Week continued to be a major event. In 2022, as many as 14 000 activities were organised involving over 300 000 participants, mainly primary school students, the third highest number in the EU in absolute figures and taking into consideration the country's population. As in previous years, the [National Coalition for Digital Skills and Jobs](#) assisted everyone involved in coordinating actions that supported digital skills, upskilling and reskilling.

The Polish regulator (Office of Electronic Communications, UKE) runs a series of educational campaigns to improve digital skills among the population. They form part of the Cybersecurity Strategy of the Republic of Poland for 2019-2024, particularly its objective 4: 'Building public awareness and competencies in the area of cybersecurity'²⁰¹. This includes teaching people how to behave responsibly on the internet, as well as the rights and obligations on the telecommunications services market. UKE runs campaigns targeted at various groups: children and young people, teachers, parents, guardians, consumers, older people, consumer advocates as well as people with special needs.

In 2022, digital subjects were being mainstreamed into formal tertiary education. Universities provided more and more courses focusing or using technologies that helped an increase in the number of ICT graduates. One of the many actions in this area was the EU-financed project [Academy of Innovative Applications of Digital Technologies](#) (AI Tech), led by a consortium of five universities²⁰².

A key government policy document, the **Digital Competence Development Programme**²⁰³ (*Program Rozwoju Kompetencji Cyfrowych, PRKC*), **was adopted in February 2023**. It is a comprehensive, multiannual document providing both an overview of the situation on digital skills in Poland and a plan for governmental actions. The budget foreseen for the programme is expected to be around EUR 600 million with the bulk (92%) coming from EU funds, including the RRP. The cross-cutting nature of the PRKC means that various entities are involved in its implementation. The Digital Competence Development Center at the Ministry of Digital Affairs will be coordinating the programme which will be both a challenge and an opportunity for it to carry out cross-departmental actions with the Ministry of Education and with the Ministry of Family and Labour, as well as other ministries.

Poland also plans to develop a comprehensive digitalisation strategy for education that would focus on efficient and meaningful integration of digital technologies into teaching, learning and assessment. This would include establishing minimum binding standards for equipping all schools with digital infrastructure to ensure equal access to digital education. At the same time, a participatory approach in the development of any major policies, involving local and regional governments, schools, educators, experts in digital education and civil society, is of particular value. The public consultations on this new policy, that is foreseen in the RRP to constitute the necessary

²⁰¹ <https://digital-skills-jobs.europa.eu/en/actions/national-initiatives/national-strategies/poland-cybersecurity-strategy-republic-poland-2019>

²⁰² The consortium consist of Gdańsk University of Technology, Wrocław University of Science and Technology, Poznań University of Technology, University of Warsaw and Adam Mickiewicz University.

²⁰³ <https://digital-skills-jobs.europa.eu/en/actions/national-initiatives/national-strategies/poland-digital-competence-development-programme>

basis for the investments in digital infrastructure in schools, including making available computers for pupils, have not started in 2022.

Best practice: Grant project for the development of digital skills

In 2017-2022, a grant project for developing of digital competences worth over EUR 27 million was implemented as part of the Digital Poland Operational Programme. Municipalities received grants worth between EUR 3 300 and EUR 33 000 to organise training for their residents. For their training needs, communes were able purchase IT equipment (up to maximum of 40% of the grant value), which they passed on transferred to the schools after the project ended. The scale of the projects was adapted to the needs of the commune and its inhabitants.

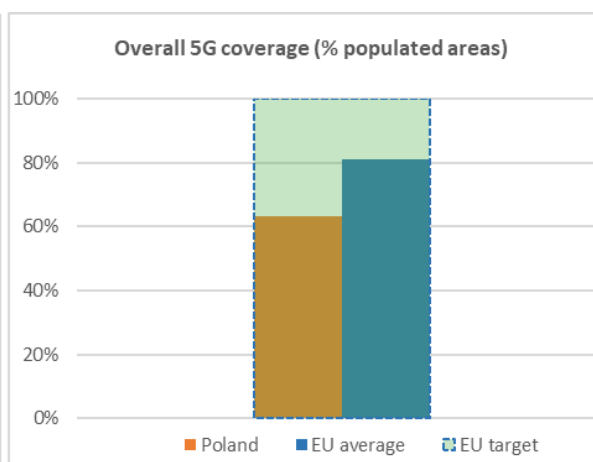
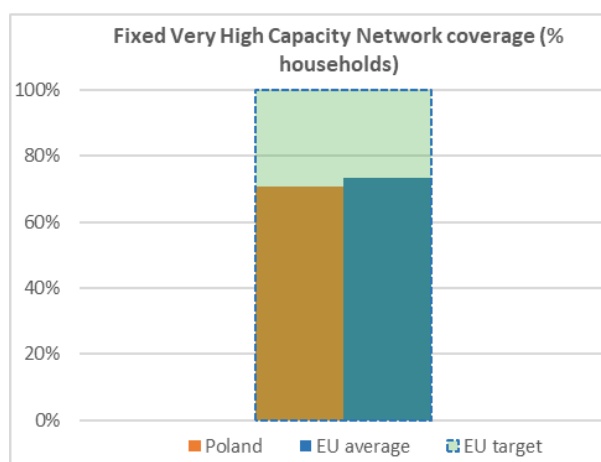
Almost 172 000 people were trained throughout Poland under this project.

Poland should step up its efforts in the area of digital skills. In particular, Poland should strengthen digital skills in primary, secondary, and vocational education and training and step up the upskilling and reskilling of the labour force, paying special attention to advanced and emerging technologies²⁰⁴.

²⁰⁴ The recommended policies, measures, and actions in this document reflect the Commission Communication 'Report on the state of the Digital Decade' COM(2023) 570.

2 Digital infrastructures

	Poland			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up	49%	58%	65%	55%	
% households	2020	2021	2022	2022	
2a2 At least 1 Gbps broadband take-up	1.5%	2.8%	3.4%	13.8%	
% households	2020	2021	2022	2022	
2a3 Fixed Very High Capacity Network (VHCN) coverage	65%	70%	71%	73%	100%
% households	2020	2021	2022	2022	
2a4 Fibre to the Premises (FTTP) coverage	45%	52%	60%	56%	
% households	2020	2021	2022	2022	
2b1 Mobile broadband take-up	73%	84%	84%	87%	
% individuals	2018	2021	2021	2021	
2b2 Overall 5G coverage	10%	34%	63%	81%	100%
% populated areas	2020	2021	2022	2022	
2b3 5G spectrum	0%	0%	0%	68%	
Assigned spectrum as a % of total harmonised 5G spectrum	2021	2022	2023	2023	



Regarding the digital infrastructure, despite some positive changes, there is still significant room for improvement. Over recent years, Poland experienced a steady increase in the percentage of households covered by fixed very high capacity networks – 71% in 2022 compared to 65% in 2020. Notably, a major part of this increase was recorded in the Fibre-to-the-Premises (FTTP) coverage that increased from 45% in 2020 to 60% in 2022.

Regarding fixed broadband take-up, 65% of households subscribed to at least 100 Mbps fixed broadband connection in 2022, which is above the EU average of 55%. However, at 1.1% of households, the take-up of 1 Gbps broadband remains significantly below the EU average of 3.4%. At the same time broadband prices in Poland remain below the EU average.

The perspective on the developments in fixed broadband should take into consideration that people living in rural areas account for nearly 40% of the country's population and that the average

population density of rural areas in Poland is about 50 people per square kilometre. This continues to be a major factor behind the high costs of building telecommunications infrastructure, resulting in a general low level of attractiveness for investment in rural areas. A potential solution for this problem could be the wider use of smart grids in energy as wind and solar sources are usually dispersed and their integration into the grid needs strong electronic communication.

Poland plans to use a mix of funds from the Recovery and Resilience Facility (RRF) and the European Regional Development Fund (ERDF) to finance its future connectivity actions. Poland estimates that the RRF and the 2021-2027 ERDF actions will together contribute with EUR 2 billion overall, subject to compliance with applicable State aid rules.

This should provide at least 1.5 million households in Next Generation Access-white areas, increasing the rate of those with access to the gigabit society's level of services up to more than 80%. The RRF contains a set of reforms in connectivity, some of which are being implemented in line with the plan. This includes a new regulation on annual telecommunications infrastructure and services inventory²⁰⁵, adopted in March 2023.

On mobile connectivity, 63% of households were covered by 5G technology in 2022, which is below the EU average of 81%. Poland has not yet assigned radio spectrum for 5G deployment, and the current deployment is based on other frequencies thereby not allowing for advanced applications. The 5G deployment is moving ahead with some mobile providers replacing their 3G networks with more advanced network services. One big mobile operator is currently switching off the 3G network in the 2.1 GHz band, allocating the released frequencies to increase the capacity and speed of its 4G and 5G networks. Another operator slated a similar process for 2024.

Regarding the legal environment, key EU regulations have not been implemented yet. In particular, the European Electronic Communication Code (Directive 2018/1972) has yet to be transposed into national law the deadline was 21 December 2020 and Poland has yet to notify full transposition to the Commission. As a result, the Commission referred the case to the Court of Justice of the EU in April 2022. Moreover, the deployment of high quality 5G networks is hampered by the failure to assign the 5G pioneer bands. In May 2020, the Polish government cancelled the auction of the 3.6 GHz band, about six weeks after the regulator began the procedure, offering four licences that would have been valid until 30 June 2035. At the end of 2022, the Office of Electronic Communications (Urząd Komunikacji Elektronicznej, UKE) launched a consultation of documentation for an auction of the band, and in June 2023 the auction itself opened for four frequency licences in the 3.4-3.8 GHz range. The selection procedure and issuing the licences is expected to be completed in the fourth quarter of 2023²⁰⁶.

For the 700 MHz band, the situation is unclear as Poland plans to use part of this band for services of the still-to-be appointed Operator of the Strategic Security Network, a state-owned entity that would provide telecommunications services to key public administration entities with the goal to ensure they fulfil tasks for defence, state security and public safety and order.

The Operator will be established by an act amending the law on the National Cybersecurity System (Krajowy System Cyberbezpieczeństwa). The government has adopted the blueprint for legislation and has submitted it to the Parliament. However, there is only a little time to proceed it as the general elections will take place in October 2023.

²⁰⁵ [Rozporządzenie Ministra Cyfryzacji z dnia 8 marca 2023 r. w sprawie informacji o infrastrukturze technicznej i kanałach technologicznych oraz o stawkach opłaty za zajęcie pasa drogowego \(sejm.gov.pl\)](#)

²⁰⁶ <https://www.uke.gov.pl/akt/ruszyla-aukcja-5g,483.html#!>

During a public consultation on the 26 GHz band between July and September 2020, the Polish operators expressed no interests the band before 2023. Given the ongoing auction of the 3.6 GHz band, there are currently no consultations on the 26 GHz band.

The largest part of the financial resources allocated to digital matters in the RRP is earmarked for connectivity, aimed at boosting the deployment of very high capacity networks, including fibre and 5G as necessary to address identified market failures and in compliance with the applicable State aid rules. This will be done in line with the best practices of the EU Connectivity Toolbox. The total amount allocated to investments in network infrastructure is EUR 1.4 billion for fixed broadband and EUR 1.2 billion for mobile broadband. With these resources Poland aims to provide universal access to high-quality telecommunication infrastructure and modern electronic communication services in areas throughout the country where there has been a market failure, narrowing the gap between urban and rural areas. The investments will focus on:

- (i) covering 930 000 households in areas, not covered by networks providing speeds of at least 30 Mb/s download with broadband internet access with a capacity of at least 100 Mb/s;
- (ii) supporting the roll-out of the 5G network by building the 5G bases stations in areas where there had been a market failure.

These measures are expected to help achieve of the EU's 5G and gigabit connectivity objectives. From the policy perspective, the main goal of the Polish Digital Transformation Strategy for 2025, as outlined in the National Broadband plan, is to ensure that all households have internet access with a downstream connection speed of at least 100 Mbps, with the option to upgrade to gigabit speeds. For Poland to achieve these goals, the plan sets out the required financial and legislative measures, aimed at removing legal barriers hindering the rapid development of broadband networks. However, the goals of the Digital Decade Policy Programme are not currently reflected in the National Broadband plan.

In December 2022, the Information System on Access to Fixed Broadband Internet Services (SIDUSIS) was implemented. The system is a database that collects information about the availability of fixed-line internet services based on notifications from customers and internet service providers. It facilitates access to broadband Internet services for consumers but also enables operators to adjust network expansion plans to the real needs of customers.

On 1 January 2023, the *Regulation on the inventory of telecommunications infrastructure and services* entered into force. The inventory is a source of reliable data on the spatial availability of telecommunications infrastructure and networks. The inventory is also subject to information on the route of fibre-optic and other than fibre-optic cable lines providing or enabling the provision of broadband Internet access. The inventory allows for a significant improvement of the planning and construction of public telecommunications networks, including the rationalization of their location by considering the route of the existing networks.

The Polish authorities are currently working on detailed measures implementing the Connectivity Toolbox, in terms of facilitating 5G network deployment. In one of the planned reforms, Poland would like to use State support to complement for investments incentivising 5G network roll-out. In this context, Poland plans to implement measures supporting the network development in areas with low population density and alongside road infrastructure in 2023.

In 2022, Poland adopted the National Scientific Policy document (*Polityka Naukowa Państwa*), indicating the High Performance Computing and Quantum Computing as the main priorities for Polish science over the coming years. As a result, Poland supports several initiatives to develop quantum computing resources. One of them, EuroQCS-PL, is a project coordinated by the Poznań Supercomputing and Networking Centre (PSNC). It plans to create a quantum computer within 4

years. Poland also takes part in LUMI-Q, multinational consortium coordinated by Czechia, working to provide a Europe-wide quantum computing environment integrated with the EuroHPC infrastructure. Both projects concern quantum computers integrated into existing supercomputers. In all, two of the six quantum computers to be built by EuroHPC Joint Undertaking will be located in, or supported by Poland.

In 2022, also a **Quantum Hub was launched in Poznań** - the Poznań Supercomputing and Networking Center. The Hub develops quantum computing technologies and their implementations thanks to the cooperation of Polish scientists and IBM.

Best practice: Poland's support for Ukraine in the telecommunications

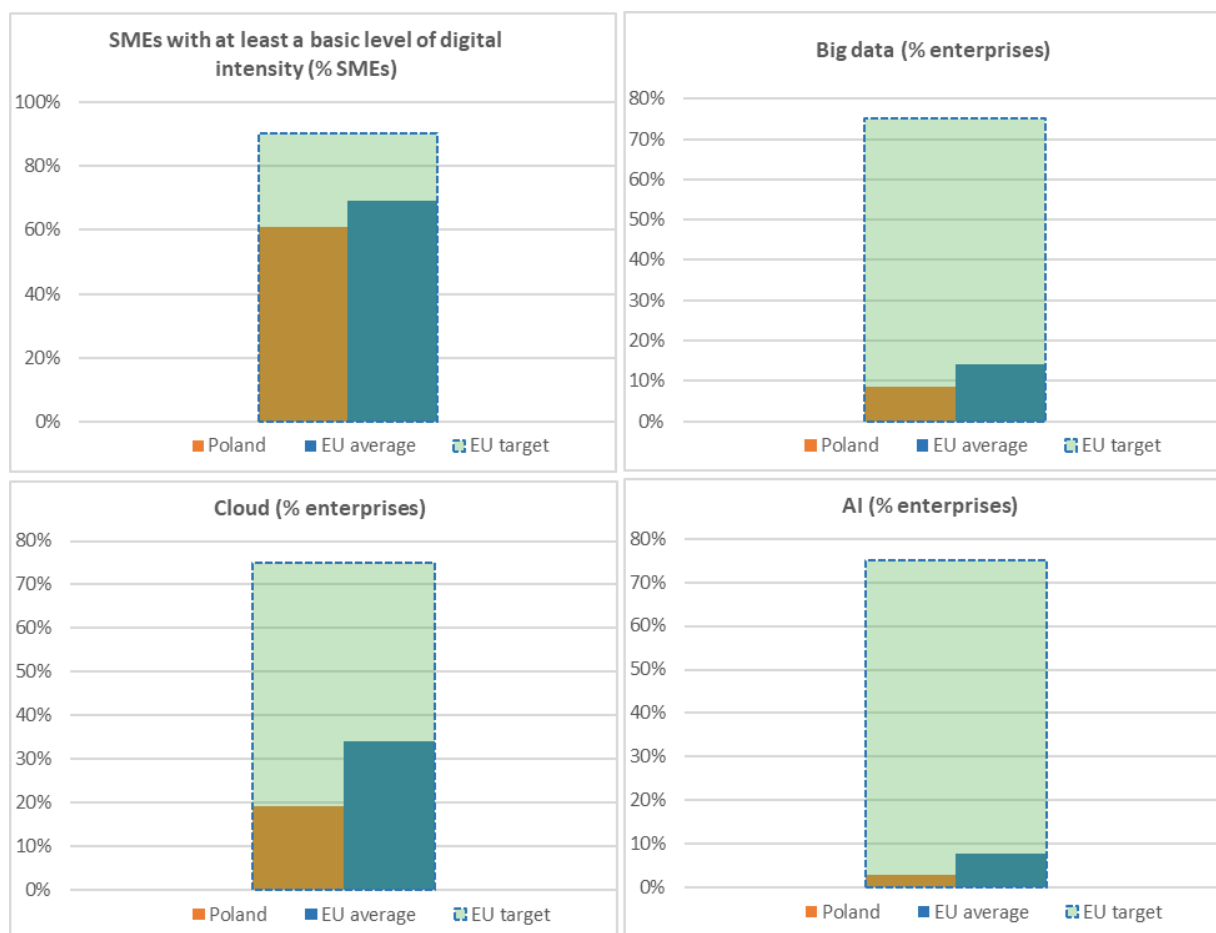
Since the Russian invasion of Ukraine in February 2022, the Polish government has been involved in activities that help Ukrainian citizens. Up until January 2023, Poland has delivered over 14 000 satellite terminals to Ukraine. It also committed to financing the subscription fees for the transferred Starlink terminals until the end of 2023. Furthermore, Poland supports the rebuilding of the civilian telecom infrastructure struck by rocket attacks from Russian forces. In March 2023, devices for storing energy and powering elements of the communication infrastructures were transferred to Ukraine. The devices make it possible to power devices and elements of telecommunications infrastructure anywhere in Ukraine, regardless of damage or destruction of the energy infrastructure from which these devices and infrastructure elements have been powered so far. Since the beginning of the conflict UKE has cooperated with the Ukrainian Regulator in strengthening border communications and security for Ukrainians coming to Poland. In addition, Polish operators signed an agreement at EU level on regarding the support for Ukraine and provided such support, e.g. free SIM cards.

Poland should step up its efforts on connectivity infrastructure. To incentivise the development of robust connectivity, the current EU regulatory framework needs to be transposed into the national regulations. The assignment of the radio spectrum needed for 5G connectivity in a transparent, open and non-discriminatory way is also necessary to achieve the Digital Decade 5G targets. Measures taken by Poland in the field of semiconductors and quantum computing should continue in order to help the EU to become a strong market player in these areas.

3 Digitalisation of businesses

	Poland			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	61%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	29%	32%	32%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	14%	18%	18%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	9%	9%	9%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud²⁰⁷	NA	19%	19%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	3%	3%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	13%	13%	13%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	13%	14%	14%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	NA	NA	8%	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	5%	5%	5%	9%	
% SMEs	2019	2021	2021	2021	

²⁰⁷ Enterprises buying sophisticated or intermediate cloud computing services indicator, see [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).



There is significant room for improvement regarding Poland's performance in the area of digitalisation of businesses, since the country remains – in most of aspects – below the EU average. 61% of Polish SMEs have at least a basic level of digital intensity, which is slightly below the EU average of 69%. Polish enterprises are taking advantage of the digital opportunities and are involved in online commerce, with 14% of SMEs selling online and 5% selling across borders to other Member States. Advanced technologies are slowly but steadily gaining popularity among Polish enterprises, with 19% using cloud computing services (EU average: 34%). 32% of Polish enterprises are using electronic information sharing (EU average: 38%). Nevertheless, only 18% of Polish enterprises actively use social media and 3% are integrating AI technologies into their operations. e-Invoices and big data are not yet widely used. This shows that Poland would have to make a significant effort to help achieve the 2030 Digital Decade target of at least 75% of enterprises taking up cloud services, big data or artificial intelligence (AI).

In 2022, integration of digital technology into businesses' activities has progressed steadily. The private sector has made the most effort, fuelled by the business opportunities and the natural evolution of the economy. However, various governmental bodies have also supported this drive using public funding, in particular from the EU funds. The remaining projects for R&D and innovation under the Smart Growth 2014-2020 Programme were implemented, and the Polish Agency for Enterprise Development (PARP) supported training and advice to managers of micro, small or medium-sized enterprises in adapting their human resources and innovation processes. In September 2022, the European Funds for a Modern Economy (*Fundusze Europejskie dla Nowej Gospodarki, FENG*) a cohesion policy instrument financing digital business, was approved by the European Commission. The projects are expected to be rolled out soon.

As in previous years, **authentication services were heavily used by the companies**, with some banks providing their customers with such services through the 'Trusted Profile' (*Profil Zaufany*), tool which makes it possible to log in to all online public services and securely sign official documents.

Regarding AI, after enacting the national strategy [*Policy for the development of artificial intelligence in Poland from 2020*](#) in December 2020, government agencies started to promote the goals, set out in the strategy. Poland also continued to support the development of digital technologies through EU-coordinated programmes. It is a member of the EuroHPC Joint Undertaking on high-performance computing and of the European Blockchain Partnership. In 2022, Poland also launched the European Blockchain Service Infrastructure (EBSI) node in NASK National Research Institute and has since been developing various parts of the system since. In February 2023 Poland confirmed its interest in an EDIC on Blockchain.

Eleven Polish European Digital Innovation Hubs (EDIHs), multi-country projects selected under the Digital Europe Programme with a total budget of EUR 23 million, will support the digital transformation of SMEs. Examples of concrete activities proposed by the EDIHs are 'test before investing, short-term advanced digital courses and training and network building events. The EDIHs are part of a European network of soon to be over 200 hubs covering all EU regions (plus Iceland, Norway, Lichtenstein, sectors and technologies).

The Digital Platform, a publicly accessible digital tool operated by the Future Industry Platform Foundation, integrates efforts all interested parties in the Polish 4.0 ecosystem. Poland is one of the 12 Member States participating in the Important Project of Common European Interest on Next Generation Cloud Infrastructure and Services (IPCEI-CIS), which forms part of the Multi-Country Project on a Common Data Infrastructure and Services. The IPCEI-CIS aims to equip the European Union with the next generation of advanced, distributed, secure, sustainable and innovative cloud-to-edge capabilities that citizens and businesses need. It will help boost the cloud services uptake by Polish enterprises, therefore helping achieve the Digital Decade's target for digital transformation of businesses.

With the RRF support, Poland will take part in a multi-country project on Cloud and Edge Computing, to develop joint capabilities in data processing with the participation of Polish businesses and other actors important for digital technology. Moreover, to help businesses become digitalised, the RRP envisages supporting 3 000 micro, small and medium-sized enterprises out of nearly 2 million with advice on digitalisation, remote training for staff and the purchase of licences and software to enable remote communication.

The requirements to make websites and mobile applications accessible were ensured a few years ago with the implementation of the relevant EU directives²⁰⁸. The private sector followed with an initiative called the Business Accessibility Forum that provides a platform for organizations to promote accessibility to all internet users. The members committed themselves to developing a common position for the business community in social consultations, and to carrying out public awareness actions.

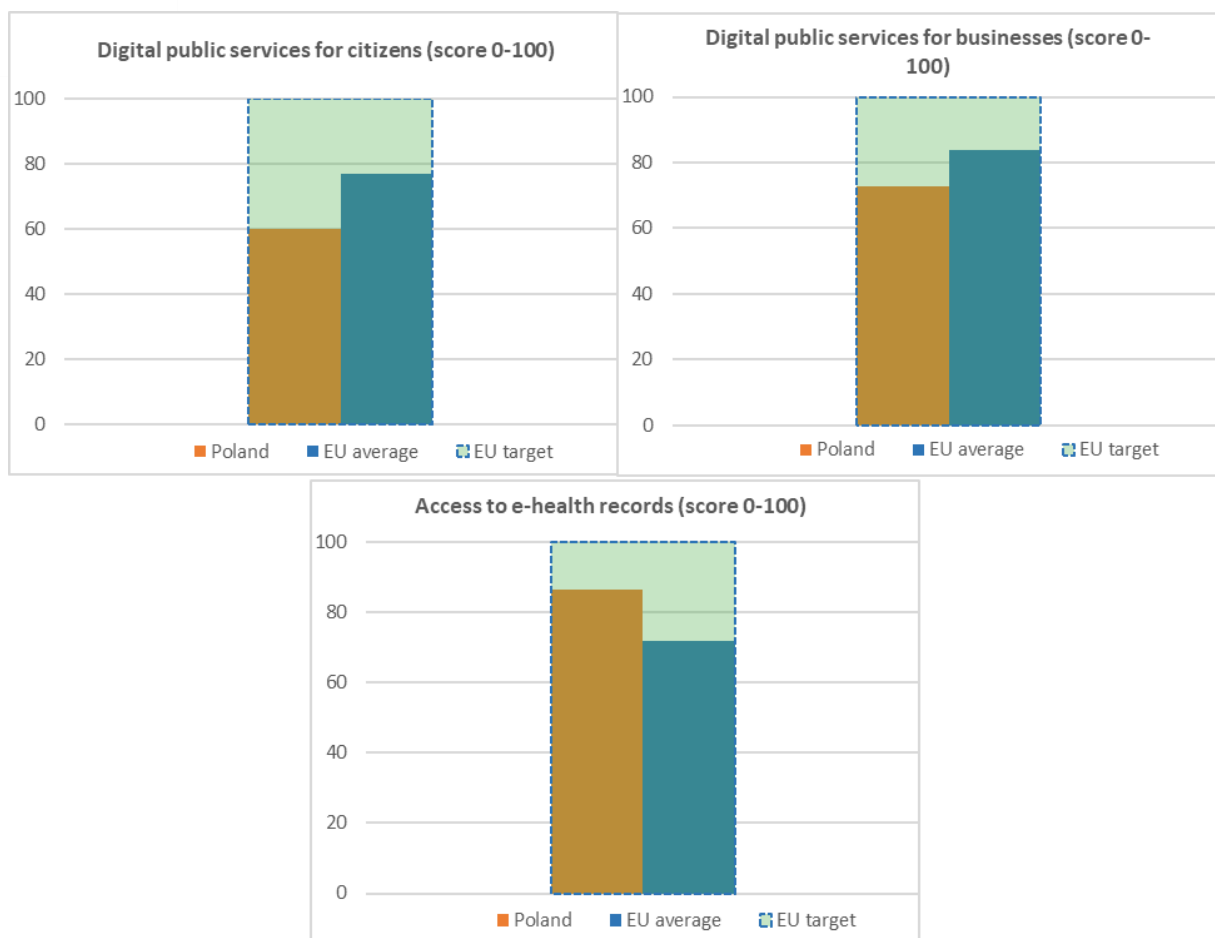
Poland should significantly step up its efforts in the area of digitalisation of businesses. In particular, Poland should facilitate access to advanced technologies including AI, big data and the cloud through sustained measures including improved access to training, incentives and knowledge

²⁰⁸ EU 2019/882 and EU 2016/2102.

transfer. It should also continue to support SMEs in their efforts to raise their uptake of advanced technologies and by encouraging start-up ecosystems.

4 Digitalisation of public services

	Poland			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	63% 2022	74% 2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	57 2021	60 2022	77 2022	100
4a3 Digital public services for businesses Score (0 to 100)	NA	70 2021	73 2022	84 2022	100
4a4 Pre-filled forms Score (0 to 100)	NA	74 2021	78 2022	68 2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	42 2021	57 2022	65 2022	
4a6 User support Score (0 to 100)	NA	60 2021	70 2022	84 2022	
4a7 Mobile friendliness Score (0 to 100)	NA	94 2021	93 2022	93 2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	86 2022	72 2022	100



Poland has room for improvement as far as the digitalisation of public services is concerned. In 2022, as much as 63% of internet users relied on e-Government services, below the EU average (74% in 2022). For the new target on e-health records access, Poland scores significantly better than EU average (86 against 72). On pre-filled forms, Poland also scores significantly above the EU average (78 against 68).

Thanks to the mObywatel app, Poland excels in mobile friendliness (93, same as the EU average) and performs well in the transparency of service delivery, design, and personal data. However, regarding the Digital Decade targets on availability of services, Poland is still underperforming in the availability of digital online services, scoring 60 on digital public services for citizens (EU average: 77) and 73 for businesses (EU average: 84), while the EU target for both indicators is set to 100 by 2030.

The flagship service provided by the government to the individuals is the mObywatel application. Launched in 2015, it acts as a digital wallet for documents (e.g. ID card, driver's licence or pensioner's card). Recently, it has been transformed into a digital assistant that allows to handle various official matters. It has gained in popularity, with the number of users hitting 2 million in December 2020, rising to 9.1 million by December 2022.

Following the Russian invasion of Ukraine in February 2022, the government also made the mObywatel app available on the [Diia.pl](https://diia.pl) service that allows Ukrainian citizens staying legally in Poland to confirm their identity in the whole EU. The service allows them to download personal data from a dedicated registry, as well as store it in an encrypted form on their mobile device and to present it to other actors to confirm their identity.

In the wake of the changes brought about by the COVID-19 pandemic, the use of e-government services also increased among businesses. To facilitate the move towards the digital sphere, a new version of the [Biznes.gov.pl](https://biznes.gov.pl) portal was launched in January 2022. The portal offers access to about 400 online services and over 1 000 descriptions of procedures. These services are widely used, in particular the authentication service 'Trusted Profile' (*Profil Zaufany*), which enables nearly 16.5 million people to identify and authenticate with a trusted signature in public online services, as well as enables them to sign documents.

The eID card is a secure tool containing certificates enabling electronic identification (an eID called personal profile) and the creation of an advanced electronic signature (called a personal signature). It may contain a qualified electronic signature from a trust service provider (chosen by the holder). Moreover, the ICAO application is also implemented in the ID card. Between March 2019 and December 2022, over 10 million eID cards were issued and more than 3.6 million people have activated the electronic layer in these cards and can use identification and authentication certificates and personal signatures.

The podatki.gov.pl portal allows legal and natural persons to declare their taxes online, obtain all necessary tax information and make an appointment with a tax office. In 2020 a new service called *e-Urząd Skarbowy* ([eTax Office](https://eTaxOffice.gov.pl)) was launched on the podatki.gov.pl portal, allowing all of the National Tax Administration' customers to handle their tax affairs quickly, easily and comprehensively, at any time and from any device. In 2022, there were almost 30 million logins to the *e-Urząd Skarbowy* portal with over 120 000 certificate requests made, of which around 90000 were processed automatically. A total of 11.27 million annual tax declarations were filed through the Your e-PIT service, accounting for 52.1% of all documents filed. Over a 2-year period, customer satisfaction after a visit to the offices increased reportedly from 78% to 92%, and the rate of dealing with cases during the first visit to the office increased from 77% to 86%.

In the **cloud domain**, the ZUCH system²⁰⁹, an IT tool available to both central and local public administration for searching, comparing, and purchasing cloud services has been operating over recent years, based on the 2019 Common State Information Infrastructure (WIIP) program. Expanding the programme, in the first quarter of 2023, a government cloud service (*Rządowa Chmura Obliczeniowa*²¹⁰, RChO) was launched. As part of RChO, cloud infrastructure services are available, allowing for key IT environments for the public administration to be built.

The government has announced it will set up a National Centre of Data Processing (*Krajowe Centrum Przetwarzania Danych*) that will ensure public services continue to be provided. It plans to build three standardised and energy-efficient data processing establishments connected by dedicated fibre links and powered by green energy. The government submitted a special bill about building this centre to the Polish parliament in April 2023.

In healthcare, the [Patient's Portal](https://portalpacjenta.gov.pl) provides increasingly more sophisticated services capitalising on the successful introduction of e-prescriptions in January 2020. Access to the patient's online account (*Internetowe Konto Pacjenta, IKP*) is enabled through the *mObywatel* and *mojeIKP* applications. Using the IKP, a patient can also authorise other people, including medical staff, to access their health data, submit a declaration of choice of their general practitioner, or apply for the Electronic Health Insurance Card. Recently, the prescription renewal system was rolled out.

The *mojeIKP* app, a mobile version of the IKP, is constantly being upgraded. The citizens can access their electronic health data, comprising identification and personal information, data on procedures

²⁰⁹ [System Zapewniania Usług Chmurowych - Gov.pl \(chmura.gov.pl\)](https://chmura.gov.pl)

²¹⁰ [ZUCH - Informacje \(chmura.gov.pl\)](https://chmura.gov.pl)

or operations and prescribed medicines. People can also view electronic results and reports, including medical images, updated e-Prescription, and the e-Dispensation information. The system emphasises the need for security as it requires citizens to authenticate themselves in the online portal and mobile app using a notified eID that complies with the eIDAS Regulation.

Until June 2023 more than 17.2 million patients have accessed their individual IKP. The app is also provided in Ukrainian and English, making it available to Ukraine's citizens.

Regarding objectives on cybersecurity, to improve the way it works and adjust it to the requirements set at the EU level, the government set out in 2020 to amend the National Cybersecurity System (*Krajowy System Cyberbezpieczeństwa*, KSC). However, the related legislative proposal has yet to be adopted.

The public sector was facing difficulties in attracting cybersecurity experts due to the wage levels offered in key public institutions. To address this problem, the Cybersecurity Fund was created, and in 2022 more than 3000 cybersecurity experts working for national institutions received additional remuneration to increase the attractiveness of the posts.

The government and some private companies also participate in the PWCyber - Cybersecurity Cooperation Programme, established in 2019. It is run in the form of a public-private partnership in order to step up cybersecurity for both public and private entities.

In 2022, the upgrade of the Safer Internet Centre started with an EU funded project worth EUR 1.6 million. The Centre is managed by NASK and the Empowering Children Foundation and runs several very practical programmes: (i) 'Saferinternet.pl', comprehensive awareness-raising activities children and young people aimed at promoting safer use of the internet and new technologies; (ii) a hotline helping provide assistance to young internet users, parents and professionals in cases of risks associated with internet use; and (iii) a Dyzurnet.pl hotline that received reports about illegal internet content, such as child abuse images, racism and xenophobia.

Digitalisation of public services has enabled them to be more user-friendly and easier to access, as evidenced by the mObywatel app. It can also pave the way for the digital transformation, provided that complementary rules are in place. Promoting the use and understanding of the benefits of these services would further increase demand. In this context, proper implementation of the EU cybersecurity rules is currently a pressing issue in Poland.

Best practice: Open data

Poland performs very well, when it comes to open data, both in terms of regulation and practical tools. In the 'Open Data Maturity 2022', it ranked third, scoring well above the average for Member States. The government's actions are guided by the [Data Opening Programme](#) for 2021-2027. The aim of the strategy is not only to increase the volume of valuable public data available for re-use but also to promote a proactive model of data sharing by the public sector, including local authorities, so that the useful information is available in the user-friendly formats directly on the Internet. It creates an environment in which various actors may use the data to deliver new products and services. The figures show the continuous efforts to increase the supply of data available on the [Dane.gov.pl](#) for re-use: there are currently 31 250 resources published, 298 data publishers and 502 application programming interfaces (APIs) registered.

Poland should step up its efforts to digitalise public services.



Digital Decade Country Report 2023

Portugal

Introduction

Portugal is expected to make a positive contribution to the collective efforts to achieve the EU's Digital Decade targets. Comprehensive policies and swift implementation can optimise Portugal's digitalisation efforts, enhance capabilities and incentivise technology adoption. The country has shown a strong performance in connectivity infrastructure both fixed and mobile. Portugal is focusing efforts on reskilling its workforce and investing in digital skills for the older population, on the understanding that investing in education and training across various demographics is vital. By continuing to invest in digital skills development and digital public services, Portugal can advance its digital competitiveness and positively contribute to the EU's Digital Decade goals.

In 2022, digital policies came within the Prime Minister's responsibility, and a new Secretary of State for Digitalisation and Administrative Modernisation was appointed. This measure reflects the government's awareness of the cross-cutting nature of digital transition for the government, where such policies were previously coordinated by the Minister for Economy and Digital Transition. An inter-ministerial Commission for Digitalisation was set up, consisting of secretaries of state from all ministries, chaired by the Secretary of State for Digitalisation and Administrative Modernisation.

Portugal is collaborating with other Member States in exploring the possibility to set up European Digital Infrastructure Consortia (EDICs) on: (i) establishing the European Cybersecurity Skills Academy; and (ii) establishing an Alliance for Language Technologies, to develop a common infrastructure in the field of natural language processing and to develop large multi-language models. Portugal is one of the Member States that have jointly submitted a formal application to set up the European Blockchain Partnership and the EDIC on European Blockchain Infrastructure, supporting EU-wide cross-border public services.

Digital in Portugal's Recovery and Resilience Plan (RRP)

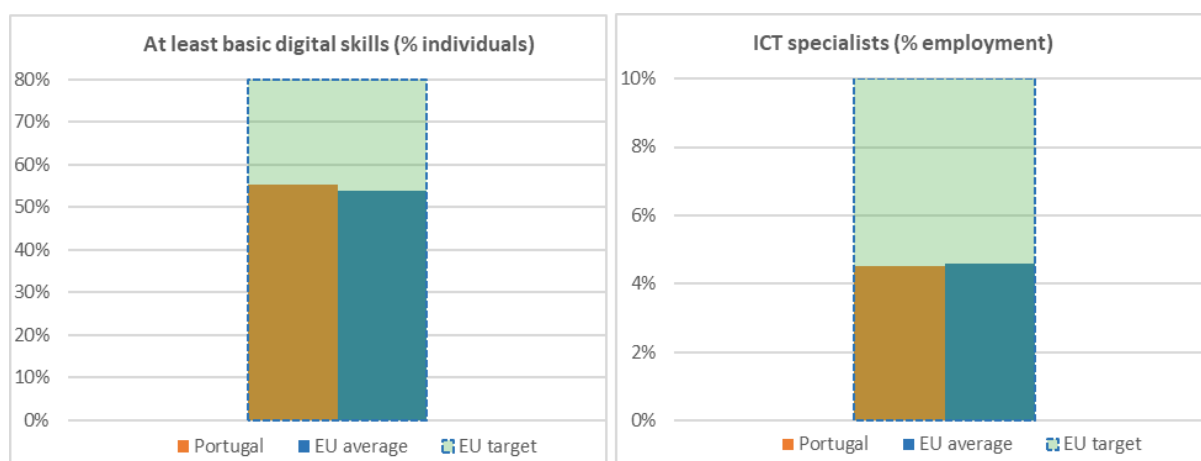
Portugal has allocated 22% i.e. EUR 3.6 billion of its digital expenditure in its RRP to prioritising digital skills, digital transformation in businesses and investments in public administration helping modernise public financial management. This allocation is expected to contribute to achieving the Digital Decade targets: EUR 816 million for basic digital skills, EUR 544 million to ICT specialists, EUR 1.3 billion to digital public services, EUR 360 million to e-health, EUR 213 million to unicorns and EUR 213 million for cloud, AI and big data²¹¹. In February 2023, Portugal received its second disbursement of EUR 1.8 billion for digital measures, including the new Secure Mobile Communications System providing secure voice, messaging and video communication for government employees. The [Portugal Digital Academy](#) and the Employment+Digital programme allow the public and businesses to assess their digital skills, get training plans and boost their digital skills. In December 2022, the government approved the national strategy for connectivity in Very High Capacity Electronic Communications Networks for 2023-2030. A [resolution](#) will make it possible to launch public tenders

²¹¹ Each Recovery and Resilience Plan must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plans had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or has no impact (0%) on digital objectives, using Annex VII of the RRF Regulation. Combining the coefficients with the cost estimates of each measure allows assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to allow for an estimation of the possible contribution of RRF measures to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice to potential ongoing revisions of the plan.

to install, manage and operate high capacity networks in 'white areas'. In addition, 17 digital innovation hubs support companies in adopting automation technologies. The country's legal framework for digitalising the public administration has come into effect, including provisions for information security and cybersecurity.

1 Digital skills

	Portugal			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	76%	80%	83%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	55%	55%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	29%	29%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	61%	61%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	23%	23%	24%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	3.9%	4.7%	4.5%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	2.3%	2.6%	2.5%	4.2%	
% graduates	2019	2020	2021	2021	



Portugal scores around EU averages in basic digital skills and ICT graduates. **The government views a high value in boosting the digital skills of the public and it's the country's workforce as a requisite for digital leadership.** Portugal's RRP reflects that importance, allocating almost EUR 816 million to digital skills (22% of its digital funding). A budget of EUR 1.41 billion is dedicated to investments in digital education for primary and secondary schools (EUR 559 million), public administration (EUR 86 million), vocational training (EUR 521 million), youth STEAM initiatives (EUR 130 m), and digital skills training for workers (EUR 100 m). A separate adult learning program worth EUR 14 m is also in place. Portugal's INCoDe.2030 programme is a major policy initiative for boosting the digital skills and qualifications of its population through customised trainings for various demographics. INCoDe.2030 focuses on five areas: i) training young people in digital skills, ii) professional training for adults, iii) digital technology training for the public, iv) higher-level training and v) production of new knowledge in disruptive technologies.

Portugal is advancing on basic digital skills, yet a quicker pace is needed to contribute significantly towards the Digital Decade target. Just over half of Portugal's population (55%) has at least basic

digital skills, while the share of those with above basic digital skills is 29%, slightly above EU averages of respectively 54% and 26%. The Portuguese with at least basic digital content creation skills account for 61%, trailing behind the EU average (66%). Given the stable trend over the years, Portugal is poised to contribute towards the 2030 EU target of at least 80% of the population having basic digital skills with gender convergence if it accelerates and scales up its efforts.

Portugal has implemented measures to boost the basic digital skills of adults. Digital competence is one of the core competences in the standard for adult education and training. At the basic level, digital competency covers information literacy, communication and citizenship, content creation, security and privacy. The national catalogue of qualifications incorporates digital literacy trainings for individuals aged 18+ who lack basic digital skills regardless of their employment status. The *Qualifica* programme uses the key competences standards for adult education and training at basic and upper-secondary levels, which include digital competence. Over 400 000 adults have already achieved full or partial qualification in digital competences through *Qualifica*, 56% of whom are adults with under upper-secondary education. In addition, the Digital skills certificate programme offers short and medium-term training on digital skills training to adults, enhancing increasing their employability. The strategy targets people with limited to no experience using the internet. Volunteers in training centres across Portugal offer online training free-of-charge on navigating the internet, using email and social media, and privacy and security standards. The training is approved by Estrutura de Missão Portugal Inovação Social and is funded by Social Impact Bonds. *Jovem+Digital/Young+Digital* trains unemployed young adults aged 18-35 in cybersecurity, e-commerce, data analysis, programming, UX/UI design and automation. When someone completes any short and medium-term course under this *Jovem+ Digital* programme they are awarded a certificate of qualifications for the specific course taken. However, only those who have gone through the entire programme will receive a digital skills certificate. Component 6 of the RRP aims to set up 225 local projects for basic qualifications, including digital competences for active adults aged 23+ without upper-secondary education, involving basic literacy, numeracy and digital skills. The *Qualifica Accelerator* aims to stimulate adult participation and certification through recognition, validation and certification of competences (RVCC). The goal is to reach 100 000 RVCC certifications by 2025.

Portugal is also improving digital education in schools. As part of its RRP, the Ministry of Education is involved in developing digital educational resources for all subjects on the curriculum. RRP component 20 focuses on installing 1 300 digital laboratories in basic and secondary schools. The main goal of the initiative is to boost skill development and promote STEAM subjects (Science, Technology, Engineering, Arts, and Mathematics). To bolster digital literacy among students under 18, Portugal has rolled out the School Digitisation Programme (2021 -2026). It aims to equip students and teachers with the tools and resources to enhance boost their digital skills by e.g. distributing of computers, increasing connectivity, and providing access to high-quality digital educational materials. The programme's total budget is EUR 687 million, derived from PT2020 and RRP sources, to be allocated until 2025.

The COVID-19 lockdowns highlighted the need for Portuguese teachers to boost their digital pedagogical skills. To address this, the Ministry of Education launched a national teachers' digital training plan with the support of the 91 national teacher training centres. The plan is organised according to DigCompEdu, and aims to integrate digital technologies into the teaching and learning processes. Over 90 000 public school teachers out of around 111 000 have completed their training.

Schools were also invited to prepare their own [action plans for digital development](#), based on the results of the SELFIE tool and DigComOrg. These plans aim to improve digital development at organisational, pedagogical and technological levels.

Beyond the RRP, the government is rolling out initiatives for the skilling, upskilling and reskilling of the workforce. To address the demand for digitally skilled workers in the business sector, the government introduced *the Employment+Digital* programme in collaboration with SMEs and social sector organisations. It encompasses four measures: i) *Training Employment +Digital* for customised digital skills courses for employees; ii) *More Digital Leader* offering advanced digital skills training for managers; iii) *More Digital training voucher* for individuals to acquire digital skills and qualifications; and iv) *More Digital Trainer* to increase the number of certified professional trainers. The programme's budget is financed by RRP's component 16 Companies 4.0. Training is tailored to companies' needs in priority sectors. The first phase trained 28 000 workers, while the second aims to train 200 000 with a budget of EUR 94 million.

Portugal is on a par with the EU average on ICT specialists in employment but has a lower percentage of ICT graduates (2.6% versus 3.9% for the EU) which has stagnated for the last 3 years. The low rates of ICT enrolment and graduates undermine the EU's prospects of reaching the Digital Decade target of 20 million ICT specialists by 2030.

Portugal is rolling out initiatives to address this shortcoming. Component 6 of its RRP is funding the creation of 365 specialised technological centres in public and public/private professional schools over the period 2022-2025, which will improve professional courses in IT, digital, renewable energies and manufacturing / industry 4.0, environmental efficiency and gender equality. However this measure does not cover Azores and Madeira. INCoDe.2030 aims to extend lifelong digital training for 72 000 professionals, train 3 000 unemployed people so they can pursue a career in ICT, and build the digital skills of 320 000 people through the platform *Academia Portugal Digital* by 2023. Portugal's indicators aim to have at least 5% and 7% employed ICT specialists, 25% and 30% of employed female ICT specialists, and 4% and 5% doctoral or equivalent level in ICT graduates by 2025 and 2030, respectively.

One of the goals of INCoDe.2030 is to strengthen the digital skills of civil servants with the aim of training professionals in cyber and information security by 2023. The C-Academy is an advanced training programme under the RRP. In collaboration with academia, it aims to train/retrain 9,800 cybersecurity specialists in businesses and public administration by Q1 2026. Courses will cover i) basic cybersecurity training for employees; ii) training of trainers; iii) training for implementation of controls in the National Cybersecurity Framework; iv) training for computer security response team or security operations centre specialists; and v) cybersecurity training for IT professionals. The target number is based on some 1 000 national entities e.g. operators of essential services, critical infrastructures operators and main public administration bodies with an estimate of 10 cybersecurity experts per entity (number of experts needed to perform cybersecurity tasks and processes in order to achieve high maturity in those type of entities).

The UPSKILL programme partners with IEFPP, CCISP, ISCTE, Algarve University and APDC to offer intensive specialised training in the digital area to 3 000 people so they can become ICT professionals by 2023.

Portugal's 18 sector councils for qualifications update qualification standards and vocational education and training (VET). They run as collaborative platforms gathering VET and labour representatives to design qualifications. No qualification is integrated in the National Catalogue of Qualifications without consulting the respective sector council, the one which focuses on electronics,

computers and telecommunications. Portugal's System for the Anticipation of Qualification Needs (SANQ) plays a vital role in managing skills development strategies. Its goal is to increase the quality of information for young people, job seekers, employers, teachers, trainers and policymakers when making decisions on skills investment. SANQ gathers data from skills anticipation exercises to inform policymaking on skills and plans the provision of education and training in the public and private sectors. A multistakeholder approach involving local communities, VET providers and employers determines SANQ's relevance.

Addressing the demand for digitally skilled workers in the business sector, Portugal introduced the Academia Portugal Digital platform (2022) to encourage people to learn digital skills and seek career opportunities via online courses. It is part of INCODE.2030 and is funded by RRP investment under Component 16. It runs until 2026.

Best practice: The UPSKILL programme

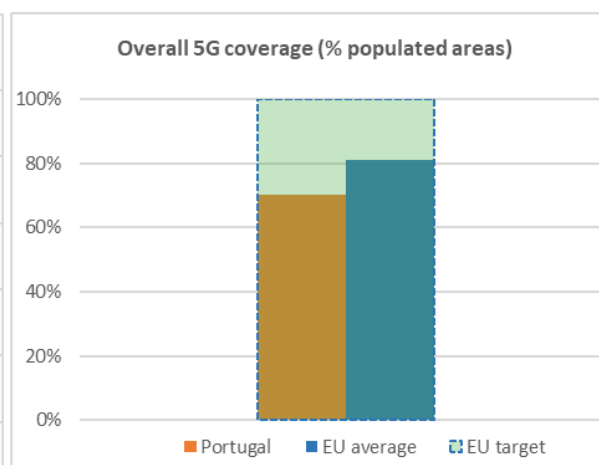
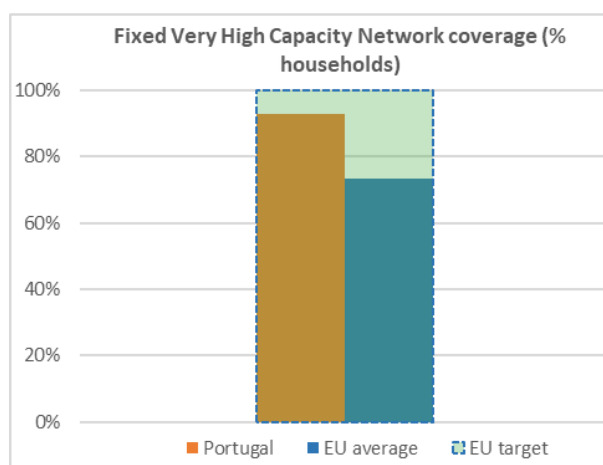
With rising demand for ICT talent in Portugal, unemployed professionals and employed people in jobs below their capabilities have the potential to pursue careers in ICT through reskilling/upskilling. UPSKILL is a requalification programme aiming to train 3 000 people by 2023 with a budget of EUR 25 million. As the low percentage of ICT graduates is perceived to be a national problem, UPSKILL was included in the action plan for the digital transition. It is a collaboration between the IEFP - Institute of Employment and Professional Training, ICT companies and higher education institutions (HEI), the latter two setting out the training needs and offer. The IEFP recruits the candidates, pays for their training and ensures that the HEIs receive funding. It offers 6 months theoretical training and 3 months of work practice. Trainees receive a monthly scholarship equal to the minimum wage. An innovative feature is ensuring that at least 80% of the trainees who complete the course are hired with a gross salary of at least EUR 1 200. Currently, 70 companies take part in the programme which entered its third stage in October 2022.

Portugal should accelerate its efforts in the area of digital skills. In particular, Portugal should accelerate the implementation of its digital skills programmes and reach a critical mass of people across all demographics. Portugal should encourage private sector investment in digital skills training and a culture of lifelong learning to adapt to evolving technologies and industry needs. Portugal should increase enrolments in ICT studies through targeted actions that ensure capacity, traceability, and evaluation, and provide funding, scholarships and incentives for ICT specialists²¹².

²¹² The recommended policies, measures, and actions in this document reflect the Commission Communication 'Report on the state of the Digital Decade' COM(2023) 570.

2 Digital infrastructures

	Portugal			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up	67%	73%	77%	55%	
% households	2020	2021	2022	2022	
2a2 At least 1 Gbps broadband take-up	1.4%	2.0%	4.5%	13.8%	
% households	2020	2021	2022	2022	
2a3 Fixed Very High Capacity Network (VHCN) coverage	87%	91%	93%	73%	100%
% households	2020	2021	2022	2022	
2a4 Fibre to the Premises (FTTP) coverage	82%	88%	91%	56%	
% households	2020	2021	2022	2022	
2b1 Mobile broadband take-up	72%	82%	82%	87%	
% individuals	2018	2021	2021	2021	
2b2 Overall 5G coverage	0%	0%	70%	81%	100%
% populated areas	2020	2021	2022	2022	
2b3 5G spectrum	8%	61%	61%	68%	
Assigned spectrum as a % of total harmonised 5G spectrum	2021	2022	2023	2023	



The successful coexistence of public and private investment, and the national regulatory authority's efforts to improve market competition mark Portugal's considerable progress on fixed very high capacity network (VHCN) and fibre to the premises (FTTP) coverage over the last few years, especially its ability to close the gap between urban and less populated areas.

Portugal is expected to make a positive contribution to the achievement of the Digital Decade goals for digital infrastructures. Portugal performs particularly well on fixed VHCN and FTTP coverage (93% and 91% respectively compared to the EU average of 73% and 56%) as well as at least 100 Mbps fixed broadband take-up (77%). However, take-up of at least 1 Gbps (4.5%) and mobile broadband take-up (82%) are below the EU average. On overall 5G coverage (70%) the country scores below the EU average (81%).

Portugal is currently implementing several measures that can help **increase the level of Gigabit and 5G network deployment**. In August 2022, Portugal adopted the law on electronic communications ([Law 16/2022 of 16 August](#)) that transposes [Directive \(EU\) 2018/1972](#) of the European Electronic Communications Code (EECC). This law updates Portugal's regulatory framework in the field with the aim of facilitating investments into the country's very high capacity network. In parallel, Portugal's national strategy for the decade and its strategic framework on national and EU funding under [Resolution of the Council of Ministers No. 98/2020](#) sets out the country's plans on deploying VHCN to households as well as to industrial, commercial and agricultural premises by 2030. In this context, a call for tenders on deployment, operations and maintenance of fixed VHCN in "white areas" will be launched by the end of Q2 2023.

Regarding 5G, in 2021, Portugal assigned two of the 5G pioneer bands i.e. the 700 MHz and 3.6 GHz bands as part of a multi-band [auction](#) that concluded in October of the that year. The "[5G Auction Regulation](#)" on allocating rights to use these frequency bands set out significant coverage obligations to incumbent operators, acquiring rights of use in the 700 MHz band. These include coverage for 95% of the population, 90% of the population in low density areas and in each parish of autonomous regions (Madeira and Azores). For new entrants the coverage obligations in Portugal by 2025 of certain road and rail infrastructures are only limited to 25% of highways, main railways and national roads. This Regulation also established network development obligations associated with the 3.6 GHz band. Those concern the installation of base stations in low-density municipalities and in those with over 50 000 inhabitants. New entrants acquiring any frequency in the auction are entitled to national roaming access for at least 10 years in the geographic areas where they would not have mobile coverage using the frequencies assigned to it (subject to coverage and time conditions). Portugal has launched two public consultations on the 26 GHz band so far (in 2018 together with other 5G bands, and in 2022), and the band has yet to be auctioned. On take-up, since late 2021, Portuguese mobile network operators have been offering their mobile subscribers free access to the 5G services. In 2022, Portugal's national regulator *Autoridade Nacional de Comunicações* (ANACOM) reviewed some prices for access to: i) [circuits](#) connecting the mainland and the autonomous regions of the Azores and Madeira (CAM circuits) as well as prices of circuits linking some islands in the Azores (inter-island circuits) over submarine cables owned by the operator with significant market power (SMP) MEO; and ii) [ducts and poles](#) i.e. Reference Duct Access Offer (RDAO) and the Reference Poles Access Offer (RPAO), laying down a monthly-fee reduction of around 35% and 20% respectively in particular to MEO's infrastructures. In July 2022, ANACOM introduced further [amendments](#) to MEO's RDAO and RPAO.

In 2021, Portugal also approved [Decree-Law 66/2021](#) that sets out a social tariff for broadband internet access services. That allows low-income consumers or people with special social needs to access broadband internet services (fixed or mobile, with 15Gb of data) at a lower price.

In November 2022, the national competition authority (Autoridade da Concorrência) was notified of a telecom operator's acquisition of another operator that controls a mobile virtual network and had acquired spectrum reserved for new entrants in the 3.6 GHz band. The national competition authority is still evaluating the merger.

Regarding the semiconductors target, Portugal is participating in the Important Project of Common European Interest (IPCEI) on Microelectronics and Communication Technologies ecosystem with associated participants (receiving aid below the GBER threshold).

With respect to the quantum target, Advanced Computing Portugal (ACP.2030) is a science and innovation strategy aligned with INCoDe.2030 and AI Portugal 2030, which aims to expand Portugal's supercomputing infrastructure by 2030. Activities include creating a supercomputing infrastructure for R&I, provide experts with advanced computing skills, and implement a public policy info-

structure. A milestone in this area was the inauguration of the Minho Advanced Computing Centre (MACC) in 2019, home to Portugal's first supercomputer, BOB. This machine is part of the Iberian Advanced Computing Network and marks Portugal's participation in the European High-Performance Computing initiative (EuroHPC). Deucalion, Portugal's second EuroHPC supercomputer will also be installed at MACC. The national HPC network and the DIH network will be introducing new cloud-to-edge market offers and promoting cloud computing.

Portugal leads DISCRETION, a multi-country project with Austria, Italy, and Spain using software-defined networks and quantum key distribution to address emerging threats and strengthen European defence in secure communication and military activities that rely on radio spectrum. Portugal is committed to the Euro QCI project, and is setting up a national ultra-secure quantum communications technology infrastructure covering mainland regions, Azores and Madeira, thereby expanding the EU network. The project brings the EU closer to its Digital Decade target of having its first computer with quantum acceleration and being at the forefront of quantum capabilities by 2030.

Portugal is well on track towards achieving the Digital Decade connectivity targets for 2030 and is expected to make a positive contribution to the collective efforts to achieve the Digital Decade targets on connectivity, especially in terms of VHCN by closing the gap between urban and less populated areas. However, the country is lagging on 5G coverage, mainly due to some delay in auctioning the 700 MHz and 3.6 GHz bands, and there is no estimated date for the auctioning of the 26 GHz band.

Best practice: replacement of the submarine cable system

The replacement of the submarine cable system connecting mainland Portugal, Azores and Madeira (CAM Ring) and the inclusion of the SMART (Science Monitoring and Reliable Telecommunications) component was decided by a Council of Ministers Resolution in November 2022. The CAM Ring will be among the first underwater electronic communication cable with SMART component. It involves placing sensors along the cable so underwater electronic communication systems will no longer be used exclusively for that purpose, making it possible to monitor environmental indicators (water temperature, level, salinity, etc.) and measure seismic activity. The specifications were developed by the LEA Consortium ('Listening to the Earth under the Atlantic') which included the Telecommunications Institute, Portuguese Institute of Sea and Atmosphere and Institute D. Luiz of FCUL. Recently, the LEA published "[Description and implementation of the 'Observer Part' of a SMART Cable](#)" to support the analysis and ordering of SMART Cable. Internationally, the [Joint Task Force on SMART cables](#) has been developing the SMART concept supported by UN agencies, the International Telecommunication Union, the World Meteorological Organization and the Intergovernmental Oceanographic Commission of UNESCO (IOC-UNESCO).

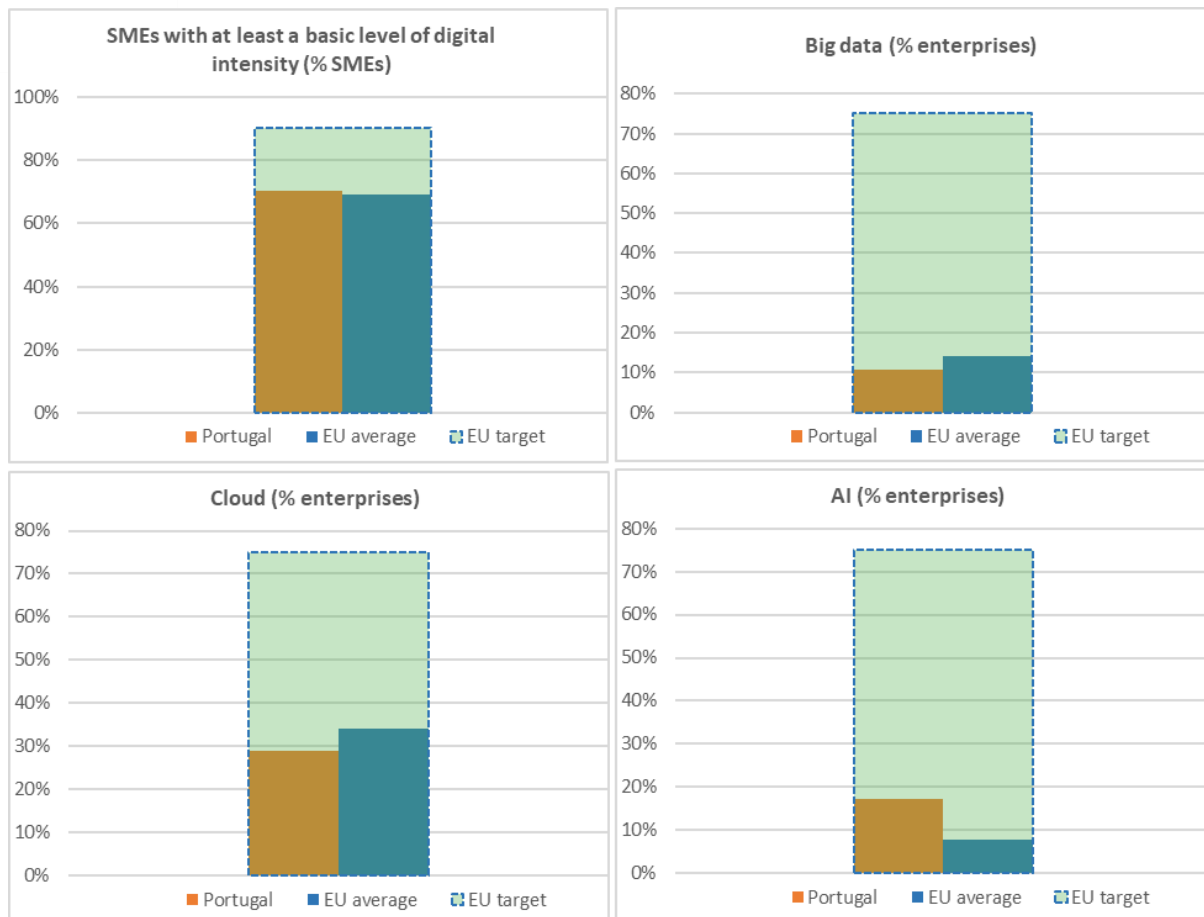
Portugal should continue its efforts on connectivity infrastructure, accelerating those supporting 5G coverage. In particular, Portugal should implement measures to grant access to network infrastructure, further simplify processes and harmonise local regulations to accelerate the deployment of gigabit connectivity.

Portugal's efforts in the area of semiconductors should be sustained in order to help the EU become a strong market player in these areas.

3 Digitalisation of businesses

	Portugal			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	70%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	42%	52%	52%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	16%	26%	26%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	11%	11%	11%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud²¹³	NA	29%	29%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	17%	17%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	17%	17%	17%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	19%	16%	18%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	16%	13%	13%	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	8%	8%	8%	9%	
% SMEs	2019	2021	2021	2021	

²¹³ Enterprises buying sophisticated or intermediate cloud computing services indicator, see [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).



Overall, Portugal is expected to make a positive contribution to the Digital Decade targets linked to the digitalisation of business. 70% of its SMEs have at least a basic level of digital intensity, surpassing the EU average of 69%. Enterprises using cloud and big data stand at 11% and 29% respectively, trailing the EU average of 14% and 34%. However, Portuguese businesses using AI account for 17%, more than twice the EU average.

Investing in knowledge-based capital and ICT equipment could encourage Portuguese SMEs to adopt digital technologies. SMEs dominate Portugal's business economy. They are concentrated in traditional sectors, most with fewer than 10 employees. Recent economic growth has improved SME activity and investment levels, but productivity remains a challenge in traditional sectors. Public support for SMEs includes financial instruments, tax incentives and qualification programmes to boost the skills of the workforce. Funding for digitalisation projects is limited for SMEs that lack sufficient collateral or own funds. Portugal has prioritised digitalisation with public initiatives and post-pandemic economic stimulus packages. Business associations and clusters promote digitalisation, good practice, and connect buyers and with sellers, while training and advising SMEs. A modest, yet growing start-up ecosystem has been encouraged through events like Web Summit and incubators, as well as venture capital financing with substantial public support. Currently Portugal counts only one unicorn, towards the Digital Decade target of doubling the number of unicorns.

The government's initiatives and financial tools to support SMEs across sectors include equity, debt and guarantees by public agencies, tax incentives (Sistema de Incentivos Fiscais à I&D Empresarial - SIFIDE) and qualification training by the Instituto do Emprego e Formação Profissional and the Agência para a Competitividade e Inovação. Portugal's RRP launched Indústria 4.0 – a comprehensive plan for digitalisation and innovation for the next 4 years.

Public programmes and funding have contributed to Portugal's digitalisation, but the landscape of resources can be complex to navigate. Different entities manage many programmes, addressing Indústria 4.0 objectives directly or indirectly. The main public agencies - SPGM, PME Investimentos, IFD and Portugal Ventures - also channel funding for innovation and digitalisation projects. Providers of digital solutions are fragmented across digital/start-up SMEs and competence/R&D centres associated with clusters and larger companies. These diverse resources and structures make it challenging for businesses to gain access to resources for digitalisation.

The Digital Commerce Districts programme aims to provide 50 districts with local digital infrastructure, targeting small businesses with a budget of EUR 52.5 million. Within its RRP, Portugal is implementing measures to boost enterprises' digital intensity: the testbeds national network, Digital Innovation Hubs (DIHs), a digital transition services catalogue, a digital maturity assessment tool and seal, proximity accelerators, vouchers for accelerators, internationalisation of commercial businesses, etc. The RRP allocates funds for companies to set up test beds under the national network initiative in order to experiment with innovative products and services through the infrastructure of entities that have capability in 5G, AI, big data and blockchain.

The DIH national network promotes digital transformation for companies and the public sector, with 16 of the 17 DIHs part of the European network. The DIH measure will fund 4 000 SMEs from the RRP. Based on sectoral and geographical coverage, its technological scope aligns with EU priorities in AI, high-performance computing (HPC), cybersecurity, cloud, big data and analytics. The goals include knowledge transfer, strengthening technological capacity, the entrepreneurial ecosystem and new technologies with the Free Zones for technology and the national test beds network. The DIH network could also be a vehicle for adoption of digital maturity seals in the field of cybersecurity, privacy, data protection and accessibility. Funded by the RRP, the programme is run by the Portuguese Institute of Accreditation, the Institute of Quality and the Imprensa Nacional Casa da Moeda, and is monitored by the Portugal Digital Mission Structure. The initiative aims to issue 15 000 seals by 2025 with a budget of EUR 30 million. The Portugal Digital Mission Structure launched the digital maturity assessment tool for companies to self-assess their strategy and innovation, cybersecurity, information management and operations. The online catalogue for digital transition services allows enterprises to access service packages, and service providers can gain accreditation. The platform implements measures from the RRP's Component 16, including support for enterprises to increase their digital maturity with programmes like Digital Commerce Accelerators, Coaching 4.0 and certification seals.

Under the RRP, the e-commerce internationalisation measure supports SMEs that are new exporters in training and consulting through a programme for market diversification and international exposure through digital channels. Its total budget is EUR 25 million.

Vouchers for incubators/accelerators aim to support start-ups less than 10 years old and SMEs certified by the Instituto de Apoio às Pequenas e Médias Empresas e à Inovação (IAPMEI) looking to develop digital business models through open data or AI, and highly qualified human resources, R&D, incubation, acceleration or consulting. Commercial micro-enterprises and SMEs will receive support for their digital transition from 25 proximity accelerators. Financial incentives for digital business models are part of the initiative funded through the RRP, with a total allocation of EUR 20 million and a voucher per accelerator/incubator worth between EUR 30 000 and EUR 150 000. In parallel, the Start-up Vouchers programme, also funded by the RRP with EUR 90 million, will give out a maximum of EUR 30 000 per start-up that deploys digital and green innovative solutions.

To promote entrepreneurship, a bill that entered into force in May 2023 establishes a competitive regime for start-ups, scale-ups and disruptive tech companies through a legal framework of tax

benefits and incentives. Start-up Portugal will lead the entrepreneurship agenda and roll out actions to support the ecosystem as part of the RRP.

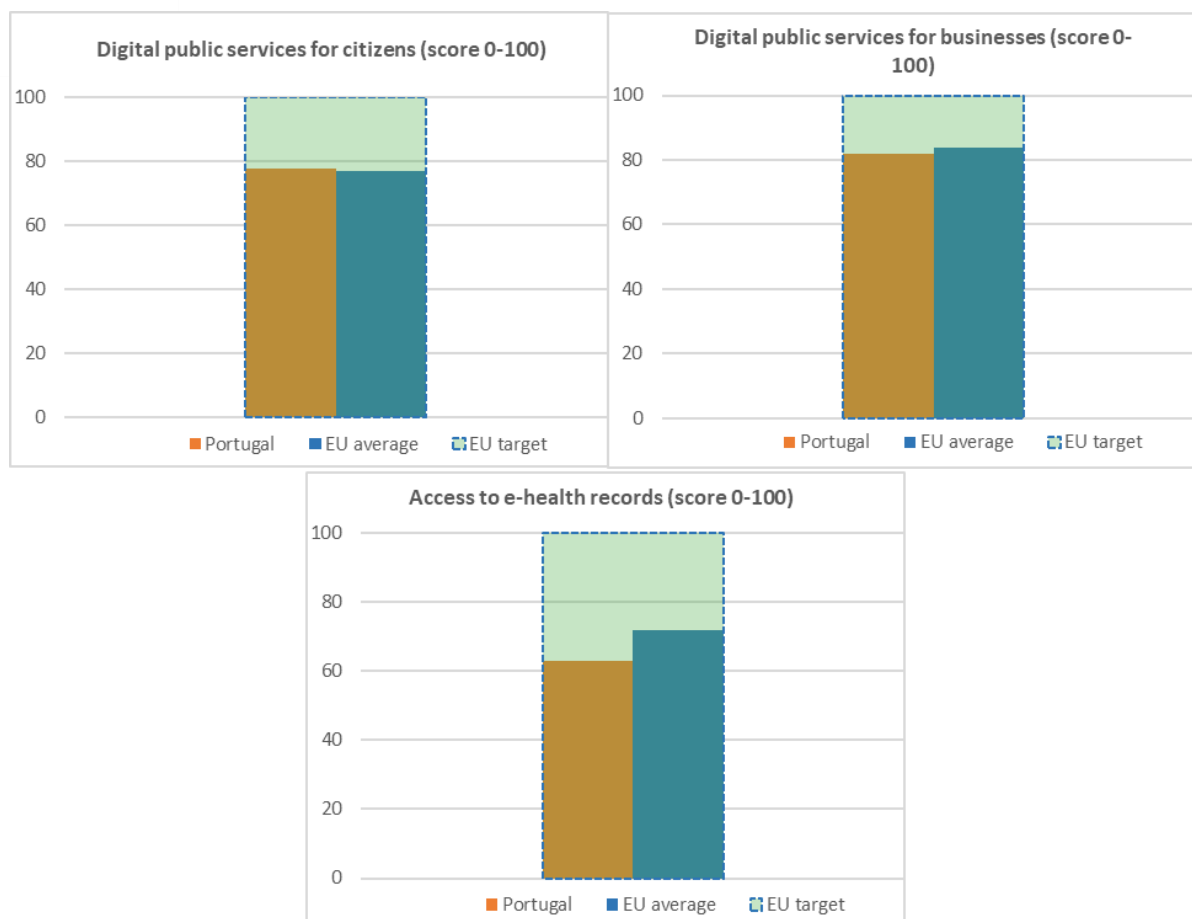
Best practice: Portugal's national Test Beds Network

The Test Beds Network of 30 test beds plans to develop of 2 711 pilot products by the end of 2025. It has a budget of EUR 150 million funded by RRP. Test beds are infrastructures where SMEs and start-ups test new products and services in a physical space with a strong digital element or a virtual simulator. They aim to increase the number of commercial products, shortening their innovation cycle and helping them cross the 'valley of death'. The measure is aligned with the European Testing and Experimentation Facilities co-financed by the Digital Europe Programme, complementing other measures like DIHs and the Technological Free Zones. Portuguese enterprises and its public administration will be able to access advanced digital competencies, specialised training, advice on funding for digital transition, as well as collaborate with SMEs, larger companies and entities in the R&I system.

Portugal should accelerate its efforts in the area of digitalisation of businesses. In particular, Portugal should simplify its application processes for public financing by using consistent eligibility criteria. Portugal should support the use of cloud computing while ensuring data privacy and security protection. Portugal should encourage the development of DIHs in particular by integrating them into the national framework for SME digitalisation, and encouraging collaboration between DIHs, businesses and other stakeholders.

4 Digitalisation of public services

	Portugal			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	81% 2022	74% 2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	79 2021	78 2022	77 2022	100
4a3 Digital public services for businesses Score (0 to 100)	NA	82 2021	82 2022	84 2022	100
4a4 Pre-filled forms Score (0 to 100)	NA	76 2021	81 2022	68 2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	70 2021	71 2022	65 2022	
4a6 User support Score (0 to 100)	NA	88 2021	88 2022	84 2022	
4a7 Mobile friendliness Score (0 to 100)	NA	88 2021	90 2022	93 2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	63 2022	72 2022	100



Portugal is expected to make a positive contribution to the collective efforts to achieve the Digital Decade goals for the digitalisation of public services.. Online services for individuals account for 78%, while those for businesses are 82% against **the Digital Decade target of providing key public services that are 100% online**. In Portugal, e-government users make up 81% of the population. The country has made digitalising public services a centrepiece of its administrative modernisation by reducing the administrative burden and using ICT to deliver better public service. A politically-empowered governance structure and a [central digital modernisation agency](#) with strong implementation capabilities has yielded profound transformations in public administration operations and service design sustained across governments and time. Portugal has pioneered people-driven digital solutions, redesigning service delivery rather than digitising outdated processes, tailoring services to people's lives and realities and reducing bureaucracy. The [e-Portugal platform](#) (2019) organises services around life events, not the structure of the public administration.

Portugal's investment in digital infrastructure focused on cross-government digital enablers such as digital identity and interoperability platforms. Strategic initiatives like the [SIMPLEX](#) programme for administrative simplification (2006), with 21 measures in 2022, have maintained it's the country's progress. The [Digital Transition Action Plan](#)²¹⁴ has simplified procedures for critical public services in health and justice. In parallel, the [national strategy for the digital transformation of public administration](#) extends the scope of the Interoperability Platform of the public sector (iAP) through seamless services and the once-only principle, implementing document interoperability across the

²¹⁴ Official Gazette publication on 21.04.2020

public sector, and integrating base registries into iAP. Four enablers have been critical in reaching the strategy goals: i) common technical, government-wide solutions i.e. digital identity, the mobile key and the interoperability platform as the foundations of digital services; ii) supporting strategies i.e. the Open Government strategy, the National Cyberspace Security strategy and sectoral strategies in the judicial and health sectors; iii) integrating new technologies such as AI, big data and data analytics into the public administration; and iv) developing human capital.

Flagship initiatives include: i) the Citizen Card – the national ID card entailing both physical and digital documents; ii) the Digital Mobile Key (DMK) - an authentication mechanism using a mobile phone; iii) Zero Licensing – a service simplifying the process for issuing certain business licenses; iv) medical e-prescriptions enabling digitised medical prescriptions; v) e-Portugal – a digital single access point for all public services; vi) the Citizen Shops, the Citizen Spots and the Business Spots for face-to-face public services; vii) interoperability platform providing shared tools for interconnecting systems; viii) the SIMPLEX programme for simplifying public administration following a citizen-driven approach involving participation and service co-creation; ix) LabX – the government laboratory for experimenting with innovation in the public sector; and x) AMA Academy – a programme for civil servants to develop digital skills. Both the Digital Mobile Key and the Citizen Card are eIDAS-compliant with a 'high' level of assurance.

Portugal is positively contributing and moving steadily towards the Digital Decade target of 100% of EU citizens having access to secure means of electronic identification (eID) that are recognised throughout the EU, enabling them to have full control over identity transactions and shared personal data. Making eID a priority has yielded positive outcomes such as Portugal's implementation of digital identification mechanisms and their adoption by the public, businesses and the public administration. The strategy for the digital transformation of public administration for 2021-2026 aims to increase the public services that require authentication through the national eID system. This goal is part of the national RRP, which guarantees sufficient funding. It brings together all national electronic authentication and signature solutions with a common Application Programming Interface for service providers, enabling secure identification on both public and private sector portals and applications. Since January 2023, users can activate the DMK using video calling and biometrics. In addition, users with an active DMK can use biometrics on their mobile devices to sign documents and authenticate themselves in over 300+ public and private websites integrated with the DMK. ID.gov.pt is the official app for accessing and sharing digital versions of personal ID documents.

Yet, while the eID Citizen Card is mandatory, it can be challenging to use for some, particularly older people, people with disabilities or people living in remote areas.

Initiatives are underway to streamline processes and provide more convenience targeting different end-users. These have added new features like mobile eSignatures, which have been swiftly integrated into digital public services by government sectors, and adopted by the private sector, including banking and utilities. Other actions include centralising energy purchases for the public administration in a secure, dematerialised way, and automating the Firms and Denominations Exchange. Professionals can register authentic acts and authenticate private documents and remote recognitions through a dedicated platform. Primary healthcare units have expanded their capabilities with interactive voice response, allowing faster, more efficient interaction.

Portugal and 20 other countries are members of the POTENTIAL European consortium funded by the Digital Europe programme to test the European digital identity wallets, which are to be launched in conjunction with the revision of the eIDAS Regulation. Running from June 2023 to May 2025, the project has a budget of EUR 62 million, EUR 17 million of which is EU co-funding. It will pilot cases like online authentication, opening online bank accounts, ePrescriptions, mobile driving licences, eSignatures and SIM registration.

The tax authority is simplifying online tax-filing and improving the user interface of the tax portal. The country has also been modernising its public procurement through mandatory e-invoicing since 2020. The private sector is encouraged to adopt e-invoicing voluntarily. Paperless invoicing is becoming common as people can receive digital invoices for purchases in supermarkets, pharmacies, restaurants, etc. that use adherent billing systems. Funded by the RRP²¹⁵, the Paperless Invoices Platform (December 2022) aims to reach 250 000 users and issue 700 million electronic invoices by the end of 2025.

The Plataforma de Atendimento à Distância (Remote Service Platform) of April 2022²¹⁶ provided by the Ministry of Justice, allows people to carry out formal acts online such as real estate purchases and mutual consent divorce without having to meet in-person. These acts carry the same legal weight as in-person acts. Pension requests can be made online with related activities being fully dematerialised. Justice LAB is an innovation and education programme (2022) for civil servants in justice bodies to provide efficient, people-centred services. The online Justice Practical Guide Tool (2023) provides simple access to justice-related information, drawing on data from public administration portals. The [Justice Govtech Strategy](#) (2023) brings justice organisations closer to the entrepreneurship ecosystem. It aims to expedite the sector's digital transformation and create a culture of innovation addressing issues such as authentication, new business models, automation and data exploration. The Portuguese RRP²¹⁷ also aims to transform social security services through digitalisation using cloud-based IT infrastructure. The plan includes the implementation of an innovative omnichannel model integrating public, business and social security service interactions into the cloud.

Portugal's public health services have untapped digital potential and aim to ensure 100% of people can access their electronic health records in line with the Digital Decade goal. Ranking 21st in the EU for online access to electronic health records (scoring 63 against EU average of 72), Portugal's Serviço Nacional de Saúde 24 – SNS 24 allows 80-100% of people in Portugal to access their health records via web, app, telephone and physical counters using eID authentication. It provides electronic patient data, ePrescription and eDispensation information, but not test results and reports e.g. laboratory tests, medical images, and hospital discharge reports. It only collects data from public healthcare providers, not private ones or public rehabilitation centres, geriatric nursing homes and mental health facilities. Portugal's efforts in expanding online accessibility to public health services align with the Digital Decade target. To support this goal, Portugal participates in several multi-country projects for electronic health record services, which aim to establish a common framework for medical imaging, lab results, hospital reports and cross-border ePrescription/eDispensation. They work to improve the exchange of health information between Member States and develop a mobile app for Europeans to access their patient summary through MyHealth@EU in different languages.

Portugal is well positioned to make a positive contribution to achieve the Digital Decade targets on the digitalisation of public services. Its digital journey shows that modernising the government requires transforming government practices, reimagining the relationship between the public and public institutions. Implementing robust data protection and cybersecurity measures to safeguard sensitive information collected from people is essential to boost take-up. Clear guidelines for using

²¹⁵ C16-i03: Catalysing the digital transition of enterprises for EUR 10 million

²¹⁶ Decree-Law No 126/2021

²¹⁷ TD-C17-i03

digital public services, and ensuring that people know how their data are used will strengthen trust in the system.

Best practice: MOSAICO

[MOSAICO](#) is a common model for designing and developing digital public services. It comprises essential principles for the evolution of public services, promoting coherence and consistency in people's and businesses' relationship with the state. The dedicated [webportal](#) provides information and documentation of technical architectures of the public administration platforms e.g. digital identity (authentication, signature, certification of attributes), open data portal, interoperability platform, catalogue of entities and services, electronic notifications system, ePortugal (single digital gateway for public services).

Portugal should accelerate its efforts to digitalise public services. In particular, it should continue the outreach to inform the public about the advantages of eID, improve the eID application process, and develop user-friendly interfaces.



Digital Decade Country Report 2023

Romania

Introduction

A number of measures are starting to be implemented in Romania, partly under the Recovery and Resilience Plan (RRP). These touch on most dimensions of digital transformation, notably e-Government and human capital, but also digitalisation of businesses. If well implemented, these measures will over time generate concrete results for citizens and businesses and bring significant benefits to the economy. While Romania's economy continues to grow fast and catch up with the EU average, there is still significant untapped potential in terms of reaping the benefits of digital transformation.

Romania has scope to improve its performance in the digital transition and to contribute to the collective efforts to achieve the EU's Digital Decade targets. Notable exceptions are fixed connectivity, especially Fibre-to-the-Premises (FTTP), where Romania performs best in the EU, and is still progressing rapidly, and the very high relative number of ICT graduates, with a high share of female ICT specialists, where Romania could make an important contribution to EU's Digital Decade targets.

There is also progress on digital public services, where Romania's scores are still below the EU respective averages, and important planned measures are still to deliver results. Romania is catching up with the EU average on certain business digitalisation indicators. On the other hand, Romania continues to perform poorly on digital basic skills and 5G coverage.

A few developments are worth noting as relevant **contributions towards the objectives of the Digital Decade Policy Programme.**

Law No. 232/2022 regarding the accessibility requirements applicable to products and services, transposing the Accessibility Directive 2019/882, is a step towards making the online participation of persons with disabilities possible. A National Strategy on the Rights of Persons with Disabilities, entitled "A Fair Romania", which covers digital products and services, also entered into force with the approval of Government Decision No. 490/2022.

Romania adopted last year, in the context of its RRP implementation, a **Cyber Security Strategy**, for the period 2022- 2027, as well as an Action Plan to implement it. The Law on cybersecurity and defence of Romania was adopted by the Romanian Parliament on 21 December 2022. Further cybersecurity investments are planned, either under the RRP, or under operational programmes co-funded by ERDF, to ensure cyber protection for both public ICT infrastructure and private infrastructure with critical importance for national security and to improve the cybersecurity skills and capabilities in public and private entities.

Finally, as an example of a digital investment for sustainability, the Romanian RRP finances an innovative digital system to combat illegal logging, a problem that Romania has long been struggling with. The investment covers an integrated IT system deployed over a surface of approximately 70 000 km²).

During the reporting period the Ministry of Research, Innovation and Digitalisation has been reorganised and now incorporates the Authority for the Digitalisation of Romania, previously under the Prime Minister's office. In the absence of an updated comprehensive digital strategy aligned with the Digital Decade targets, the upcoming national Digital Decade roadmap could be an important tool to monitor Romania's progress in digital.

Digital in Romania's Recovery and Resilience Plan (RRP)

Romania's Recovery and Resilience Plan contributes with EUR 5.97 billion (i.e. 20.5% of Romania's total allocation) to the country's digital transformation. Of this, EUR 4.98 billion is estimated to contribute to the Digital Decade targets²¹⁸.

Component 7, worth EUR 1.81 billion, focuses on the digital transformation of the public sector, cybersecurity and connectivity. Reforms such as the 5G security law, the 5G auction and the adoption of the government cloud and interoperability laws are included there. Other relevant measures are in component 4 (digitalisation of transport), component 8 (digitalisation of the tax and pension authorities), component 9 (support for the digitalisation of businesses and for digital R&D), and component 15 (digitalisation of education).

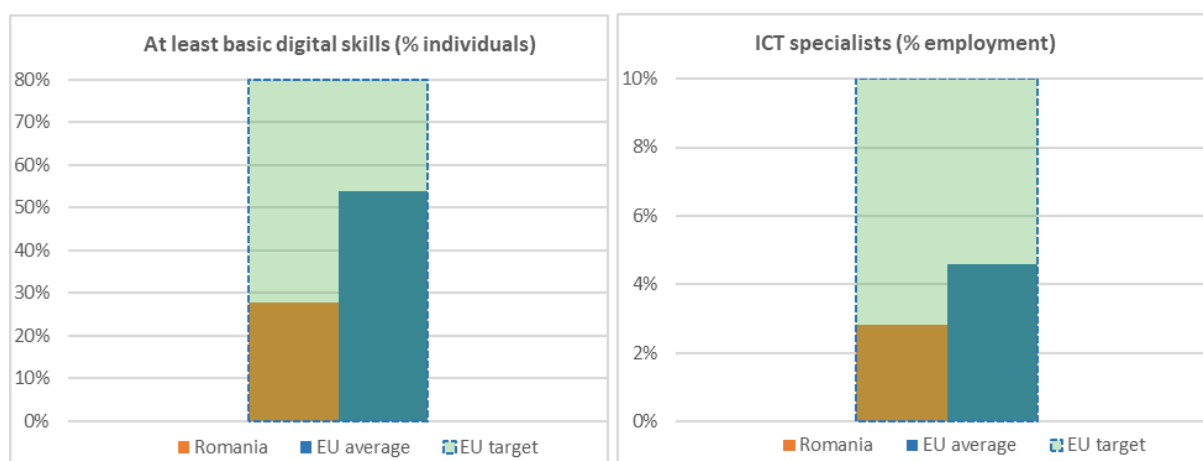
A first payment of EUR 2.6 billion was disbursed to Romania in October 2022, based on the fulfilment of 21 milestones and targets linked to the first instalment. These cover also reforms contributing to the digital transition, in particular, the set up of the Task force for digitalisation, the adoption of the 5G security law and of cybersecurity strategy. The second payment request, with a positive preliminary assessment adopted by the Commission on 27 June²¹⁹, covers important deliveries for digital transformation, including the 5G auction, key reforms relevant for the development of a governmental cloud and measures for the digitalisation of education.

²¹⁸ Each Recovery and Resilience Plan must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plan had to specify and justify to what extent each measure contributes fully (100%) or partly (40%) to digital objectives, using Annex VII of the RRF Regulation. Combining coefficients with the cost estimated of each measure allows assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a qualitative assessment of the data took place to allow for an estimation of the possible contribution of the plan to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice to potential ongoing revisions of the plan.

²¹⁹ [C_2023_4438_1_EN_annexe.pdf \(europa.eu\)](#)

1 Digital skills

	Romania			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	76%	82%	84%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	28%	28%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	9%	9%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	41%	41%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	6%	6%	9%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	2.4%	2.6%	2.8%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	6.3%	6.7%	6.9%	4.2%	
% graduates	2019	2020	2021	2021	



Romania is carrying out several measures in the area of digital skills, but it remains well below the EU average in terms of current results, which represents a risk for the collective achievement of EU's targets.

Only 28% of people have at least basic digital skills, below the EU average of 54% and the EU target of 80%. The gap with the EU average is equally big when it comes to women with at least basic digital skills (26% compared with 52% at EU level). Moreover, only 9% of individuals have above basic digital skills compared with the EU average of 26%. **When compared to EU 2030 targets, these results suggest that Romanian authorities and all the stakeholders involved will need to make significant efforts to narrow these gaps.** Furthermore, a significant change of pace would lead to productivity gains, to a more widespread use of technology across the economy and to higher take-up of public services by citizens.

During the reporting year, several significant measures aimed at developing digital skills have been implemented, including reforms and investments under the Recovery and Resilience Facility (RRF),

projects co-funded by the European Regional Development Fund (ERDF) and by the European Social Fund (ESF). Romania's RRP contribution towards raising basic skills levels is estimated at EUR 760 million, while its contribution towards achieving the ICT specialists target is estimated at EUR 507 million²²⁰.

A new legislative framework for digitalising education was established in 2022. Notably, Minister's Order no. 4150/29.06.2022 set out the digital skills profile for the professionals in education, as well as the mechanism for validating teachers' digital skills in school exams, in line with the European Digital Competence Framework for Educators. Digital education and media skills has been introduced as a new subject for upper secondary education students, starting with academic year 2022/2023, via Order no. 4800/2022. Further Minister's Orders were adopted with the aim of i) improving the continuous training of teachers in pre-university education, the quality assurance of the teachers' professional development programmes, and education, and ii) including a digital component in the vocational and training standards, etc.

Furthermore, various grant schemes, supporting digital skills directly or indirectly, through the provision of infrastructure and equipment, were launched during the reporting year. According to the Romanian authorities, calls for proposals, launched under the RRP during the reporting year, aim at upskilling and reskilling the employees of 2 000 SMEs, and developing the professional and digital skills of students and of teaching and research staff.

Another project aimed at increasing the digital skills of the general public, launched in 2022, involves turning libraries into hubs for developing digital skills in local communities. It aims to provide computer and technical equipment to 1 030 libraries, train 1 100 librarians and 100 000 community members served by applicant libraries.

As regards infrastructure and equipment, a call was launched to establish 10 regional consortia that would develop campus infrastructure for dual education, covering European Qualifications Framework levels 3-8, adapted to the profiles of the high schools and technological higher education institutions. Another one aims at the provision of digital equipment and technological resources for high schools and the creation of at least 1 100 Smart Labs, to support all curriculum areas to develop advanced digital skills. Another call is aimed at providing digital equipment and technological resources for high schools and creating at least 1 100 smart labs to develop advanced digital skills in all curriculum areas.

The country has a low share of ICT specialists: 2.8% of total employment, remaining below the EU average (4.6%), while the share of ICT graduates of 6.9% puts Romania among the EU's leaders. The discrepancy is explained to a large extent by the difficulty in retaining talent in Romania. Romania's performance is well advanced as regards women in the digital sector: female ICT specialists represent 25.2% of ICT specialists, against an EU average of 18.9%. Romania's performance in ICT graduates has positive implications for EU's collective efforts to reach the Digital Decade target of 20 million ICT specialists, with an increased gender convergence.

Further measures targeted specifically at increasing the number of ICT specialists include a legislative measure modifying and completing the list of occupations within the national economy, which now lists highly specialist ICT professions (blockchain technology architects, digital game designers and developers, complex data engineer etc.) as well as various measures to increase the attractiveness of

²²⁰ As estimated by the Joint Research Centre (Papazoglou M., Torrecillas J., Cardona M., Calza E., Vázquez-Prada Baillet M., Righi R., *Mapping EU level funding instruments to Digital Decade targets. Application to main digital instruments in 2014-2027*, López Cobo, M. and De Prato, G. editors, Publications Office of the European Union, Luxembourg, 2023, JRC134647, <https://publications.jrc.ec.europa.eu/repository/handle/JRC134647>

participating in ICT university degree programmes, including the approval of four new ICT specialisations for 2022-2023 academic year.

The private sector involvement in policies aimed at the development of digital skills is still at an early stage but increasing. In terms of purely private initiatives, only 9% of enterprises provide ICT training to their employees, well below the EU average of 22%, although this percentage increased significantly over the past year.

Romania also participated in Code Week 2022, a public-private initiative providing support to increase basic digital skills across Member States. With 2 297 activities organised, most of them (93%) organised in schools, Romania ranked 5th among all participating countries. The activities attracted 79469 participants, 45% of whom were girls. Reinforced action in skills will also generate higher scores for adoption and use of digital technologies and very high capacity networks but will also lead on the long term to high labour force productivity and a more innovative economy.

Best practice: CRED and PROF

In the context of the COVID-19 pandemic, the existing **CRED** project started to support teachers with specific training modules for digital skills improvement (56 615 teachers participated up to April 2023, amounting to 48% of the total number of teachers in primary and secondary education) and with a large-scale continuous training programme for teachers "Digital educational resources: creation, use, and evaluation". Up to present, around 3900 teachers have completed this course and around 8 700 open educational resources have been made available. The training portal had over 2.4 million pages viewed during the last year and over 90 million pages viewed since its launch.

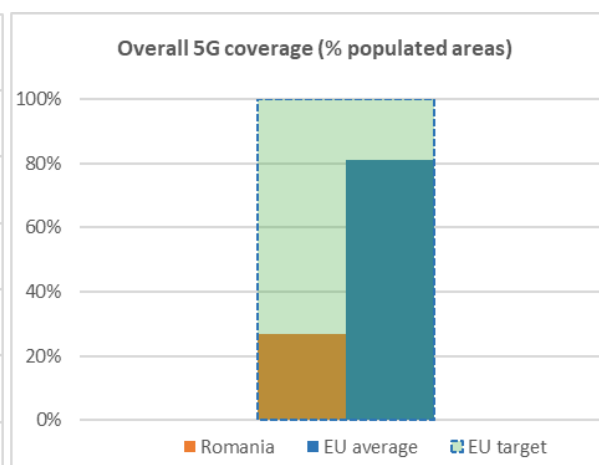
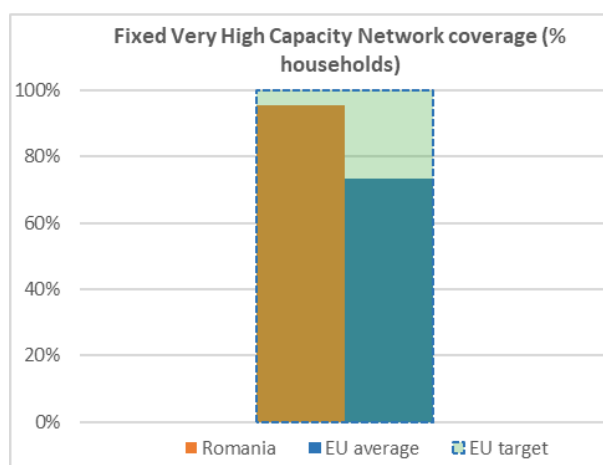
Based on the cooperation between 4 universities and 11 Teachers Resources Centres, the **PROF** project develops interventions for the teachers career mentoring, which include an significant component of digital education: training programs in mentoring and digital skills (2 846 teachers-mentors trained up to December 2022), continuous training of 25 000 teachers by the end of December 2023, by using the e-Prof IT platform and the training programmes for school managers and teachers.

Romania should significantly step up its efforts in the area of digital skills. In particular, Romania should further involve private stakeholders in the development and delivery of policies for digital skills. Romania should also pay special attention to reinforcing efforts for upskilling and reskilling, as well as to the attraction and retention of ICT specialists²²¹.

²²¹ The recommended policies, measures, and actions in this document reflect the Commission Communication 'Report on the state of the Digital Decade' COM(2023) 570.

2 Digital infrastructures

	Romania			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up	68%	76%	81%	55%	
% households	2020	2021	2022	2022	
2a2 At least 1 Gbps broadband take-up	8.5%	18.3%	23.3%	13.8%	
% households	2020	2021	2022	2022	
2a3 Fixed Very High Capacity Network (VHCN) coverage	76%	87%	96%	73%	100%
% households	2020	2021	2022	2022	
2a4 Fibre to the Premises (FTTP) coverage	76%	87%	96%	56%	
% households	2020	2021	2022	2022	
2b1 Mobile broadband take-up	65%	82%	82%	87%	
% individuals	2018	2021	2021	2021	
2b2 Overall 5G coverage	12%	25%	27%	81%	100%
% populated areas	2020	2021	2022	2022	
2b3 5G spectrum	21%	22%	38%	68%	
Assigned spectrum as a % of total harmonised 5G spectrum	2021	2022	2023	2023	



Digital infrastructure is the area where Romania performs best, already fulfilling one of the pre-conditions for a successful digital transformation and making an exemplary contribution to the EU's digital targets target for Gigabit connectivity for all.

In particular, fixed connectivity is the area where Romania is among EU's frontrunners, and still progressing quickly, with 96% of households having gigabit network coverage. VHCN coverage is at 96% compared with the EU average of 73%. Romania performs the best among Member States on FTTP coverage at 96% compared with an EU average of 56%. Take-up has also developed positively, with 81% of individuals taking up subscriptions of at least 100 Mbps compared with the EU average of 55%, and 23% of individuals taking up connections of at least 1Gbps compared with the EU average of 14%. Prices are rising across all baskets but remain at about half of the EU average. Moreover, some large rural urban disparities remain in some parts of Romania, where rural areas are still below the EU average in terms of VHCN coverage.

The RoNET project was completed in 2022, having brought speeds of up to 10 Gbps to 695 localities that were previously uncovered. The National Regulatory Authority ANCOM is currently mapping the localities still uncovered by VHCN. Currently, it remains to be seen how the commitments under the RRP (worth EUR 94 million) will be met or how the funding from ERDF (EUR 100 million) will be used to cover the remaining white spots.

In terms of market regulation, the market for wholesale dedicated capacity remains deregulated as the retail market for high quality electronic communications services provided at a fixed location was found to be effectively competitive. The market shares of operators in the fixed broadband market, based on lines, remain fairly stable.

The situation is different regarding the 5G rollout, where Romania stands at 27% overall household coverage, the lowest percentage in the EU, where the average is 81% and the EU target is to cover all populated areas. However, most of Romania's 5G coverage is in the 3.6 GHz band, an essential band for enabling advanced applications requiring large spectrum bandwidth, where Romania is covered up to 26%, compared to an EU average of 41%. During the last measurement exercise in 2022, only 22% of the 5G spectrum was allocated but this changed towards the end of the year. Mobile broadband take-up, at 82%, is also slightly below the EU average of 87%. Similar to the fixed broadband market, the mobile broadband market shares, based on active connections has not experienced major changes over the reporting period.

Several notable legal and regulatory developments took place in 2022, relevant to both fixed and mobile connectivity. The Law no. 198/2022, transposing into the national legislation the provisions of the Electronic Communications Code, has entered into force. This new legislative framework revises, among others, the security measures required to be taken by the providers and gives them new responsibilities to inform subscribers about significant threats and ways to protect themselves. Furthermore, it strengthens the regulatory and supervision power of the national regulatory authority (NRA).

Furthermore, Romania has progressed in implementing 12 out of the 39 recommendations included in the broadband cost reduction toolbox at EU level, as part of its RRP. The measures, preliminarily positively assessed by the Commission on 27 June 2023 as part of Romania's second payment request, are expected to be of particular support to the 5G rollout objective, in accordance with security regulations, and provide broadband coverage for white areas.

Notably, as regards 5G rollout, following the transposition of the Code, ANCOM carried out a selection procedure for awarding spectrum usage rights, auctioning off 555 MHz in the 700 MHz, 1500 MHz, 2600 MHz and 3.4-3.8 GHz frequency bands. In the 700 MHz band, three FDD blocks (2x5 MHz each) were awarded (valid during 2023-2047), out of the six FDD blocks and three SDL blocks that were available. In the 3.4 – 3.8 GHz band, 310 MHz TDD were awarded (valid during 2026-2047), out of the 400 MHz available. As regards the 26 GHz band, there was no interest expressed from the market players. The total value of the licence fees amounts to EUR 432.6 million, to be paid in instalments, up to November 2028. The three winners of the spectrum usage rights had coverage obligations imposed on them, including i) coverage of 95% of the (existing and future) highways and modernised railways, ii) coverage of a number of white areas within a period of 6 years, iii) the progressive roll-out of networks in the 3.4-3.8 GHz band, by installing a number of base stations in various categories of urban localities up to 31 December 2033, as well as iv) coverage of all the (existing and future) international airports in Romania.

Moreover, the NRA adopted several regulatory measures to facilitate 5G rollout, including i) indicative tariffs for access to network operators' poles, ii) the identification of main network operators that own, administer or hold as a concession poles that are/could be used by the providers

of public electronic communications networks, iii) indicative access tariffs for specific categories of network operators (e.g. local public transport service) and iv) maximal prices for access to public property real estate.

However, doubts remain regarding the expected rollout of 5G vis-à-vis the 2030 target, and some of the coverage obligations run until 2033. Among the potential reasons are general affordability in the consumer market and the current lack of a clear local business case for verticals. The good FTTP coverage was also invoked by stakeholders as a possible reason for potential lack of demand. The situation observed and the expectations described represent a clear risk to the achievement of the Digital Decade target of full 5G coverage by 2030.

All in all, Romania is very well placed to reach the Gigabit target early on, due to a mix of favourable market dynamics and public intervention, including regulation and funding. However, for the time being, and in spite of having caught up on 5G spectrum assignment and of several other regulatory measures put in place to facilitate rollout, there is a real risk of Romania not reaching the 2030 5G target.

With respect to the semiconductor target, Romania takes part participates in several European projects and initiatives, in particular the Important Project of Common European Interest (IPCEI) on Low-power processors and semiconductor chips, with a current budget allocation of EUR 500 million under its RRP.

Romania is involved in the EuroQCI initiative to build a pan European quantum communication infrastructure and is developing further competences in quantum.

Best practice: RO-NET

The RO-NET project, worth EUR 85 million, co-financed by ERDF, rolled out almost 5 000 km of fibre to cover 695 localities in rural areas of Romania, bringing them potential speeds of 10 Gbps, as well as six radio towers in the Danube Delta. These localities represent over 30% of the areas considered white at the start of the project. Other operators than those that were involved in rolling out the dark fibre now need to provide last mile connections to the end users, with 60 operators being reported as active at present in this respect. The long-term impact is estimated at 120 000 households being connected thanks to this project.

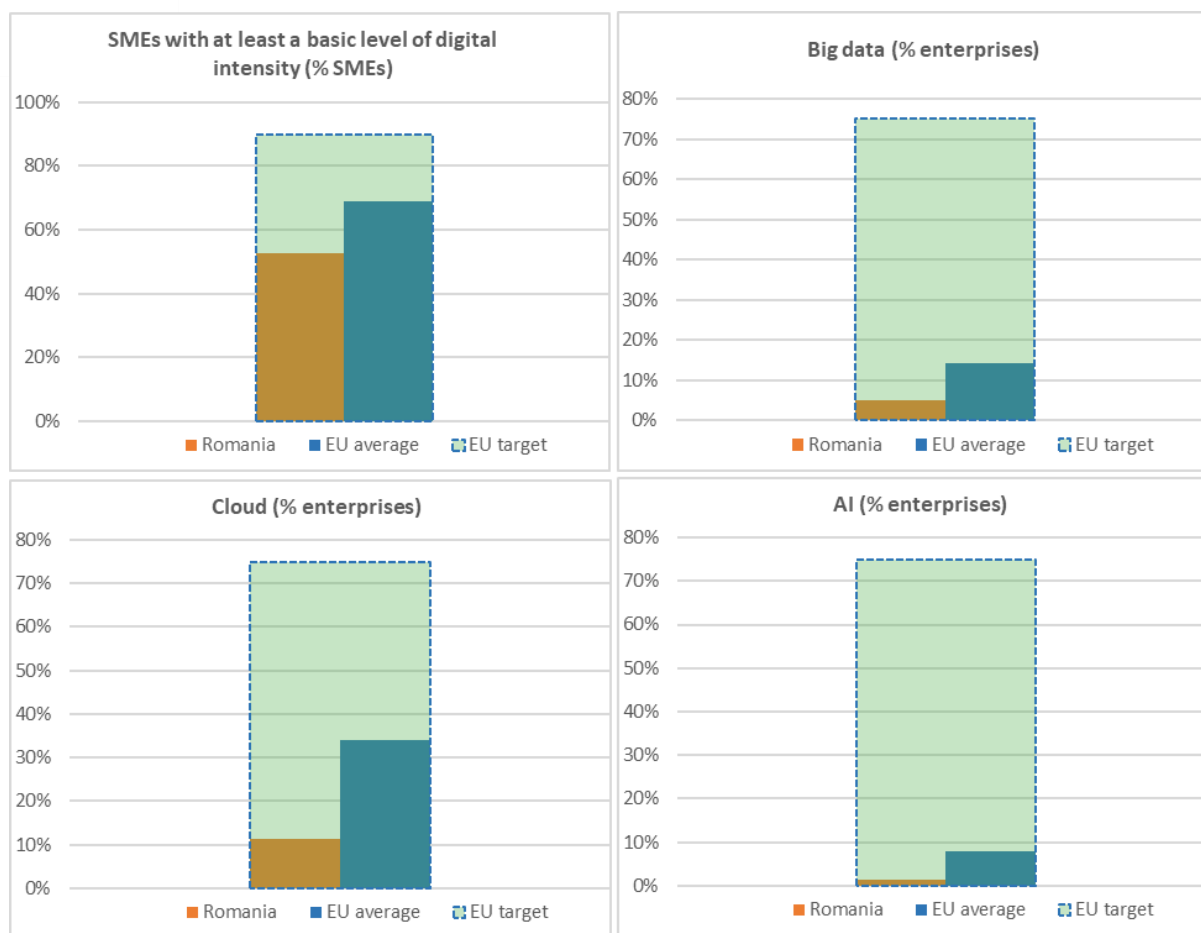
Romania should accelerate its efforts on connectivity infrastructure, notably on the roll-out of 5G connectivity, exploring all available sources of financing to shoulder private investments in the areas which are not commercially viable.

Romania's efforts in the area of semiconductors and quantum should be sustained in order to help the EU become a strong market player in these areas.

3 Digitalisation of businesses

	Romania			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	53%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	24%	17%	17%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	8%	12%	12%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	5%	5%	5%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud²²²	NA	11%	11%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	1%	1%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	17%	17%	17%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	17%	12%	10%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	8%	7%	8%	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	6%	4%	4%	9%	
% SMEs	2019	2021	2021	2021	

²²² Enterprises buying sophisticated or intermediate cloud computing services indicator, see [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).



There is a significant untapped potential regarding Romania's performance on the digitalisation of businesses and its contribution to the collective efforts to reach EU's targets in this area. The scores for the adoption of advanced digital technologies are particularly low: adoption of AI is at 1% compared with an EU average of 8%; adoption of cloud services is at 11% compared with the 34% EU average; and big data is at 5% compared with 14%. It is to be recalled that the Digital Decade calls for the adoption of advanced technologies by 75% of businesses. As regards the percentage of SMEs with a basic level of digital intensity, the gap with the EU is not as wide as for the other indicators (53% versus the 69% EU average; and against a 2030 EU level target of 90%). There was progress over the last year concerning enterprises that sell online and concerning the E-Commerce turnover; and there are early signs of convergence, although Romania does still score below the EU average across all these indicators.

The RRP's overall contribution to the take-up of advanced digital technologies is estimated at EUR 119.8 million and the contribution for the 90% basic digital intensity target is estimated at EUR 359.5 million. Further funding is available under the ERF for both the previous (2014-2020) and current (2021-2027) programming periods.

Moreover, 7 of the 12 digital innovation hubs pre-selected by the Romanian authorities have been selected by an EU-restricted call under the Digital Europe Programme to become part of a network of European Digital Innovation Hubs (EDIHs) and have already received their funding. EDIHs help SMEs and local public authorities (LPAs) address digital challenges and improve business/production processes and products/services using digital technologies. Their main support is in (i) identifying investors, (ii) training in acquiring digital skills, (iii) testing before investment, and (iv) creating an ecosystem for innovation and networking. Co-funding under the ERDF is envisaged.

A new artificial intelligence strategy is currently being prepared by the government, within the framework of the existing 2022–2027 National Strategy for Research, Innovation and Smart Specialisation (approved through Government Decision No 933 of 20 July 2022). Special attention will be paid to developing trustworthy, robust, secure and safe AI systems, as well as to the transparency of algorithms, diversity, equity and the contribution to social well-being. Moreover, a Romanian Committee for Artificial Intelligence is currently being operationalised and will serve as a support organisation and a single point of contact and information regarding AI opportunities in Romania.

A notable project is **the Romanian Artificial Intelligence Hub**, a recipient of ERDF funding of over EUR 52 million and a multi-stakeholder project that will create the collaborative means to leverage AI resources (particularly high-performance computation and open access to training data pools) at the national and international levels. In particular, it will be used to finance the projects of Romanian researchers, joint research projects with internationally renowned institutes, etc. It will also find AI solutions to help citizens and generate start-up and spin-off projects.

As regards the unicorns Digital Decade target, two Romanian companies have been reported as having the potential to achieve unicorn status (i.e. with a valuation of between EUR 100 million and 1 billion). The Romanian ICT sector is one of the five most important sectors of the economy in terms of employment. Its real annual growth rate is significantly above that of the economy as a whole (on average 15% during 2014-2020) and it makes a significant contribution to Romania's GDP growth, (contributing approximately three times more than one would expect given its share of the overall economy). However, it is not yet sufficiently innovation-driven and is largely reliant on outsourcing by foreign companies²²³. Romania's total R&D intensity is the lowest in the EU (at 0.48% of GDP) and is far below both the EU average of 2.27% and Romania's own target of 2%. The level of public R&D is particularly low. Innovation activity and R&D absorption capacity at company level remain limited²²⁴. The ecosystem density of start-ups is relatively low and the scaling-up of innovative domestic firms is hindered by the limited size of the local venture capital market. Romania is one of the EU top performers in terms of productivity growth, but the productivity level of the Romanian economy is still well below the EU average.

Measures are being taken to tackle this issue. For example, the 2014-2020 Competitiveness Operational Programme includes measures to develop digital innovation clusters as well as a more innovation-driven ICT sector.

Furthermore, several relevant regulatory and legal developments were reported. The **Investment and Development Bank was established in 2022** through Government Decision No. 1204/2022, as a credit institution, wholly owned by the Romanian state throughout its operational period, through the Ministry of Finance. **Law No 179/2022 regarding open data and the reuse of the public sector information** entered into force, transposing Directive (EU) 2019/1024. It facilitates open access to public administration data, the reuse of data for R&D processes and the development of new products and information services. The national open data portal data.gov.ro is aligned with EU practices, including on licensing and the application profile for data portals. Romania is considered a

²²³ [ANIS - Studiu privind impactul industriei de software si servicii IT](#)

²²⁴ Business enterprise expenditure on R&D (BERD) has been stagnating in recent years and, at 0.29% of GDP, is around a fifth of the EU average of 1.53% in 2020.

follower in terms of open-data maturity, with an improved rating in 2022 and scoring relatively well on policy governance, portal feature usage and sustainability, and impact awareness²²⁵.

Further measures carried out under the RRP are expected to make it easier for businesses to operate. The Emergency Government Ordinance No. 140/2022 on the single industrial license, as well as the Government Ordinance No. 18/2022 regarding the authorisation and operation in Romania of the representative offices of foreign companies and economic organisations can help achieve this. Further relevant measures under the RRP (e.g. a platform for stimulating the competitiveness of the business environment, ensuring legislative transparency, reducing administrative burden and procedural simplification) are expected to be completed in 2024.

Some relevant measures are under way, but further measures to support the digitalisation of businesses, digital innovation and more generally the ecosystem of start-ups (including facilitating SMEs' access to finance) are needed to contribute well to the EU targets and catch up with the EU averages. Progress would also significantly improve the competitiveness of the Romanian ICT sector and of the economy as a whole.

Best practice: ION

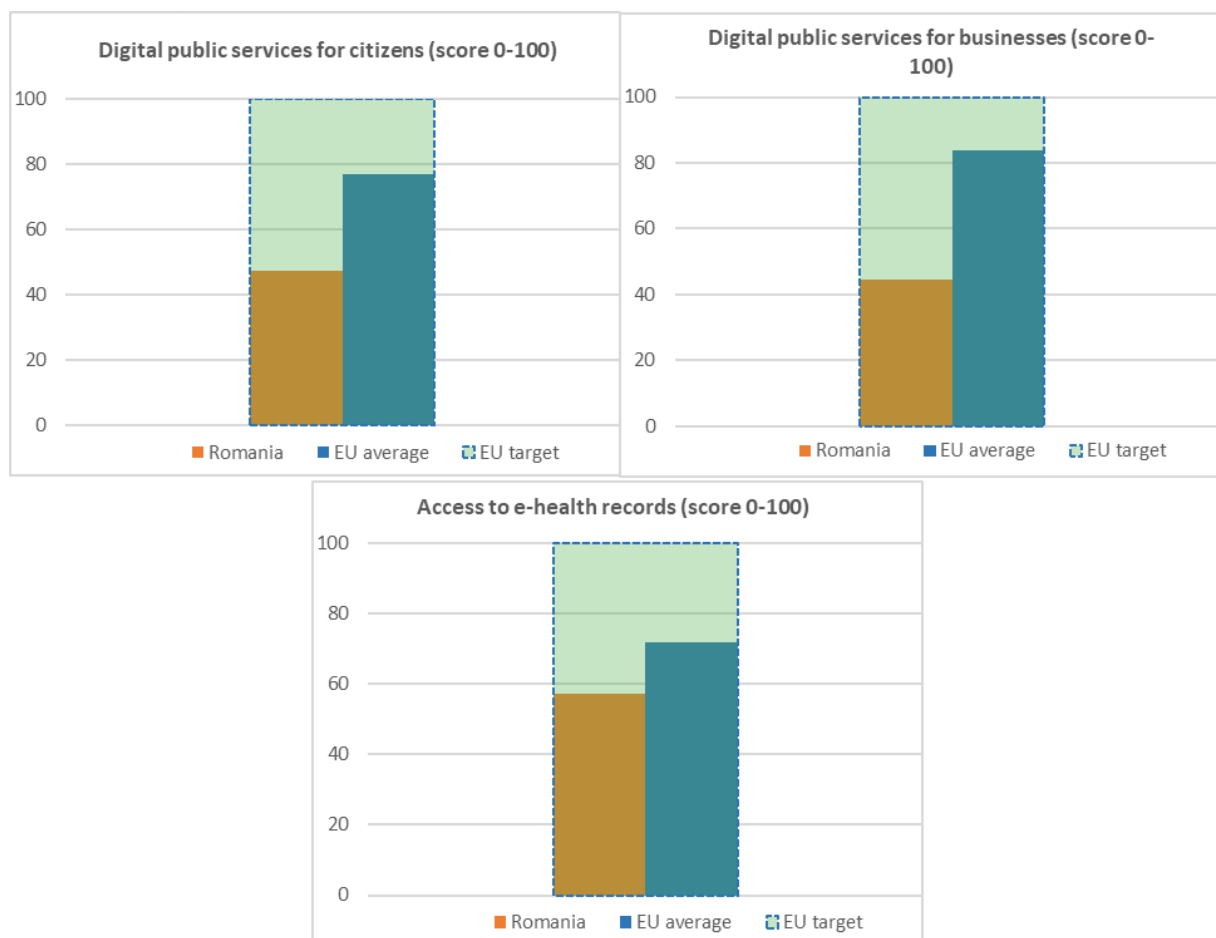
The Romanian Government launched [ION](#), the first governmental counsellor based entirely on artificial intelligence at the start of 2023. ION will capture public opinion and inform the members of the cabinet accordingly. It will also raise awareness of the potential and benefits of innovative digital technologies.

Romania should significantly step up its efforts in the area of digitalisation of businesses. In particular, Romania should scale-up measures to support the digitalisation of businesses and help create a business environment with a stronger focus on innovation.

²²⁵ https://data.europa.eu/sites/default/country-factsheet_romania_2022.pdf

4 Digitalisation of public services

	Romania			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	24% 2022	74% 2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	44 2021	48 2022	77 2022	100
4a3 Digital public services for businesses Score (0 to 100)	NA	42 2021	45 2022	84 2022	100
4a4 Pre-filled forms Score (0 to 100)	NA	19 2021	41 2022	68 2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	41 2021	44 2022	65 2022	
4a6 User support Score (0 to 100)	NA	72 2021	68 2022	84 2022	
4a7 Mobile friendliness Score (0 to 100)	NA	75 2021	77 2022	93 2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	57 2022	72 2022	100



A series of major reforms and investments aimed at the digital transformation of public services were initiated under the RRP in 2022, in accordance with the 2021–2027 strategic framework for the adoption and use of innovative technologies in the public administration.

Romania's performance in this area remains however still to be improved. Only 24% of internet users use e-Government services, compared with the EU average of 74%. Romania scores 48 on digital public services for citizens compared with the EU average of 77. Similarly, the score for digital public services for business is 45, below the EU average of 84 but catching up with it. These rather low scores are consistent across the various dimensions of the eGovernment Benchmark study (i.e. user support, mobile friendliness, transparency of service delivery, design and personal data, and pre-filled forms).

The Romanian RRP has contributed an estimated EUR 1 570 million to the digital transformation of government. In terms of important developments over the past year, Interoperability Law No 242 of 20 July 2022 entered into force and is expected, in the medium term, to significantly improve the quality of public service, traceability and transparency. In accordance with the 'once-only principle', once the national interoperability platform is implemented, public institutions will no longer have the right to request information that can be found on the national interoperability platform and the citizen's physical presence at the counter will be gradually reduced. Furthermore, essential digital public services will also be available cross-border.

Furthermore, Government Emergency Ordinance No 89 of 28 June 2022 on the establishment, administration and development of cloud IT infrastructures and services used by public authorities and institutions has created the legal framework for the government's cloud platform. The ordinance

clarifies the various competences and addresses concerns regarding citizens' privacy and transparency regarding access to data by public institutions.

These measures have laid the foundations for a profound digital transformation of the public sector. If well implemented, they can lead to integration and interoperability of services; uniformity and accessibility of data sets for digital use; enhanced management and security of information; improved cooperation of state institutions with citizens; and better management of policies in support of social welfare and environmental protection.

Further measures are being implemented in this area and are expected to benefit citizens and business in the short and medium terms. Two examples are: (i) the development of an electronic public procurement system, which operationalises standard e-forms for the publication of public procurement notices; and (ii) the development of the Technology Interoperability System with the Member States, which will be based on the construction of the e-IDAS node for Romania, interconnecting it with the e-IDAS nodes of the other Member States and with the Romanian providers of identity and electronic services.

As regards the e-ID target, Romania has not yet notified any e-ID schemes under the e-IDAS Regulation by Romania, but one pre-notification is in progress. The current EUR 200 million RRF funded investment is expected to deliver up to 8.5 million electronic identity cards by 2026 and authorised digital signatures.

These cards will make it easier for citizens to access various electronic services, thus significantly simplifying their relationship with public authorities, and increasing the quality and accessibility of public services. Romania is also involved via public and private entities in two large-scale pilot projects that are testing the European Digital Identity Wallet in a number of everyday use cases (funded under the Digital Europe Programme with an overall grant request of approximately EUR 0.4 million). Furthermore, a [Centralised Software Platform for Digital Identification](#) (PSCID) is being developed, co-funded by the ERDF and expected to be delivered by the end of 2023. The expected result is a national registry of electronic identities, which are to be interconnected with the e-IDAS node and with the catalogue of e-government services.

With a score of 57, Romania ranks 23 in the EU regarding access to electronic health records (the EU average score is 71). The country has implemented a centralised access service for citizens that includes electronic patient summary data (identification, personal information, allergies, current diagnoses, medicines, procedures) except for information on medical devices and implants. Both public and private primary healthcare providers as well as pharmacies provide relevant health-related data accessible by citizens. Furthermore, e-prescription and e-dispensation information as well as hospital discharge reports are available to citizens. However, laboratory test results, medical imaging reports and medical images are not available. It is estimated that between 40% and 59% of the national population are technically able to use the national access service. Citizens can access their electronic health records by logging in to an online portal using two-factor authentication with a nationally notified e-ID scheme. Access via a dedicated mobile app is not available. In view of the target of 100% citizen access to electronic health records, Romania should make further efforts to roll-out access services across the entire population, including disadvantaged groups, and to different types of healthcare providers. Moreover, citizens would benefit from having updated health data available and having access to electronic results and reports other than discharge reports.

Furthermore, in relation to the e-health target, **the National Health Insurance House (NHIH) is currently implementing an e-prescription project**, co-funded under ERDF, to create prescriptions that are recognised and can be issued in all Member States. This is expected to be delivered by June 2025. Moreover, the NHIH is, in partnership with the Special Telecommunications Service (STS) and

the Authority for the Digitalisation of Romania, setting up a computer system for connecting to the DES (Electronic Health Record), thus bringing together all actors involved in a medical act (including the providers of paraclinical, clinical, physical and rehabilitation services, home healthcare, home palliative care, dentistry, medical devices, assistive devices and technology, emergency consultations at home and unassisted medical transport activities). The project will extend the existing system which already brings together medical data at the level of primary care, hospitals and the main national insurance institutions (i.e. SIUI, SIPE and CEAS). In addition, the RRP includes significant investment in e-Health infrastructure and telemedicine services connecting patients and caregivers.

All these investments are a major opportunity to improve Romania's performance in the digital transformation of government and to bring significant benefits to citizens and businesses, once implemented effectively.

Best practice: Ghiseul.ro

Several ongoing projects are gaining traction and illustrating the benefits of e-government services to citizens and businesses in terms of simplification and limiting administrative burden. 'Ghiseul.ro' is a nationwide payment platform and an online app that is implemented by the ADR and the Romanian Electronic Payments Association. It allows citizens to view and pay fees, taxes, fines, etc. online. 400 types of payments can be made with it and 1.8 million citizens and businesses have used the platform so far. In the first 3 months of 2023, 75 public institutions started using the platform to receive payments, and 250 000 end users registered – thus indicating that the platform is becoming increasingly successful.

Romania should step up its efforts to digitalise public services. In particular, it should continue to implement the planned measures swiftly and effectively, including via the RRP, as they represent a major opportunity for the digital transformation of government, with significant benefits for citizens and businesses.



Digital Decade Country Report 2023

Slovakia

Introduction

Slovakia has scope to improve in the digital transition and to contribute to the collective efforts to achieve the EU's Digital Decade targets, particularly in the field of digital skills and digital public services where progress is evident. However, despite recent advances, Slovakia should scale-up efforts in the digitalisation of businesses and connectivity, in particular in the roll out of 5G. Slovakia is participating in the multi-country project aimed at deploying 5G corridors across Europe. In December 2022, the Slovakian government adopted the Action plan for the digital transformation of Slovakia for 2023-2026 and the National digital skills strategy of the Slovak republic and action plan for the years 2023-2026. Together with the strategy document 'The National Concept of Informatization of the Public Administration for years 2021-2026' adopted at the end 2021, these documents are aligned to the Digital Decade Policy Programme.

Slovakia continuously monitors the state of the security and resilience of electronic communications networks and cybersecurity, working in cooperation with ENISA, the EU's cybersecurity agency. In 2021, Slovakia adopted an amendment to the national Act on Cybersecurity, which included the EU toolbox for 5G cybersecurity. The country plans further updates to its national regulation on obligations for registered companies with regard to the security and integrity of networks and services as well as cybersecurity, in line with European Electronic Communications Code and with the NIS2 Directive.

Digital in Slovakia's Recovery and Resilience Plan (RRP)

The Slovakian modified Recovery and Resilience Plan (along with the REPowerEU chapter) amounts to EUR 6.4 billion in grants. The Slovak plan's digital ambition remains broadly unchanged maintaining EUR 1.3 billion (i.e. 21%) of its total allocation to be devoted to the digital transformation and, out of this amount, EUR 1.2 billion are expected to contribute to the Digital Decade targets ²²⁶.

Slovakia has already received two disbursements, and in total (including the pre-financing), EUR 1.9 billion has been already paid out. The two instalments included so far a few of milestones and targets, focusing on digitalisation and cybersecurity in public administration and digital skills. The country adopted a National Concept for Informatisation of Public Administration, which aims to update cybersecurity requirements and increase the standardisation of solutions for all public administration bodies. Furthermore, Slovakia completed the pilot phase of the '[senior tablet](#)' project which distributed tablets to 1 000 older people and disadvantaged people and gave training on how to use the devices.

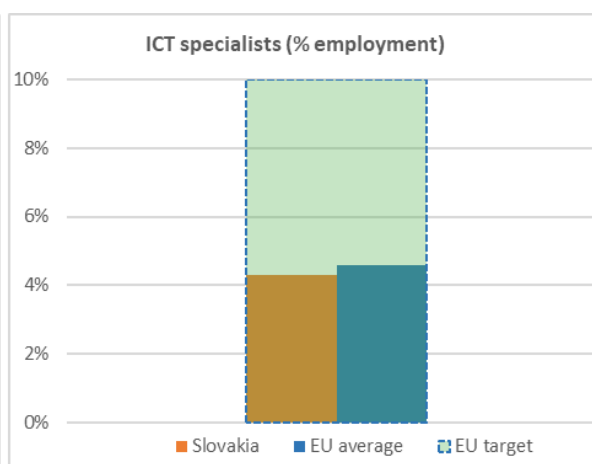
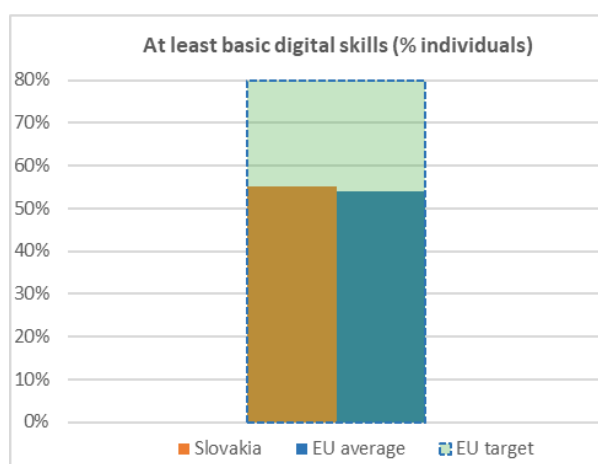
For requesting the next RRF payment, Slovakia shall implement several measures linked to digital, including building a network of four European Digital Innovation Hubs and one additional digitalisation centre, an Action Plan for the Digital Transformation of Slovakia for 2023-2026, and the National Digital Skills Strategy as well as adopting the list of priority electronic services.

²²⁶ Each Recovery and Resilience Plan must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plans had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or has no impact (0%) on digital objectives, using Annex VII of the RRF Regulation. Combining the coefficients with the cost estimates of each measure allows assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to allow for an estimation of the possible contribution of RRF measures to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice to potential ongoing revisions of the plan.

In April 2023, Slovakia submitted a modified RRP to take into account the decreased financial allocation (grant allocation is reduced by EUR 321 million) and the integration of a REPowerEU chapter to decrease the country's dependence on Russian fossil fuels and support the green transition. The modified Recovery and Resilience Plan was adopted in July 2023.

1 Digital skills

	Slovakia			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	88%	87%	88%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	55%	55%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	21%	21%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	72%	72%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	16%	16%	15%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	4.2%	4.3%	4.3%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	3.9%	4.4%	4.4%	4.2%	
% graduates	2019	2020	2021	2021	



Slovakia scores slightly better than the EU average on at least basic digital skills but below the EU average on above basic digital skills. 55% of individuals are reported to have at least basic digital skills in Slovakia, which is slightly above the EU average of 54%. In terms of individuals having at least basic digital content creation skills, Slovakia is at 72%, significantly above the EU average of 66%. However, the percentage of individuals with above basic digital skills is lower than the EU average (21% vs 26%). The percentage of enterprises providing ICT training (15%) is also significantly below the EU average (22%). While the percentage of internet users has slightly increased, up from 87% in 2021 to 88% in 2022, Slovakia remains below the EU average of 89%.

Slovakia's National Digital Skills Strategy and Action Plan for 2023-2026 was adopted in December 2022. It addresses the need to improve digital competences in Slovakia to contribute to the collective effort to achieve the 2030 Digital Decade target of 80% of individuals aged 16-74 having at least basic digital skills. More specifically, the national Action Plan seeks to (i) develop the digital skills of young people and teachers; (ii) develop the digital skills of the active labour market participants,

by promoting upskilling or reskilling; (iii) reduce the digital skill gap and minimise the impact of digital exclusion. The Action Plan sets out measures with clear and measurable targets for each of these areas and allocates significant funding to them. These measures include: (i) supporting and strengthening the Slovak National Coalition for Digital Skills and Jobs; (ii) establishing an effective model for managing and coordinating activities in the field of digital skills between relevant public administration bodies; (iii) creating a National Centre for the Digital Transformation of Education and developing a curriculum for Digital for primary and secondary schools, offering trainings specifically for older people and disadvantaged groups via a dedicated IT platform; and (iv) increasing digital skills and competences of women and girls to improve their position on the Slovak labour market by creating a platform for women in the digital age, by developing a career centre and programme for female STEM graduates who do not have sufficient experience and for women who have taken a career break. **At 4.3%, the share of ICT specialists in Slovakia is slightly below the EU average of 4.6%.** The percentage of ICT specialists has grown since 2017, at a rate slightly above the EU average, but has now stalled compared with the previous reporting period. Of these ICT specialists, only 14.9% are women, which is one of the lowest shares in the EU. Slovakia ranks above the EU average for the number of ICT graduates. 4.4% of graduates in Slovakia have an ICT degree, which is slightly above the EU average of 4.2%.

Slovakia's National Digital Skills Strategy and Action Plan for 2023-2026 also addresses the need to improve in this area. It sets out several measures to increase the percentage of ICT specialists in the workforce and ICT graduates and create conditions and support activities to increase the share of women in ICT. These measures include educational campaigns aimed at promoting STEM subjects and ICT career paths to high school students as well as projects and campaigns to raise awareness and encourage girls to familiarise themselves with digital technology and potential ICT career paths (including coding camps and similar projects).

Some of the measures taken to increase the share of ICT specialists and graduates have been designed and implemented together with Czech, Slovenian, and Ukrainian partner institutions.

Moreover, Slovakia is home to a well-established and active national coalition for digital skills and jobs (Digitalna Koalicia). It brings together ministries, universities, associations, and tech companies, and its main initiatives aim to increase people's digital competences.

Slovakia participated in EU Code Week 2022, with 163 activities organised, 74% of which in schools, and with a total of 6 654 participants.

Best practice: IT Fitness Test

Slovakia uses a comprehensive 'IT Fitness Test' (conducted by the IT Association of Slovakia and the Slovak National Coalition for Digital Skills and Jobs) to assess the ICT skills of individuals living in Slovakia every year. The outcome of the tests helps monitor the progress towards achieving the 2030 Digital Decade targets and corresponding national targets in the Slovak Action Plan.

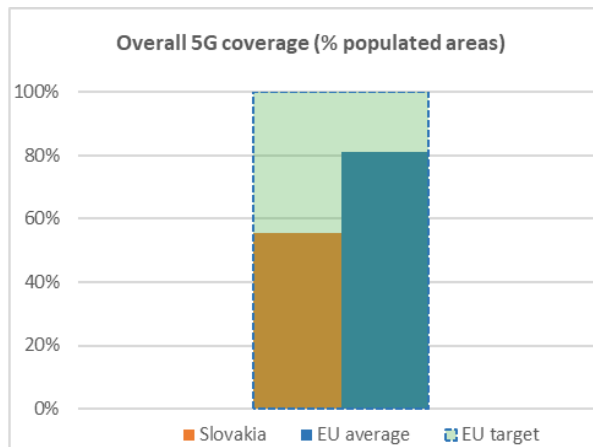
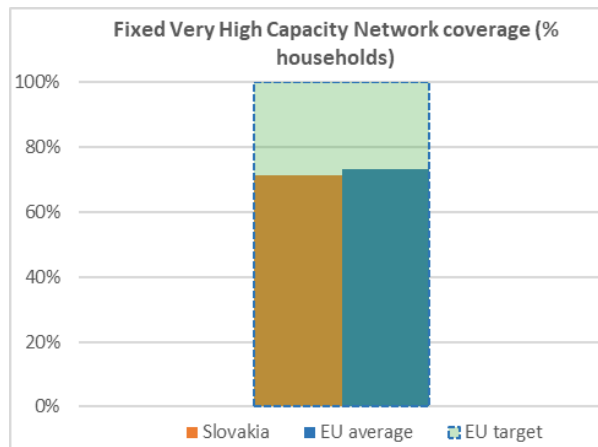
Slovakia should accelerate efforts in the digital skills area. Particular attention should be given to closing the digital gap, and to ensuring the inclusion of vulnerable groups in all digital trainings, to

maintaining a positive trend for the number of ICT graduates as well as to the attraction and retention of ICT specialists²²⁷.

²²⁷ The recommended policies, measures, and actions in this document reflect the Commission Communication 'Report on the state of the Digital Decade' COM(2023) 570.

2 Digital infrastructures

	Slovakia			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up % households	28%	29%	33%	55%	
2a2 At least 1 Gbps broadband take-up % households	0.4%	1.1%	0.9%	13.8%	
2a3 Fixed Very High Capacity Network (VHCN) coverage % households	50%	67%	71%	73%	100%
2a4 Fibre to the Premises (FTTP) coverage % households	49%	62%	67%	56%	
2b1 Mobile broadband take-up % individuals	75%	86%	86%	87%	
2b2 Overall 5G coverage % populated areas	0%	14%	55%	81%	100%
2b3 5G spectrum Assigned spectrum as a % of total harmonised 5G spectrum	67%	67%	67%	68%	



Slovakia has significant room for improvement on digital infrastructure. In 2022, Slovakia made progress on fixed networks. The percentage of households covered by fixed very high capacity networks, provided on fibre-to-the-premises (FTTP) and DOCSIS 3.1 infrastructures, increased from 67% in 2021 to 71% in 2022, which is just below the EU average of 73%.

On the take-up of fixed broadband of at least 100 Mbps, Slovakia remains with 33% significantly below the EU average of 55%. The take-up of at least 1 Gbps broadband stands at only 0.9% of households in the country, well below the EU average of 13.8%.

A National Broadband Plan (NBP), approved by the Slovak government in 2021, aims for all households, urban and rural, to have access to an internet connection of at least 100 Mbps, with the possibility of upgrading to gigabit speed. The plan also aims for major socio-economic actors to have access to gigabit connectivity. In 2022, a feasibility study was launched to help implement the

plan in such a way to achieve the 2030 Digital Decade objectives. The study also includes environmental conditions that must be part of the grants/calls for communications infrastructure in the preferred models for action. The results were delivered in April 2023. The Slovak authorities emphasised, however, that full coverage with VHCN is a very challenging goal given that the country's natural features present significant challenges.

In November 2022, a mapping exercise and public consultation was launched to determine the status of the current and planned gigabit coverage of Slovakia. The results will be used to implement the objectives of the national broadband plan.

On the financial side, Program Slovakia co-funded by the ERDF was approved by the European Commission in November 2022 and provides for EUR 112 million dedicated to gigabit connectivity. The Slovak RRP does not include investments in connectivity.

No major deregulatory steps were taken during the reporting period, rather a modification of the prices of regulated access included in the reference offer of the SMP operator.

New measures were taken by the national regulatory authority to define the quality of universal service. It is now analysing the availability and affordability of the universal service.

On mobile networks, 67% of the total harmonised 5G spectrum has been assigned in Slovakia, and 55% of populated areas are covered by 5G. This is a significant increase compared to the 14% coverage of the previous year, but the coverage remains below the EU average of 81%. The coverage in the 3.4-3.8 GHz spectrum band, needed for advanced applications requiring high bandwidth, is with 39% close to the EU average of 41%.

The Slovak national regulatory authority imposed obligations, as part of the 2020 5G auction, to ensure that at least 95% of the population of each regional capital of Slovakia is covered by a 5G network by the end of 2025 and that at least 90% of the population living outside regional cities is covered by 5G by the end of 2027.

Moreover, in 2016, Slovakia had already assigned frequencies in the 3.6 GHz band, with rights of use extending until the end of 2024. As frequencies were allocated in line with the principle of technological neutrality, mobile network operators who hold these rights are already entitled to use them to provide 5G services. The first commercial 5G network in the 3.6 GHz frequency band was introduced in October 2020. To give rights to use frequencies in the 3.6 GHz band as of 2025, on 1 March 2022, the Slovak regulatory authority launched a selection procedure, which was successfully completed on 5 May 2022. The whole 3.4 – 3.8 GHz band was assigned in this auction, with the validity of the rights of use set to last until the end of 2045. The successful bidders are required to build an electronic communications network with two 5G access points in each district of Slovakia and with at least 300 5G access points throughout the country by the end of 2027. The new licenses are valid until 2045.

The 26 GHz frequency band is not assigned yet, due to limited demand.

A study funded under Connecting Europe Facility Digital is ongoing with the aim of preparing the implementation of 5G and FRMCS communication systems in view of Connected and Automated Mobility on the railway corridor Brno (CZ) – Bratislava (SK). It is expected to be completed by the end of 2023

Slovakia did not report any specific measure to contribute to the EU's collective efforts to achieve the semiconductors target and targets on edge nodes and quantum computing. However, the Action Plan for the Digital Transformation of Slovakia for 2023-2026 acknowledges the importance of all advanced technologies, including edge computing. The deployment of all advanced digital technologies is one of the strategic targets in the Action Plan.

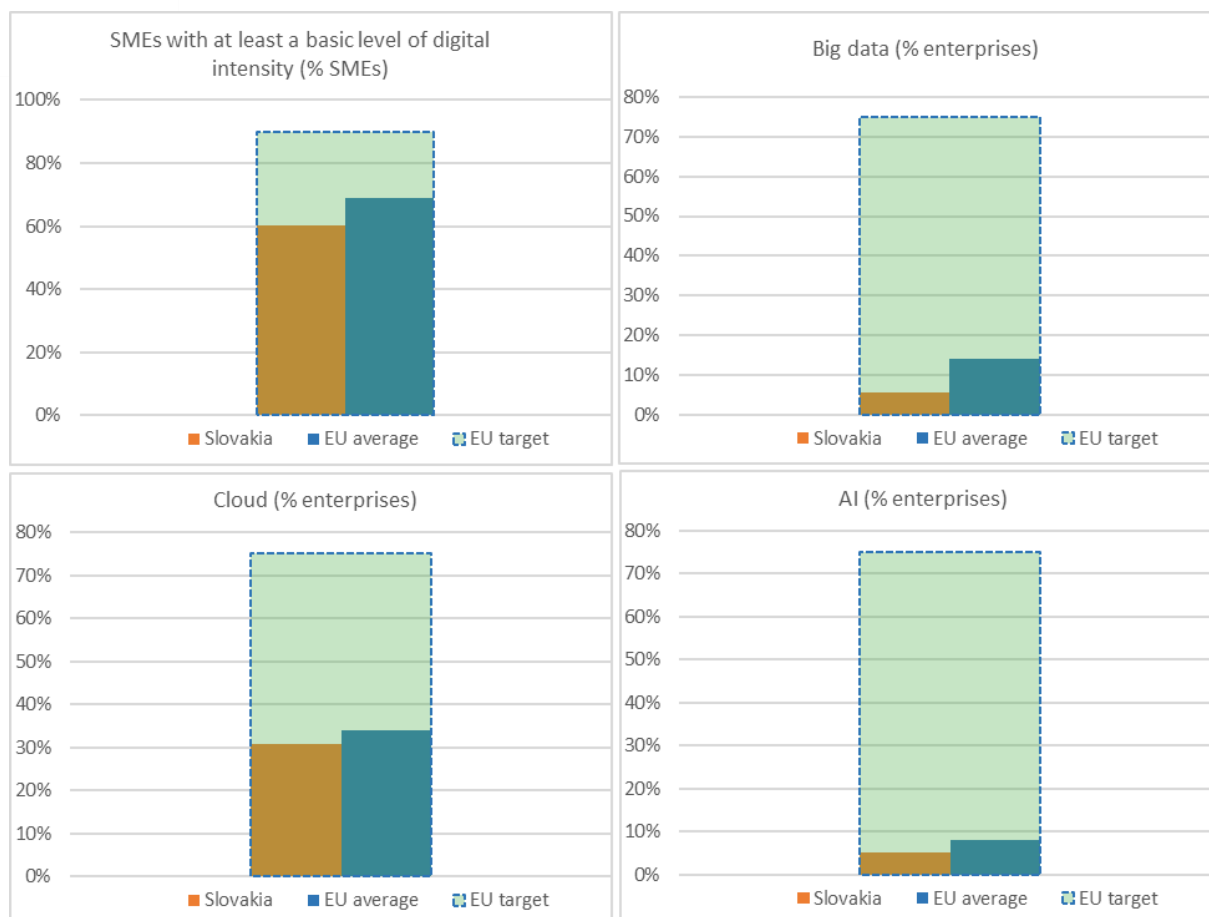
Slovakia should step up its efforts on connectivity infrastructure, to accelerate both the rollout of gigabit and 5G connectivity, especially fibre to the premises in rural areas. The swift implementation of the ERDF measures is very relevant.

Slovakia's efforts in the area of semiconductors should be sustained in order to help the EU become a strong market player in these areas.

3 Digitalisation of businesses

	Slovakia			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	60%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	31%	31%	31%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	18%	21%	21%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	6%	6%	6%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud²²⁸	NA	31%	31%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	5%	5%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	17%	17%	17%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	17%	13%	14%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	11%	8%	9%	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	7%	7%	7%	9%	
% SMEs	2019	2021	2021	2021	

²²⁸ Enterprises buying sophisticated or intermediate cloud computing services indicator, see [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).



Slovakia has room for improvement on digitalisation of businesses. The percentage of enterprises analysing big data was 6% in 2020 which is significantly below the EU average of 14%. 31% of enterprises in Slovakia reported to be using cloud computing services in 2021, which is below the EU average of 34%. The percentage of enterprises using AI technology was also below the EU average (5% vs 8%).

Electronic information sharing in enterprises is low compared to other Member States. Only 31% of enterprises reported using an enterprise resource planning software package to share information between different functional areas. This is significantly below the EU average of 38%.

The use of social media is below the EU average. Only 21% of enterprises reported to use two or more of the social media tools considered as part of the assessment, which again is significantly below the EU average of 29% of enterprises.

The uptake of e-invoicing for automated processing is very low in Slovakia. 17% of enterprises reported to be sending e-invoices in 2020, which is significantly below the EU average of 32%. Slovakia is one of the four lowest ranking countries for this indicator.

The share of SMEs in Slovakia selling online to other Member States is with 7% below the EU average of 9%.

Slovakia acknowledges the need to improve in this area. In December 2022, the Slovak government adopted an Action Plan for the Digital Transformation of Slovakia for 2023-2026. Supporting innovation and the adoption of digital technologies in SMEs is one of the priority areas set out in the action plan. More specifically, Slovakia identified the need to ensure that entrepreneurs and SMEs have the right digital skills, and the need to support the technological and knowledge transfer from

research and innovation clusters to real world business use cases. A specific chapter of the Action Plan for the Digital Transformation focuses on supporting the basic level of digital intensity of SMEs. It sets as a measurable goal of more than 67.6% of SMEs in Slovakia reaching at least a basic level of digital intensity by 2026.

Moreover, the Action Plan for the Digital Transformation of Slovakia for 2023-2026 confirms the country's intention to contribute to the collective efforts in the EU to reach the 2030 Digital Decade target of at least 75% of enterprises using cloud computing, big data or AI. It defines clear goals at national level and sets at 42.6% the number of enterprises using cloud computing, big data, and/or artificial intelligence by 2026. Specific measures and investments set out in the Action Plan are intended to help Slovak enterprises to reach this goal collectively. Strategic goals in the area of AI include, in particular, supporting (i) collaboration between academia and businesses, (ii) use and deployment of AI in medicine, and (iii) creation of an ecosystem to deploy AI using data.

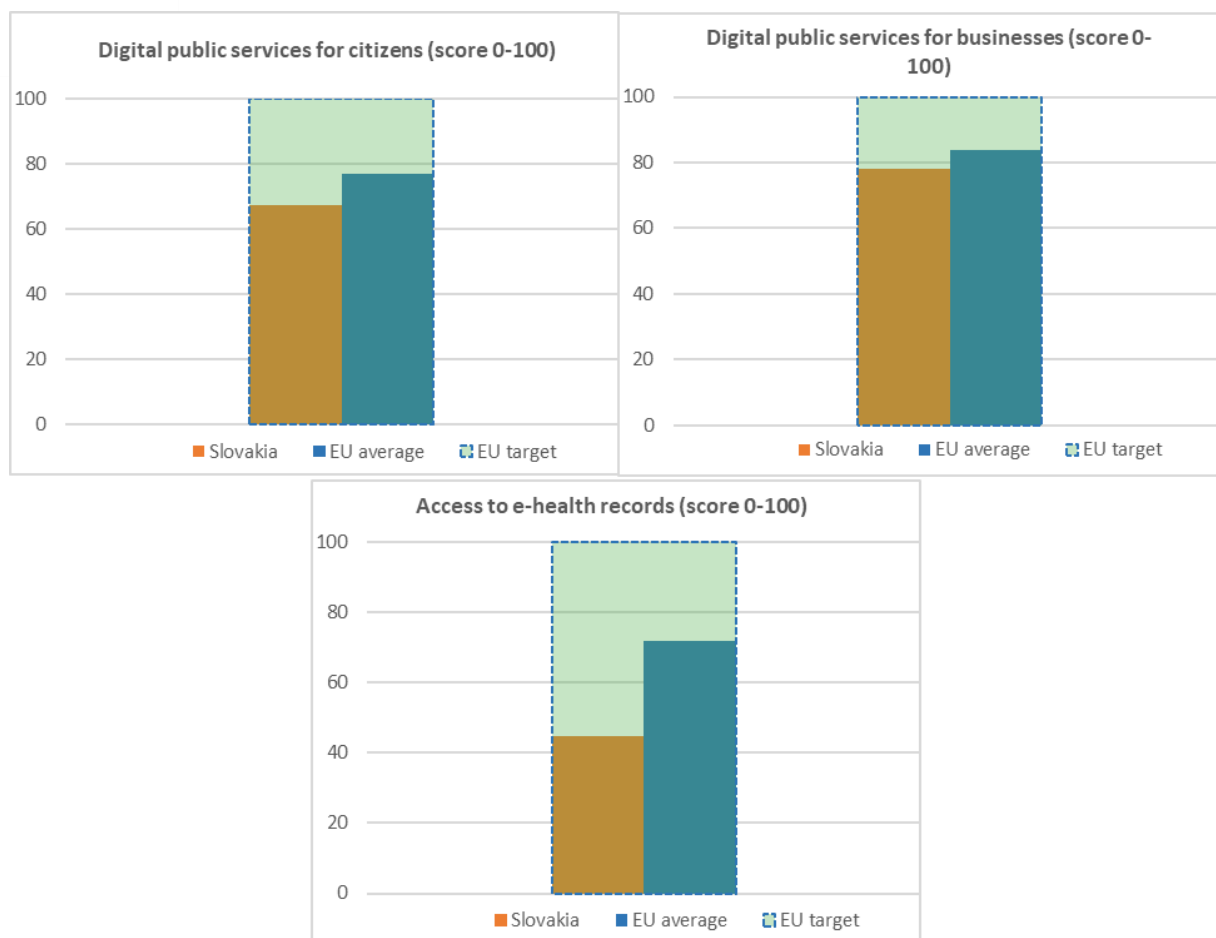
Slovakia has four European Digital Innovation Hubs (EDIH) funded under the Digital Europe Programme (co-funding under the RRF is also envisaged), and one EDIH funded directly by the National government. The EDIH cover a broad selection of technologies and sectors, including critical digital technologies, healthcare, manufacturing, the automotive sector and mobility. They will support SMEs mainly by: (i) identifying investors, (ii) providing training on digital skills, (iii) testing before investment, and (iv) creating an ecosystem for innovation and networking.

There are currently no unicorns based in Slovakia and no scale-ups have been identified as potential unicorns with a current market valuation between EUR 100 million and EUR 1 billion. The Action Plan for the Digital Transformation includes measures to support innovative businesses in Slovakia. It remains to be seen what effect these measures will have.

Slovakia should step up its efforts in the area of digitalisation of businesses. In particular, Slovakia should facilitate access to training, information and knowledge sharing and other supportive actions, including through European Digital Innovation Hubs, to make further progress in the digitalisation of businesses.

4 Digitalisation of public services

	Slovakia			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	82% 2022	74% 2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	65 2021	67 2022	77 2022	100
4a3 Digital public services for businesses Score (0 to 100)	NA	75 2021	78 2022	84 2022	100
4a4 Pre-filled forms Score (0 to 100)	NA	45 2021	56 2022	68 2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	44 2021	46 2022	65 2022	
4a6 User support Score (0 to 100)	NA	74 2021	80 2022	84 2022	
4a7 Mobile friendliness Score (0 to 100)	NA	83 2021	88 2022	93 2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	45 2022	72 2022	100



Even though Slovakia still scores below the EU average for most of the monitored indicators, the country has made visible progress compared to the previous year.

Slovakia's scores for digital public services for citizens and businesses remain below the EU average, but have increased compared to the previous year. For citizens the score increased from 65 in 2021 to 67 in 2022, which is still significantly below the EU average of 77. For businesses the score increased from 75 in 2021 to 78 in 2022, which again is below the EU average of 84.

With 82% e-Government users among internet users, Slovakia ranks above the EU average of 74%. This suggests significant potential for e-Government services.

The country has introduced several measures to support progress in this area. Notably, the Slovak authorities have introduced measures to ensure the fulfilment of the principles of the Berlin Declaration on digital society and digital government based on values, which will be taken into account by the national strategic documents. The overall aim is to ensure that public electronic administration services are safe, easily accessible to every citizen, and uphold human rights.

Slovakia ranks low on citizen's access to electronic health records, with a score of 45 which is significantly below the EU average score of 72. The country introduced a national online service for citizens to access their electronic health records, but less than 20% of the population are currently reported to technically be able to make use of the electronic access service through the online portal. When accessing the online portal, authentication is done with a nationally notified eID scheme based on two-factor authentication. This service includes electronic prescription data and electronic patient summary data such as information about allergies, current diagnoses, medical devices and implants, procedures, and current and past medications. The health-related data are not typically updated

within a few days or a few hours after each incident of care. Furthermore, eDispensation information, electronic results, and reports are not accessible to citizens at the current state. This is a big inconvenience for citizens using the service. A mobile app is not available. Citizens are supplied with relevant health-related data in their electronic health records from primary public and private healthcare providers as well as pharmacies. Other healthcare providers are not connected to national access services at this point. The roll-out of the electronic access service facilitating citizens' full access to their electronic health records is ongoing and largely in early stages with a low population coverage and few healthcare providers supplying relevant data.

Almost 4 million people (around 72% of the citizens) have access to an electronic identification (eID) scheme, which has been notified to the European Commission under the eIDAS Regulation. Slovakia is also involved via public and private entities in one large-scale pilot project testing the European Digital Identity Wallet in several everyday use cases funded under the Digital Europe Programme.

In June 2022, the Slovak authorities launched a national mobile identity, linked to various e-government services. The mobile application called [Slovakia on mobile](#) offers users access to the Central Government Portal (Slovensko.sk) by utilizing the app without a reading device. The country's electronic mobile services will be expanded over time and open to all residents, not only current Slovensko.sk subscribers. This is an essential service for citizens as they are now able to communicate easily with the authorities through their mobile phones.

Overall, Slovakia has made efforts to improve its scores in digital public services. However, individuals and businesses still face difficulties when using digital public services which are reported to lack usability and to have limited transparency.

Slovakia should step up its efforts to digitalise public services. In particular, it should monitor the effective use of digital public services as well as possible challenges for particular groups of citizens.



Digital Decade Country Report 2023

Slovenia

Introduction

Slovenia is expected to make a positive contribution to the collective efforts to achieve the Digital Decade targets. Further efforts are needed to attain its level of ambition and to further contribute to achieving the Digital Decade targets and objectives, especially as regards ICT specialists and connectivity in rural areas. Slovenia's active involvement in multi-country projects on advanced technologies should be maintained. Slovenia is actively preparing a framework for its digital transformation. The government has set up a Digital Transformation Ministry and adopted a comprehensive digitalisation strategy, [Digital Slovenia 2030](#), which is aligned with the Digital Decade targets and take note of the Digital Decade Policy Programme.

Slovenia is currently preparing the groundwork, with some initial steps that are essential for successful implementation. First, Slovenia prepared a thorough analysis of its state of play: strengths and challenges per area are well identified and described in several different strategies. Second, on the implementation of strategies, Slovenia plans to collect and analyse data and other evidence to continuously adapt and improve its implementation activities. Initial activities are ongoing, including the appointment of an inter-ministerial group that will prepare the Action Plan for Digital Slovenia 2030. It is key that those results are available on time and taken into account in the design and development of current and future measures and activities.

Slovenia is collaborating with other Member States in exploring the possibility to set up **European Digital Infrastructure Consortia** (EDICs) on: (i) establishing an Alliance for Language Technologies, to develop a common infrastructure in the field of natural language processing and to develop large multi-language models; and (ii) the Networked Local Digital Twins Towards CitiVerse project, using disruptive and immersive technologies for future city related projects. Slovenia is one of the Member States that have jointly submitted a formal application to set up the European Blockchain Partnership and the EDIC on European Blockchain Infrastructure, supporting EU-wide cross-border public services.

Digital in Slovenia's Recovery and Resilience Plan (RRP)

The Slovenian Recovery and Resilience Plan amounts to EUR 2.5 billion and EUR 0.5 billion (21%) is devoted to the digital transformation – of which EUR 471 million are expected to contribute to Digital Decade targets²²⁹.

In the context of the first payment request, amounting to EUR 49.6 million and disbursed in April 2023, Slovenia achieved 12 milestones and targets and four of them are related to digital measures. The digital measures focus on two areas: First, the digitalisation of the economy, covering the adoption of a Strategy for the digital transformation of enterprises and the identification of potential participants for the multi-country projects on the European Common Data Infrastructure and Services and on the Low-Power Processors and Semiconductor Chips. The second area covered is the

²²⁹ Each Recovery and Resilience Plan must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plans had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or has no impact (0%) on digital objectives, using Annex VII of the RRF Regulation. Combining the coefficients with the cost estimates of each measure allows assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to allow for an estimation of the possible contribution of RRF measures to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice to potential ongoing revisions of the plan.

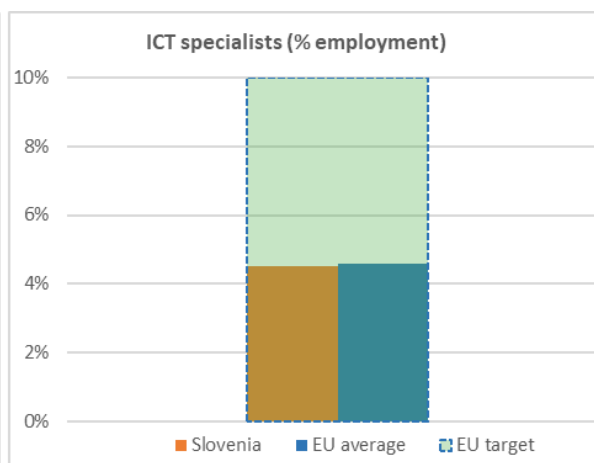
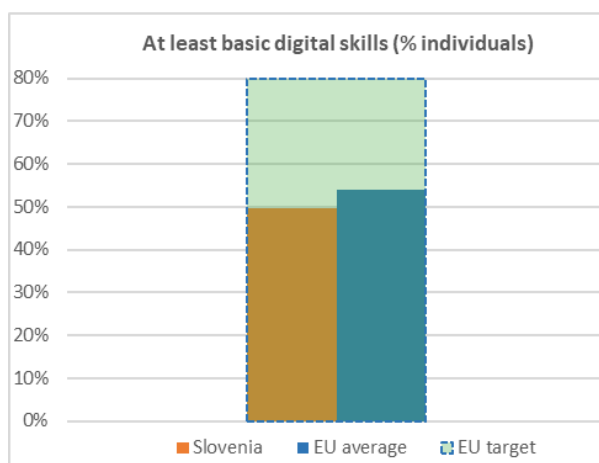
digitalisation of public services: A State Administration Informatics Development Council was established to coordinate, among others, IT investments, standards and back-office systems. Those milestones are generally a first step to prepare the ground for the further implementation of those measures.

Slovenia is currently working on an amendment of its RRP to take into account the decreased financial allocation (the grant allocation is reduced by EUR 286 million) and the integration of a REPowerEU chapter to reduce the dependence on Russian fossil fuels and to support the green transition. A draft was opened to public consultation in March 2023 and [submitted](#) to the Commission on 14 July 2023.

1 Digital skills

A digitally skilled population increases the development and adoption of digital technologies and leads to productivity gains.²³⁰ A digitally skilled workforce is more likely to find and maintain jobs. This is particularly relevant in Slovenia, which is among the countries with the highest share of jobs at high risk of automation, almost twice as high as in other OECD countries.²³¹

	Slovenia			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	85%	88%	88%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	50%	50%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	20%	20%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	66%	66%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	26%	26%	29%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	4.4%	4.8%	4.5%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	4.1%	4.1%	4.5%	4.2%	
% graduates	2019	2020	2021	2021	



Basic digital skills are a little less widespread in the Slovenian population aged 16-74 than in the EU on average. Only 50% of people aged 16-74 have at least basic digital skills, which is below the EU average of 54%. The gap with the EU average is even larger when it comes to above basic digital skills (20% compared with 26% at EU level). But the level of penetration of software and regular internet use are at par with the EU average. However, with regard to the gender balance, the share of women with at least basic digital skills is – as for the population in general - below the EU average. Slovenia's best performance in this area is on enterprises providing ICT training – the country has the 6th highest

²³⁰ OECD Economic Outlook, Digitalisation and productivity (2019): A story of complementarities, [OECD Economic Outlook, Volume 2019 Issue 1 | OECD iLibrary \(oecd-ilibrary.org\)](https://www.oecd.org/economic-outlook/volume-2019-1/).

²³¹ IMAD: productivity report 2020, [aPoP_2020_splet.pdf \(gov.si\)](https://www.imad.gov.si/aPoP_2020_splet.pdf).

share of enterprises who provided ICT training to their personnel. In its strategy Digital Slovenia 2030, Slovenia aims at 60% of the population having basic digital skills by 2025 and reaching the EU target of 80% of the population by 2030. Taking into account Slovenia's starting point and its ambition, it can make a positive contribution to the collective efforts to reach the Digital Decade targets, provided that the efforts are stepped up and planned measures are implemented timely and in a consistent manner.

Slovenia is implementing several measures aimed at building basic digital skills in the context of the Promotion of the Digital Inclusion Act. The level of digital skills of vulnerable groups is generally considerably lower than in the population in general, but in line with the EU average for vulnerable groups. A key measure to address this issue is the [Promotion of Digital Inclusion Act](#). It sets out a framework for several actions targeting the increase of basic digital skills in the broader population and the reduction of the gender gap. More specifically, the Act aims to raise awareness of the benefits of digital skills and technologies and to strengthen understanding and use of them.

In 2022, one of the most prominent actions under the Act was the digital voucher. Between June and November 2022, EUR 29 million was disbursed to almost 200 000 pupils and students in digital vouchers, worth EUR 150 each, to purchase basic computer equipment. In March 2023, the Act was amended to support not only the purchase, but also the borrowing of basic computer equipment and to broaden the group of possible beneficiaries to cover vulnerable groups. In addition, a first proposal for a new law, addressing the target groups not yet included in the current Act, is expected by the end of 2023.

This activity is complemented by the [Active Labour Market Policy Plan](#) which was adopted in December 2022 and includes digital skills training for unemployed people.

With its [Digital Education Action Plan](#), Slovenia lays out a comprehensive national programme in the area of digital education. The country has implemented several actions and projects in this area in recent years, but it has been several years since it planned to implement a comprehensive programme like the Digital Education Action Plan. Several stakeholders were involved in its preparation. The Plan aims at improving a number of points, including the digital skills of teachers and pupils, and at fostering digital infrastructure, ecosystem and digital education. First activities have already been launched, notably as part of the RRP. For example, Slovenia published a [call](#) at the end of 2022 which is expected to provide 20 000 teachers and principals (around 40% of all Slovenian teachers), with an average of 13 days of training in digital skills, sustainability and financial literacy by mid-2026. A consortium responsible for the training programmes has been selected.

An example of learning and training activities for pupils is the workshop for primary school children 'Safety on the Internet'. Around 20 000 pupils learned in five workshops about online safety, fake news and responsible interaction with online media. Furthermore, Slovenia promoted coding and digital literacy for pupils in CodeWeek 2022 with 145 activities (including 95 in schools) with around 3 400 participants. Only 43% of the participants were girls, which is one of the lowest shares in the EU. Digital skills are expected to become a more systematic part of school education when the curriculum reform will be implemented until the end of 2025.

Slovenia scores around the EU average in advanced digital skills, but it scores far behind the Member States that are innovation leaders. Recruiting a sufficiently skilled workforce remains a challenge for enterprises in Slovenia. After a steady increase in recent years, the share of ICT specialists in total employment decreased compared with the last reporting period (4.5% vs. 4.8%). Furthermore, after scoring at or above the EU average in recent years, Slovenia's share of ICT specialists is now slightly below the EU average of 4.6%. The share of ICT graduates remains above the EU average (4.5% vs. 4.2%) and increased compared with the last reporting period, after a recent

stagnation. Slovenia scores just above the OECD average for ICT bachelor graduates, but its share is lower for master and doctorate graduates²³². The country has a slightly lower share of female ICT specialists than the EU average (17.6% vs. 18.9%). Moreover, Slovenia is in very strong need of additional ICT specialists: 78% of Slovenian enterprises reported difficulties in recruiting ICT specialists, which is the highest percentage in the EU (EU average is at 63%). In its strategy Digital Slovenia 2030, the country aims to have 6% of employed ICT specialists in the workforce by 2025 and to reach the EU target of 10% in 2030²³³. Regarding gender balance, Slovenia aims at 20% female ICT specialists by 2025 and 25% by 2030.

Slovenia is currently implementing several programmes and initiatives to address the need for a more digitally skilled workforce. To identify, forecast and meet labour market needs, Slovenia is putting into place a Platform for Competence Prediction. The Ministry of Labour, Family, Social Affairs and Equal Opportunities is implementing the project, which is co-financed with EUR 800 000 by the European Social Fund, together with public employment services. It includes short-, medium- and long-term forecasting (i.e. covering a timespan between below one year and up to 10 years) of job and skills needs. Moreover, it aims at establishing institutional cooperation between key stakeholders to further develop lifelong education policies and career guidance. In 2022, a job vacancy search engine was added to the platform, which, on top of its original functionality, also provides an overview on short-term trends and data for short-term forecasts. The first implementation phase was finalised in March 2023 and is expected to be continued in the Operational Programme for the Implementation of European Cohesion Policy.

In addition, Slovenia implements measures in the area of up- and reskilling, e.g. it continues to implement the SME funding programme to enhance the digital skills of SME employees. The programme has a total budget of EUR 1.3 million. It started in 2021 and plans to finance 200 projects with grants of up to EUR 10 000 (capped at a maximum of 60% of the total investment) in micro enterprises and SMEs in less developed areas. These grants are supporting investment in technology equipment, digitalisation of production, the transition to a low-carbon economy and the skillset required to implement the projects in question. Since Q2 2022, around EUR 2 million has been invested in more than 370 projects. In March 2022, Slovenia adopted a Resolution on the National Programme of Adult Education to make adult education offer more flexible, including the introduction of short-cycle ICT courses leading to micro-credentials. In the context of an Inter-ministerial Working Group, Slovenia is trying to identify and remove obstacles to the fast recruitment of highly skilled foreign ICT specialists. Concrete actions include the amendment of several laws, e.g. the [amendment](#) of the Employment, Self-Employment and Work of Foreigners Act at the end of March 2023, and the preparation of a fast-track visa for highly skilled workers.

In addition, the private sector recently launched a number of activities to tackle the lack of ICT specialists, notably by raising awareness of the need for digital skills in different industries. In 2022, the ICT Association of Slovenia performed an analysis of the ICT labour market and made some proposals to increase the number of ICT specialists by 2030, including reforming the education system and facilitating the employment of foreign professionals. Moreover, the ICT Association started education programmes to increase digital skills of workers in areas such as artificial intelligence and agile programming in 2022.

²³² OECD Economic Survey: Slovenia 2022. In 2019, the share of ICT graduates of bachelor's degree courses was 4.6% (OECD average 4.4%) and 2.2% (OECD average 3.7%) for master's and 2.5% (OECD average 3.5%) for doctorate levels.

²³³ The 20 million target represents about 10% of total employment.

Best practice: Mobile Heroes

Mobile Heroes is a 'classroom on wheels' that provides educational courses to elderly people to help them develop/increase their basic digital skills. The courses cover basic digital skills and individual support in the use of digital tools and devices like computers and smartphones. Furthermore, awareness-raising for the challenges posed by digital tools and their safe use are part of the courses. *Mobile Heroes* provides support to a population group that has a generally lower digital literacy knowledge and lower basic digital skills. It therefore contributes to the Digital Decade objectives that are linked to digital citizenship. The *Mobile Heroes* pilot project started in autumn 2022 and 19 workshops with 270 participants in 19 locations (including rural areas) have taken place so far. Activities currently being planned include a training programme in digital competences for at least 4 000 people aged 55 and older in all Slovenian municipalities.

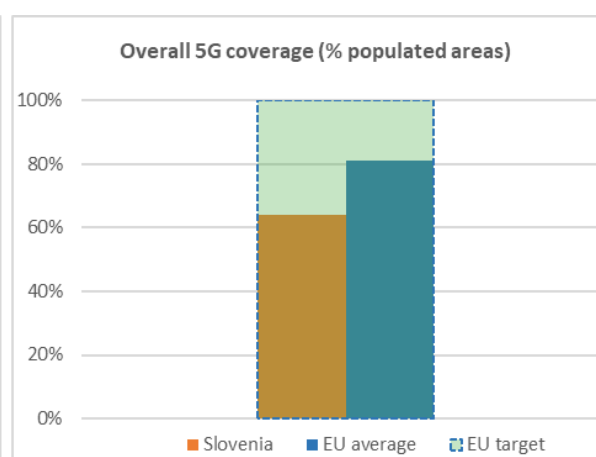
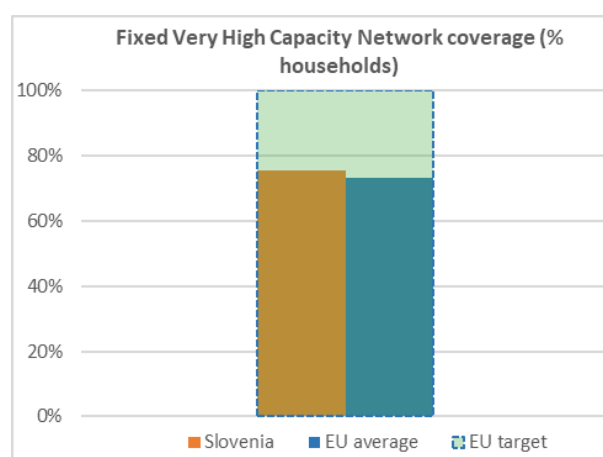
Slovenia should accelerate its efforts in the area of digital skills. Notably, Slovenia should increase the level of basic and, in particular, advanced digital skills to allow its population and economy to make full use of the potential of the digital transformation. It should strengthen early identification of labour market needs and further complement them by additional and quicker reactions, especially in digital upskilling-and reskilling and adapting the (higher) education curricula to the latest digital needs. A further reinforced collaboration between industries, (higher) education institutions, the public administration and relevant stakeholders can increase the effectiveness of those actions²³⁴.

²³⁴ The recommended policies, measures, and actions in this document reflect the Commission Communication 'Report on the state of the Digital Decade' COM(2023) 570.

2 Digital infrastructures

Slovenia's size, its sparsely populated rural areas and its topography complicate the broad development and availability of digital infrastructure. Rural areas very often lack gigabit connectivity. However, despite the comparatively small size of the country and its economy, Slovenia is very active, including in multi-country projects, in developing the infrastructure for advanced technologies like semiconductors, quantum computing and blockchain.

	Slovenia			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up	33%	43%	52%	55%	
% households	2020	2021	2022	2022	
2a2 At least 1 Gbps broadband take-up	<0.1%	<0.1%	4.5%	13.8%	
% households	2020	2021	2022	2022	
2a3 Fixed Very High Capacity Network (VHCN) coverage	66%	72%	76%	73%	100%
% households	2020	2021	2022	2022	
2a4 Fibre to the Premises (FTTP) coverage	66%	72%	76%	56%	
% households	2020	2021	2022	2022	
2b1 Mobile broadband take-up	75%	87%	87%	87%	
% individuals	2018	2021	2021	2021	
2b2 Overall 5G coverage	0%	37%	64%	81%	100%
% populated areas	2020	2021	2022	2022	
2b3 5G spectrum	98%	98%	98%	68%	
Assigned spectrum as a % of total harmonised 5G spectrum	2021	2022	2023	2023	



Slovenia shows a varied picture for fixed broadband coverage: The very high capacity network (VHCN) coverage has been steadily increasing over the last reporting periods and the fibre coverage is considerably above the EU average. However, a significant gap persists between rural and urban areas. The coverage of fixed VHCN is, with 76% of households covered, slightly above the EU average of 73%. However, despite some progress made with this indicator, a considerable gap still exists between urban and rural areas, where only around half of the households are covered by fixed VHCN (51% compared with 46% in the last reporting period) and where the country's topography is a challenge. Concerning Fibre to the Premises (FTTP) coverage, Slovenia ranks well above the EU

average of 56%, with 76% of households covered. The percentage of households with fixed broadband take-up of at least 100 Mbps (megabits per second) has again increased significantly, in line with the trends of the previous reporting periods, and is now very close to catching up with the EU average. In 2022, Slovenia registered a remarkable improvement concerning the percentage of households with a take-up of at least 1 Gbps (gigabit per second), which went from a negligible 0.02% in 2021 to 4.5% in 2022. In spite of the progress registered in this area, Slovenia is still considerably below the EU average of 13.8% for this indicator.

The [Plan for the development of gigabit infrastructure until 2030](#) was approved by the Government in August 2022. It sets several strategic goals regarding the development of Gigabit infrastructure and is aligned with the Digital Decade targets, including:

- Gigabit connectivity for all major socio-economic drivers, such as schools, cultural institutions, transport hubs and major public service providers, and digital-intensive businesses by the end of 2025;
- 100 Mbps internet access, upgradeable to Gigabit speeds, for all rural and urban households by the end of 2025;
- Gigabit connectivity for all households, businesses and other socio-economic drivers in rural and urban areas by the end of 2030.

One of the major recent regulatory developments relates mainly to the transposition into the Slovenian regulatory framework of the European Electronic Communications Code (Directive (EU) 2018/1972), which was finalised in October 2022 with the approval of ZEKom-2. The approval and entry into force of ZEKom-2 will also facilitate the implementation in Slovenia of the 21 best practices (out of 39) of the Connectivity Toolbox that are not implemented yet, pending the approval of the law.

Under its RRP, Slovenia put forward investments for the deployment of gigabit infrastructures through dedicated reforms and investments in rural areas.

For mobile coverage, Slovenia also shows a mixed picture: despite a considerable improvement in 5G coverage, the country is still far below the EU average. But the coverage with essential bands to enable advanced applications that require large spectrum bandwidth is well above the EU average. Notable improvement has been made concerning the overall 5G coverage which has increased by 27 percentage points since last year (from 37% to 64%), but it is still below the EU average of 81%. However, for 5G coverage on the 3.4-3.8 GHz pioneer spectrum bands, Slovenia scores well above the EU average (55% vs. 41%). The 3.4-3.8 GHz bands are essential for enabling advanced applications requiring large spectrum bandwidth. As for fixed broadband coverage, there is also still a gap between urban and rural areas for overall 5G coverage, for which the overall 5G coverage score is only 14.1%. Since the 98% of the overall available spectrum was already assigned in 2021, this indicator is expected to rapidly increase in the coming years. Further assignment of spectrum is planned in 2023. The mobile broadband take-up is in line with the EU average and has consistently been growing over the last three reporting periods. As part of the Plan for the development of gigabit infrastructure until 2030, Slovenia has set strategic goals for 5G coverage, which are aligned with the Digital Decade targets. These goals include uninterrupted 5G coverage for all urban areas and all major land transport routes until the end of 2025 and 5G network coverage for all populated areas by the end of 2030.

In relation to the multi-country projects, Slovenia has examined the opportunity of a 5G cross border study project with a consortium of neighbouring countries. This resulted in two projects applying to CEF DIGITAL 5G cross border corridor calls. With Italy, a project covering three border crossings where one is on TEN-T roads, and with Croatia, a project covering one border crossing on TEN-T road

are being prepared. Universities, road operators and telecom operators from both countries are involved in the projects.

Slovenia has made significant progress in the latest reporting periods as regards regulatory developments. The transposition of the Electronic Communications Code in October 2022, together with other regulatory and market developments, represents a milestone for the modernisation and competitiveness of the Slovenian electronic communications sector and will support Slovenia's contribution to achieve the EU's Digital Decade targets on connectivity.

The objective of this multi-country project is to increase the resilience of the semiconductor value chains. In the context of its RRP, Slovenia plans to support this multi-country project and submitted the [list of six potential project participants](#) in April 2022. On top of its multi-country project contribution, Slovenia is preparing the ground for additional bilateral collaboration activities with other Member States, in particular, Austria, Italy and Belgium (the latter with the research and development organisation Interuniversity Microelectronics Centre, IMEC).

Slovenia is also launching activities to establish an ecosystem of stakeholders, which are mostly active in semiconductor design and highly specialised electronic board production. A small number of companies are active in chips design and a few smaller chips-user companies are mainly active in the manufacturing of printed circuit board. Furthermore, some research institutes and university faculties are involved in chip research and development. Slovenia is planning to support the project Chips.SI, which is a competence centre for microelectronics, sensor systems and integrated photonics and optoelectronics to support the ecosystem.

Slovenian's main contribution to the **edge nodes target** so far has been the participation in the multi-country project on Common Data Infrastructure and Services (see 'Digitalisation of businesses' for more details).

Slovenia is involved in a few multi-country projects and initiatives on quantum computing. The country is a member of the European High Performance Computing Joint Undertaking (EuroHPC JU) and plans to co-finance a quantum computer consortium to strengthen the quantum computing capacities with EUR 1 million at a location selected by the EuroHPC. Slovenia is also participating in the European Quantum Communication Infrastructure (EuroQCI) and will implement (until 2026) a project that aims at developing a national network and ecosystem for quantum key distribution. The total budget of the project is planned to amount to EUR 6 million. In the first phase of the project, which started in early 2023, a national QCI network is developed and connected with networks of neighbouring countries. In a second phase, the plan is to connect the QCI network via an optical ground station to satellites. A part of the project features as an investment under the RRP. Moreover, in 2022, Slovenia launched the research programme Physics of quantum technologies in order to build a quantum infrastructure in Slovenia in collaboration with industry, public sector and government stakeholders.

Slovenia is very active in blockchain, including by being involved in several initiatives and multi-country projects. In addition to the formal application to set up the European Blockchain Partnership and the EDIC on European Blockchain Infrastructure, Slovenia participates in four European Blockchain Infrastructure (EBSI) projects that were selected in the Digital Europe Programme call in 2022. First, the Traceability Reference Architecture Conformant (TRACE4EU) project led by Slovenia with more than 50 participating European organisations and companies from 15 Member States will design and implement solutions for trustworthy products (e.g. traceability of metals for battery production) and data traceability (e.g. customer data retrieval for identification, and 'know your customer' (KYC)). The more general objective of this project is to create an "umbrella architecture" based on existing EBSI services. Second, the EBSI-enabled verifiable credentials and trusted

organisations registries (VECTOR) project will allow self-sovereign identity technologies in education and social security in 20 participating countries (i.e. users will be able to self-manage their digital identities without depending on third-party providers to store and manage data). Third, the EBSI Nodes Expansion consortium aims to reinforce the robustness and maturity of the EBSI production network by increasing the number of validator nodes by 18 and by providing support services by 24 entities across 15 European Member States. Fourth, the European Digital Identity Wallet (EUDIW) will establish cross-sectoral and cross-border cases in the areas of identity, signature, education credentials and social security (e.g. issuance of A1 document confirming the country in which an employee currently pays for social security contributions).

Slovenia is contributing to the Important Project of Common European Interest (IPCEI) on Microelectronics and Communication Technologies ecosystem with associate participants (receiving aid below the GBER threshold).

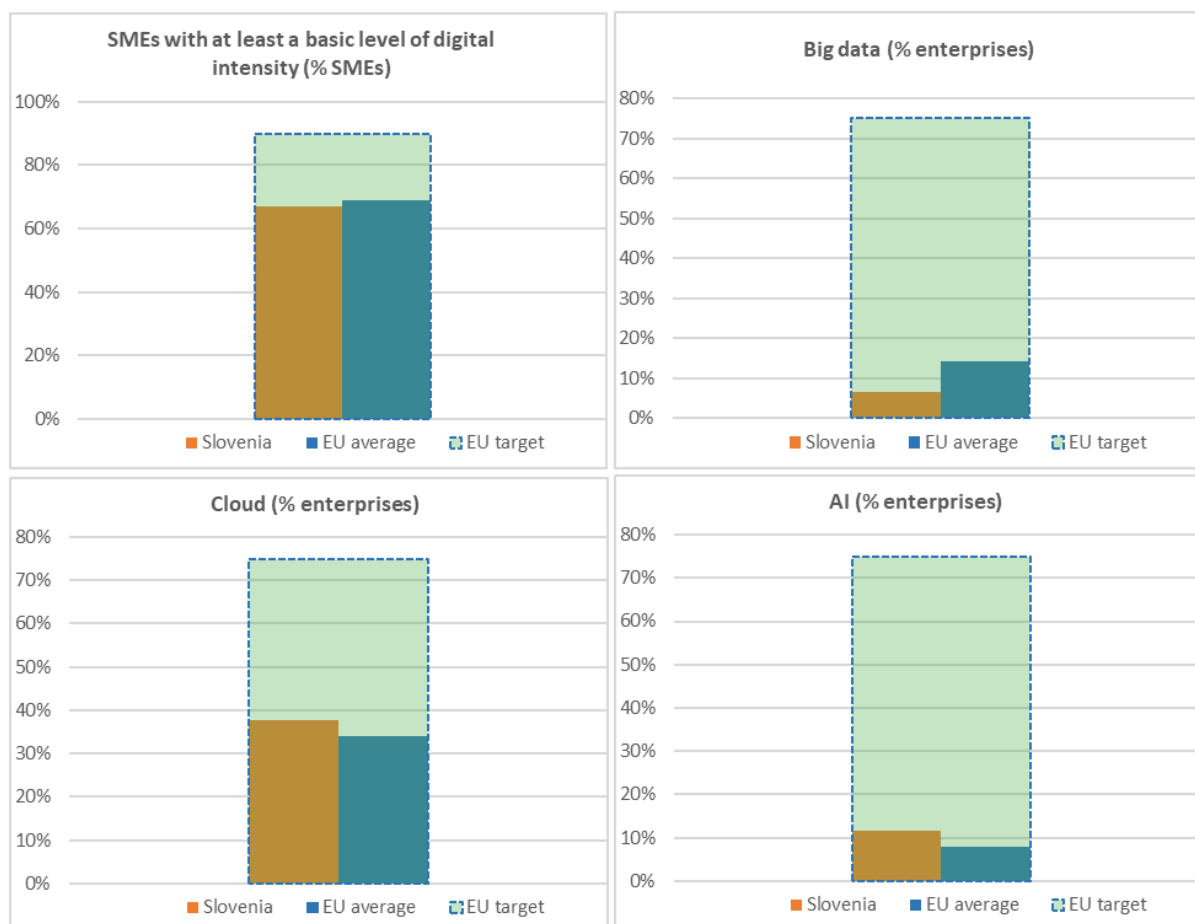
Slovenia should accelerate its efforts on connectivity infrastructure. It should continue and complement the efforts to address the connectivity challenges, especially in rural areas. Moreover, Slovenia's activities, including in multi-country projects, in the development of the infrastructure for advanced technologies like semiconductors, quantum computing and blockchain should be sustained in order to help the EU become a strong market player in these areas.

3 Digitalisation of businesses

Slovenia has high ambitions for the digitalisation of businesses. In the context of its [Strategy for the Digital Transformation of the Economy](#), adopted in January 2022 as a reform under the Recovery and Resilience Plan, the country declares its aspiration to make a significant contribution to the collective efforts to achieve the Digital Decade targets on the digitalisation of businesses.

	Slovenia			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	67%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	33%	36%	36%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	24%	30%	30%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	7%	7%	7%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud²³⁵	NA	38%	38%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	12%	12%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	58%	58%	58%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	17%	19%	19%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	12%	14%	13%	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	12%	13%	13%	9%	
% SMEs	2019	2021	2021	2021	

²³⁵ Enterprises buying sophisticated or intermediate cloud computing services indicator, see [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).



Slovenia scores well on the use of the advanced technologies artificial intelligence (AI) and cloud services in enterprises, but is far behind as regards enterprises analysing big data. The country scores above the EU average for AI (12% vs. 8%) and cloud services (38% vs. 34%). However, based on data from 2020, the share of enterprises analysing big data is only half as high and Slovenia is fifth last in the EU. Big data analysis is a relevant basis for several other advanced technologies, so this low performance could be one possible explanation for the observation of the Institute of Macroeconomic Analysis and Development of Slovenia that the use of several digital technologies and tools (e.g. CRM systems) remains a challenge for Slovenian enterprises, especially for SMEs²³⁶. The OECD has also highlighted the relevance of data collection and analysis for a more comprehensive digital transformation and wider use of advanced technologies in Slovenia²³⁷. In its 'Digital Slovenia 2030' strategy, Slovenia states its – considering its starting point ambitious – goal of 35% of enterprises using AI, 30% using big data and 50% using cloud in 2025 and to reach the EU target of more than 75% of enterprises using artificial intelligence, big data or cloud in 2030 for all the three technologies.

Measures in the Slovenian RRP are expected to contribute to the increase of the use of the advanced technologies in enterprises, including AI, cloud services and big data analysis. The RRP investment Industrial/Business Digital Transformation Programme will support the use of advanced technologies in SMEs and large companies– of which at least EUR 10 million will be dedicated to SMEs. Furthermore, the measure is expected to support the Digital Decade objectives linked to sustainability. According to the Slovenian authorities, some projects are intended to contribute to

²³⁶ [Institute of Macroeconomic Analysis and Development of Slovenia: Productivity Report 2022.](#)

²³⁷ [OECD Economic Surveys Slovenia, 2022.](#)

lower greenhouse gas emissions and address climate change. In total, [23 consortia](#) (each composed of at least one large company acting as leading project partner and at least two SMEs or start-ups/scale-ups) were selected in September 2022 and the preparation of the project launch, i.e. the signing of the contracts with the leading project partners, took place in December 2022. According to the Slovenian authorities, the projects must use at least three of the following advanced technologies: robotics and/or process automation, Internet of Things (IoT), AI, blockchain/distributed ledger technology, digital twins, cloud computing, big data, quantum computing, virtual, enriched or augmented reality or 3D printing.

Particularly relevant for the cloud uptake target is the Slovenian participation in the multi-country project on Common Data Infrastructure and Services, as part of its RRP. The project aims to develop and deploy the next generation of advanced, distributed, secure, sustainable and innovative cloud-to-edge capabilities. These activities are therefore expected to support advanced cloud uptake among Slovenian enterprises and Slovenia's efforts to contribute to the Digital Decade cloud uptake and edge nodes target.

The private sector has also launched a few activities to support enterprises in their uptake of advanced technologies. One example is the [Ai4si](#) initiative, led by the ICT Association of Slovenia, which promotes the uptake of AI in the economy and is intended to support a faster knowledge transfer from research into businesses. Representatives from businesses, state administrations and research institutes organise workshops and seminars (e.g. a [Machine Learning Academy for Business Applications](#)), and provide information material (e.g. a [guide to introduce AI to SMEs](#)) which helps SMEs to identify opportunities, challenges and the first steps to implement AI.

Slovenia scores fairly well in the digitalisation of SMEs. The country scores slightly below the EU average for SMEs with at least a basic level of digital intensity (67% vs. 69%) and is a mid-performer when it comes to SMEs' share and turnover in selling online. However, the country is in the EU top 5 for SMEs selling cross-border online (13% vs. 9%) as well as for enterprises sending e-invoices (58% vs. 32%). In its 'Digital Slovenia 2030' strategy, Slovenia aims at 65% of SMEs having at least a basic level of digital intensity by 2025 and reaching the EU target of 90% of SMEs in 2030²³⁸.

Slovenia is currently mainly continuing to implement measures that were in preparation or launched previously to support SMEs in increasing their level of digital transformation. As part of the RRP reform 'Strategy for the Digital Transformation of the Economy', Slovenia is laying out strategic orientations to increase the development and use of advanced digital technologies, to develop a supportive business ecosystem and framework conditions. Moreover, the Slovene Enterprise Fund implemented in 2021 a voucher system which continues to support the digital transformation of SMEs with grants of up to EUR 10 000 (amounting to a maximum of 60% of eligible costs per voucher) to help them prepare a digital strategy, gain knowledge in digital marketing (e.g. online shop), acquire digital skills (training for at least 20% of a SME's employees) or improve cybersecurity (e.g. system security screening). This measure covers a rather selective range of digitalisation activities, but it can contribute to address the issue that the ICT investments in Slovenia are below the OECD average²³⁹. So far, SMEs have received around 3 700 vouchers, a large majority focusing on digital marketing. The Digital Innovation Hub Slovenia is closely involved in the voucher

²³⁸ The Slovenian target values are based on the Digital Economy and Society Index 2022 indicator data, where 55% of Slovenian SMEs had at least a basic level of digital intensity. There is a break in series for this indicator, therefore no comparison of indicator results are possible between 2022 and 2023.

²³⁹ [OECD Economic Surveys Slovenia, 2022](#). The OECD explains that one possible reason for low investment could be that SMEs have limited access to external funding for investment in ICT.

programme, notably it developed a [digital maturity assessment](#) that is used in this context and evaluated the programme's impact in 2022. The evaluation will inform the following programmes.

In addition, two European Digital Innovation Hubs (EDIHs), multi-country projects selected under the Digital Europe Programme with a funded budget of EUR 3.2 million, will support the digital transformation of SMEs. One of the EDIHs targets manufacturing businesses and public organisations with a focus on high performance computing, artificial intelligence, cybersecurity, blockchain and robotics ([Smart, resilient and sustainable communities \(SRC-EDIH\)](#)) and the other EDIH supports the digital transformation of SMEs in the manufacturing, agrifood, health and tourism sector via several advanced technologies ([Digital Emergency Response for Slovenia \(EDIH DIGI-SI\)](#)). Another additional EDIH proposal received a Seal of Excellence ([Public, Private, People, Partnership Digital Innovation Hub \(4PDIH\)](#)) and will support industry, public administration and communities in building digital skills and innovative processes. Examples of concrete activities proposed by the EDIHs are 'test before invest', short-term advanced digital courses and training and network building occasions. The EDIHs are part of a European network which will soon include over 200 hubs covering all EU regions (plus Iceland, Norway and Lichtenstein), sectors and technologies.

In addition, the private sector launched some activities to support companies in their digital transformation. For example, the Chamber of Commerce and Industry and the ICT Association of Slovenia organise the annual [GoDigital](#) conference. The 2022 conference focussed on the opportunities and success factors for the digital and green transition. As part of the conference, an expert panel selected the best digital project of the year for the GoDigitalAward. The winner produces mobile homes and buildings and won the award because of the IT system monitoring of its production processes, which contributed to increasing the efficiency of the production line by 30% in the past two years. Another event dealt with cybersecurity. Furthermore, the ICT Association of Slovenia also provides training and helps companies to use e-invoicing and other e-documents to digitalise the B2B process via its [Centre for promotion of e-business](#).

There is still neither a unicorn²⁴⁰ nor a potential future unicorn in Slovenia²⁴¹ and there is room for improvement in the commercialisation of R&D in the ICT sector. The R&D intensity of the Slovenian ICT sector is below the EU average²⁴². The quality of the scientific research in computer science is comparable to OECD peers, but only 6.2% of IP5 patents (i.e. patents filed in at least two patent offices worldwide, including one of the five largest IP offices) concerned ICT-related technologies – which is less than a third of the OECD average. Furthermore, fewer new firms are created – the share of start-ups (up to 2 years old) in the business environment is nearly 10% lower than the OECD average²⁴³.

An additional hindrance is the lack of access to finance, notably equity, for start-ups and scale-ups. Venture capital investment in Slovenia amounts to 0.003% of GDP, which is the lowest value in the EU (the EU average is 0.074%).²⁴⁴ Slovenian enterprises rely heavily on bank credits, which are structurally not very well suited to financing new and riskier digital start-ups and companies with

²⁴⁰ Based on data from Dealroom (date of extraction 16/01/2023). Unicorn is an undertaking founded after 31 December 1990 which had an initial public offering or trade sale above USD 1 billion or an undertaking that has been valued at over USD 1 billion in its last private venture funding round, including where the valuation has not been confirmed in a secondary transaction.

²⁴¹ Based on data from Dealroom (date of extraction 24/02/2023). A potential future unicorn is a start-up with a market valuation between EUR 100 million and EUR 1 billion.

²⁴² JRC (2022): PREDICT Dataset: The EU ICT sector and its R&D performance.

²⁴³ [OECD Economic Surveys Slovenia, 2022](#).

²⁴⁴ Invest Europe May 2022.

innovative business models, but little collateral²⁴⁵. Related to this, stock market capitalisation of listed domestic companies remains lower than in other Member States²⁴⁶.

The above challenges are also reflected in the Strategy for the Digital Transformation of the Economy and Slovenia has set out objectives and concrete actions to address them. For example, it intends to increase the number of digital patents and the share of private funding of digital start-ups and scale-ups by 30% over the next five years. The Slovenian RRP includes measures that are expected to contribute to this: an Act on Forms of Alternative Investment Funds entered into force in August 2022 to improve access to finance and the functioning of the capital markets in Slovenia. In addition, the RRP includes the adoption of a [Capital Markets Development strategy](#) setting out specific measures to further develop the capital markets in the country. According to the Slovenian authorities, the strategy was adopted in March 2023. To improve the efficiency and the coordination of the Research, Development and Innovation (RDI) governance in Slovenia, the Act on Research, Development and Innovation Activities entered into force in January 2022. When it comes to concrete funding programmes, Slovenia provided grants, seed capital and non-financial support, including mentoring and training, mainly via the European Regional Development Fund 2014-2020.

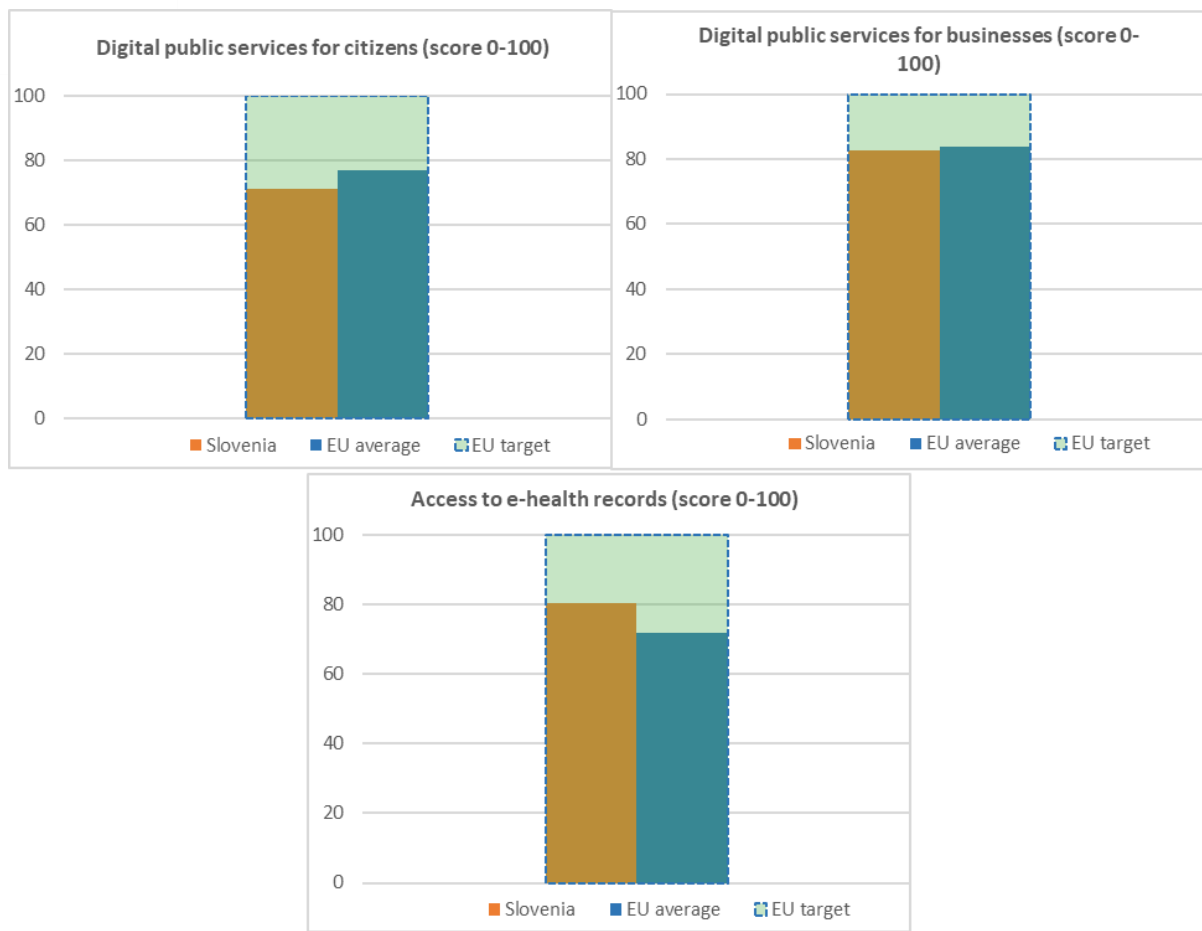
Slovenia should continue implementing its policies in the area of digitalisation of businesses, in particular by quickly implementing and complementing the efforts to provide supportive framework conditions, including a highly skilled workforce, especially for SMEs and start-ups.

²⁴⁵ [OECD Economic Surveys Slovenia, 2022](#).

²⁴⁶ Worldbank, [World Federation of Exchanges database](#) (accessed on 3 April 2023), measured in % of GDP.

4 Digitalisation of public services

	Slovenia			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	81% 2022	74% 2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	69 2021	71 2022	77 2022	100
4a3 Digital public services for businesses Score (0 to 100)	NA	84 2021	83 2022	84 2022	100
4a4 Pre-filled forms Score (0 to 100)	NA	68 2021	72 2022	68 2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	62 2021	64 2022	65 2022	
4a6 User support Score (0 to 100)	NA	80 2021	82 2022	84 2022	
4a7 Mobile friendliness Score (0 to 100)	NA	90 2021	94 2022	93 2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	80 2022	72 2022	100



Slovenia performs fairly well on the digitalisation of public services. In 2022, Slovenia made several new digital services available to citizens, in the category of family life events (e.g. [parental leave](#) and [allowance](#)). However, Slovenia still performs below the EU average for digital public services for citizens (score of 71 vs. 77). The country is very close to the EU average for digital public services for businesses (score of 83 vs. 84). There is a generally high level of online interaction with public authorities in Slovenia. The share of e-Government users is well above the EU average (81% vs. 74%), although the possibility to communicate electronically-only with citizens and entrepreneurs via email is below the EU average (score of 44 vs. 76)²⁴⁷. In its 'Digital Slovenia 2030' strategy, Slovenia aims at a score of 85 for digital public services for citizens and businesses and to reach the EU target of 100 in 2030.

The [Digital Public Services Strategy 2021-2030](#) is a key measure that lays out strategic orientations to improve the governance of the digital transformation in the public administration. More concretely, it intends to provide user-friendly, simple, interoperable and secure digital services and to provide the public administration with the necessary tools for better services and decision making. The strategy was adopted in December 2022 and is part of the reform related to the strengthening of the governance of the digital transformation of the public administration in the Slovenian RRP. According to the Slovenian authorities, it will be further operationalised with an Action Plan that will include concrete measures with a timeline and attributed budget for a period of 2-3 years. The Action Plan is currently being prepared and expected to be adopted soon.

²⁴⁷ [eGovernment benchmark 2022](#), Factsheets.

Slovenia is implementing several projects to improve its IT infrastructure: For example, in the context of the European High Performance Computing Joint Undertaking, the Ministry of Public Administration promoted the use of high-performance computing technology in public administrations, including by inviting state administration employees to training courses and events on this topic– the project concluded at the end of 2022 and had a budget of around EUR 50 000.

Slovenia scores above the EU average on the access to electronic health records for its citizens (score 80 vs. 72). Apart from private mental health facilities, citizens are provided with relevant health-related information from most public and private healthcare providers. Citizens are required to use a two-factor authentication with a nationally notified eID scheme to get access.

The [e-health Strategy 2022-2027 – e-health for a healthier society](#), sets out the objectives and priorities for a national e-health framework. It was published in November 2022 and has the components governance model (a high-level organisation structure including national and local level), strategic orientations for funding, user-centric and supporting services, IT infrastructure including common standards to develop electronic health records, workforce with digital skills and legislation to adapt the legal framework so as to implement the strategy. Furthermore, the strategy sets out the modalities for introducing a common electronic health card and a remote health framework (telemedicine), and for facilitating the exchange and flow of data. The strategy was developed with the support of the European Commission’s Technical Support Instrument. Moreover, in Q1 2023, the Ministry of Health updated the Central Registry of Patient Data with new data and functionalities (e.g. integrate demographic patient data, attribute-based access control and national language processing text search). The measure is expected to contribute to prepare the way for a further increase in the availability of electronic health records.

The issuance of an electronic identity card, part of the Slovenian RRP, was launched in March 2022 and was notified under the eIDAS regulation in May 2023. The card is notified at level of assurance ‘high’ and can be used for authentication and qualified electronic signatures via an eID card reader. In addition, the mobile app [eOsebna](#), which also serves as an eID card reader, was launched to allow the contactless use of the card using NFC (Near Field Communication) at the end of 2022. The budget for the app’s development is around EUR 100 000. The card can be used as a health insurance card since April 2023 and this use case is expected to help increase the use of the eID card. Slovenia also collaborates with other Member States in this area. The Ministry of Digital Transformation participates in the European project [Potential](#), which aims at implementing and testing the European Digital Identity Wallet for different public services, including cross-border, use cases. Slovenia participates in the SIM eRegistration pilot.

The Strategic orientations in several areas that are relevant for the digitalisation of public services were recently adopted.

Slovenia should accelerate its efforts to digitalise public services. In particular, it should quickly translate the strategic orientations, in a participatory manner (e.g. including user feedback), into ambitious and concrete measures to provide efficient and user-friendly digital online services.



Digital Decade Country Report 2023

Spain

Introduction

Spain is expected to make a positive contribution to the collective efforts to achieve the EU's Digital Decade targets, given its large population share in the EU, and its dynamic evolution on digital transformation. The Spanish authorities have made significant endeavours in recent years, laying the foundation for an ambitious digital transformation of the Spanish economy. Spain is making significant progress in all four dimensions to address its main digital challenges.

Spain presented the 'Digital Spain 2026' strategy in 2022 as an update of the previous 'Digital Spain 2025'. The aim of the strategy is to promote the country's digital transformation through a set of reforms and significant public and private investments, aligned with the EU's Digital Decade Policy Programme and the [European Declaration on Digital Rights and Principles for the Digital Decade](#).

Spain is collaborating with other Member States in exploring the possibility to establish **European Digital Infrastructure Consortium (EDICs)** on: (i) the Alliance for Language Technologies, to develop a common infrastructure in the field of natural language processing and to develop large multi-language models; (ii) Genome, to enable effective and secure cross-border access to repositories of personal genomic datasets; (iii) and the Networked Local Digital Twins Towards CitiVerse project, using disruptive and immersive technologies for future city related projects.

On the promotion of digital rights to put people at the centre of the digital transformation, following adoption of the Charter of the Digital Rights in July 2021 Spain has been taking the lead on this issue in international forums such as the OECD and the General Secretariat for Ibero-America, which recently adopted the Ibero-American Charter of Digital Rights.

Digital in Spain's Recovery and Resilience Plan (RRP)

Spain's RRP, with a total budget of up to EUR 69.5 billion in transfers, contains an ambitious set of reforms and investments in digital and assigns 28.2% of the allocation to digital (EUR 19.6 billion), including an expected EUR 18.8 billion²⁴⁸ to help meet the Digital Decade targets.

In the context of the payment of the first RRF instalment, Spain satisfactorily fulfilled 52 milestones and targets. A number of them were related to measures in the area of digital and notably concerned major reforms and strategies to facilitate the digital transition of Spain's economy and society (i.e. the adoption of the [Digital Spain 2025 strategy](#); the [National Digital Competences Plan](#); the [strategy for the promotion of 5G technology](#); the [SME Digitalisation Plan 2021-2025](#); the [national AI strategy](#); and the [Plan for the Digitalisation of Spain's Public Administration 2021-2025](#)).

For the second instalment, on 30 April 2022, Spain submitted to the Commission the payment request based on the achievement of 40 milestones and targets, including some relevant measures on: 1) 5G spectrum and deployment (i.e. assignment of the 700 MHz band and the legal act on 5G spectrum reduction taxation); 2) digital skills and education ([#CompDigEdu](#), [#EcoDigEdu](#) and [Royal Decree 640/2021](#)); 3) adoption of eight agreements on supplementary R&D&I plans ([Royal Decree](#)

²⁴⁸ Each Recovery and Resilience Plan must assign at least 20% of its total allocation to digital objectives. The plans therefore had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or not at all (0%) towards digital objectives, using Annex VII of the RRF Regulation. Combining the coefficients with the cost estimates of each measure makes it possible to assess to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to make it possible to estimate the possible contribution of RRF measures to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice to potential ongoing revisions of the plan.

[991/2021 of 16 November 2021](#) and [Royal Decree 287/2022 of 19 April 2022](#)); and 4) Spain's [Charter of Digital Rights](#).

On the third instalment, on 11 November 2022, Spain submitted to the Commission the payment request based on the achievement of the 29 milestones and targets, including the entry into force of Spain's General Telecommunications [Law 11/2022 of 28 June](#); General Audiovisual Communication [Law 13/2022 of 7 July 2022](#); [Law 17/2022 of 5 September](#) on Science, Technology and Innovation digitisation; and [Organic Law 3/2022 of 31 March 2022](#) on the organisation and integration of vocational training. A measure on the promotion of major cultural services was also undertaken.

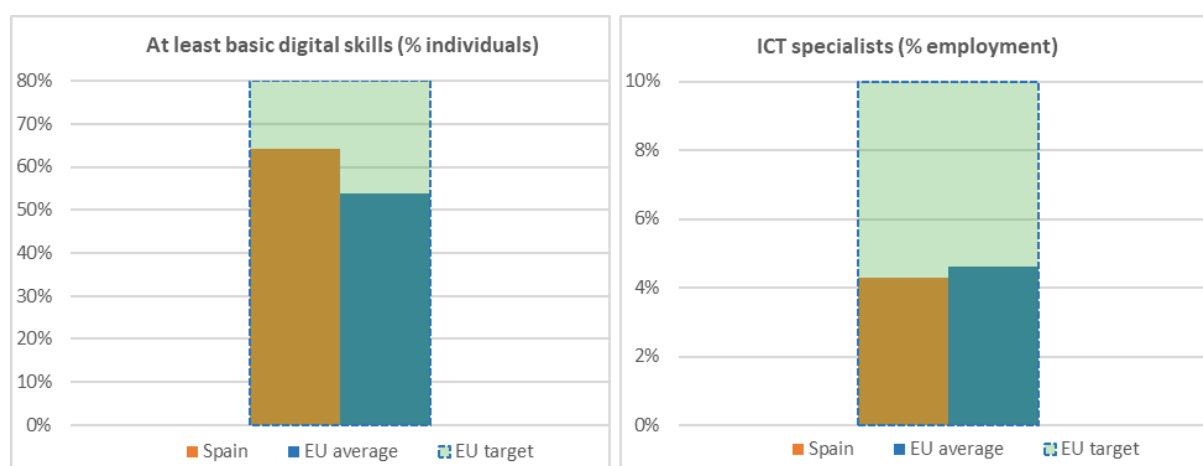
Regarding the 58 milestones and targets of the fourth instalment that are meant to be fulfilled in 2022²⁴⁹, there is a wide range of digital measures such as: [Royal Decree-Law 7/2022 of 29 March](#) on 5G cybersecurity; the [Start-up Law](#); the assignment of the 26 GHz band; the release of the National Cybersecurity Industry Support program; and the budget commitment of investments under both the [Kit Digital](#) and [Agents of Change](#) programmes; among other measures.

In June 2023, Spain submitted its [addendum](#) to the RRP (reinforcing its digital dimension) which is currently being reviewed by the Commission.

²⁴⁹ Compliance and fulfilment of the milestones and targets laid down in the fourth instalment will be assessed by the Commission once Spain formally submits the related payment request.

1 Digital skills

	Spain			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	91%	92%	93%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	64%	64%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	38%	38%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	74%	74%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	20%	20%	21%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	3.9%	4.1%	4.3%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	4.2%	4.0%	4.8%	4.2%	
% graduates	2019	2020	2021	2021	



Spain performs well on digital skills, especially on ‘at least basic’ digital skills (64% of the population) and is making progress towards achieving the Digital Decade targets. However, efforts are still needed to equip more than one third of Spain’s population with basic digital skills. Spanish users use regular internet (93%) and have at least basic digital content creation skills (74%). The percentage of enterprises providing ICT training (21%) is slightly below the EU average (22%) and the percentage of **ICT specialists (4.3%) is growing slowly in alignment with the path registered in the EU but is still below the EU average (4.6%)**. The lack of ICT specialists is partly being addressed as the percentage of ICT graduates has now increased significantly above the EU average (4.8% vs. 4.2%), thus contributing to narrowing the gap with their continuously growing demand. The share of women among the ICT specialists is at 18% just below the EU average.

Spain is currently implementing several measures that can further increase the level of basic digital skills. In November 2022, as part of the National Digital Competences Plan with a budget of EUR 3.7 billion, Spain presented the [Generation D Pact](#), an ambitious public-private initiative that is aimed to: 1) provide a public space for public-private cooperation to boost digital skills; 2) raise awareness on

how to overcome the digital divide; 3) make digital skills training and activities easily accessible; 4) promote digital skills certifications; and 5) foster cooperation between all levels of administration.

Some targeted plans have been launched on child, primary and secondary education. Following and complementing the [Educa en Digital](#) programme (approved in July 2020), Spain presented in November 2022 a digitalisation and digital skills plan for education [#DigEdu](#) that is focused on schools and all members of the education community and is based on four pillars: 1) development of digital education skills (schools, teachers and students); 2) digitalisation of the Education Centre and Centre's Digital Plan; 3) creation of educational resources in digital form; and 4) advanced digital methodologies and skills. Under this plan, and as part of component 19 ('Digital Skills') of Spain's RRP, Spain launched two *territorial cooperation programmes* in September 2021 to improve digitalisation in the education system: 1) [#CompDigEdu](#) to improve pupils' and teachers' digital skills, and to transform schools into digitally competent educational organisations (2021-2024); and 2) [#EcoDigEdu](#) to facilitate teachers' and pupils' access to digital means and to provide teachers with relevant training to use them (2021-2025). As a result, publicly supported schools will be equipped with at least 300 000 digitally connected devices and connectivity (enhancing previous measures under the *Educa en Digital* programme) and at least 240 000 classrooms will have new or upgraded interactive digital systems; at least 22 000 schools will develop their own digital strategies; and at least 700 000 teachers will receive digital skills training (over 80% of them will be certified). Spain also launched other initiatives in 2022 to improve the basic digital skills of children and, will in 2023 deploy a programme focused on people at risk of digital exclusion, including people over 65, people with disabilities, and vulnerable groups.

Public-private initiatives are also supporting efforts to increase basic digital skills in Spain. In the 2022 edition of Code Week, students participated in 923 activities across Spain (ranking 28th out of 78 countries), most of them (78%) in schools and attracting 59 937 participants (50% of whom were girls). Spain was also one of the six countries developing the Code Week School Label pilot and six Spanish schools were awarded a Code Week label of excellence.

Spain is currently implementing and developing several initiatives to increase the number of ICT specialists, both in the education system and business (upskilling and reskilling), since the need was already identified in the National Strategy for Artificial Intelligence, the Digital Agenda 2026 and the Spanish RRP.

As regards vocational education and training (VET), in March 2022, Spain adopted [Organic Law 3/2022 of 31 March 2022](#) to modernise the VET system by 1) upskilling low skilled workers to improve their employability; 2) addressing skills mismatches; 3) updating the National Catalogue of Professional Qualifications to fit the future needs of the economy; and 4) improving the attractiveness of, and enrolment in, higher VET programmes. In April 2021, Spain published [Royal Decree 279/2021 of 20 April](#), establishing a **VET specialisation course on AI and big data**. In June 2022, Spain approved the disbursement of EUR 87.5 million (as part of component 20 'Strategic Plan to Boost Vocational Training' of the Spanish RRP) to Spain's autonomous communities for the upskilling and reskilling through modular training of more than 160 000 workers over the year. These training courses will form part of a vocational training degree or a professional certificate. In addition, a network of 1 500 digital training centres vocational training is being set up within the [FP Digital Plan](#). With an investment of EUR 29.5 billion, 1 050 digital training centres were already created at the regional level during 2022 and a further 510 will be added to these in the scope of local entities with funding of EUR 12.5 billion. In addition, further collaboration and coordination between education and businesses would help close the ICT specialist gap.

In higher education, Spain launched two calls in November 2022 to fund 32 academic chairs on both [artificial intelligence](#) and cybersecurity, in order to promote synergies between universities and

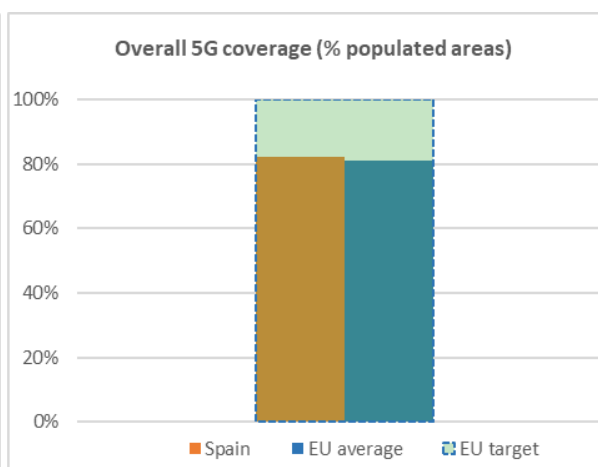
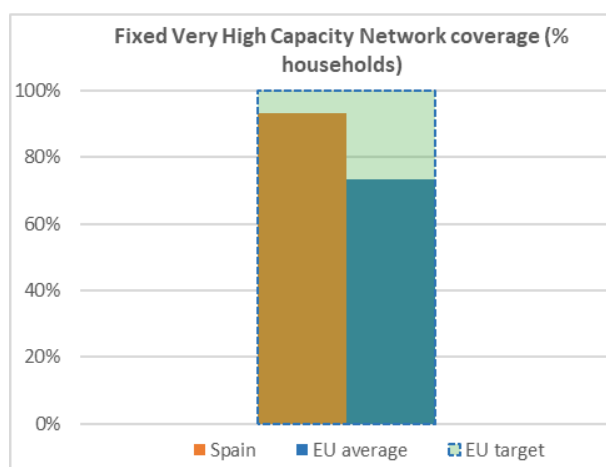
research centres through inter-university cooperation networks, as well as with companies and public administrations. The [Uni Digital Plan](#), which was presented in 2021 (budget: EUR 142.85 million), aims to improve the digitalisation of the university system. Up to 16 agreements were signed in 2022 to deploy very high connectivity in academic and research centres.

Spain should accelerate its efforts in the area of digital skills, notably in the upskilling and reskilling of the labour force, in particular, in advanced and emerging technologies, to address the lack of ICT specialists. Additionally, Spain should continue to encourage more students to specialise in ICT and promote diversity and a gender-balanced uptake of this subject, reducing any possible stereotypes in the teaching and learning of informatics.²⁵⁰

²⁵⁰ The recommended policies, measures, and actions in this document reflect the Commission Communication 'Report on the state of the Digital Decade' COM(2023) 570.

2 Digital infrastructures

	Spain			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up	76%	83%	87%	55%	
% households	2020	2021	2022	2022	
2a2 At least 1 Gbps broadband take-up	<0.1%	<0.1%	14.6%	13.8%	
% households	2020	2021	2022	2022	
2a3 Fixed Very High Capacity Network (VHCN) coverage	92%	94%	93%	73%	100%
% households	2020	2021	2022	2022	
2a4 Fibre to the Premises (FTTP) coverage	85%	89%	91%	56%	
% households	2020	2021	2022	2022	
2b1 Mobile broadband take-up	85%	94%	94%	87%	
% individuals	2018	2021	2021	2021	
2b2 Overall 5G coverage	13%	59%	82%	81%	100%
% populated areas	2020	2021	2022	2022	
2b3 5G spectrum	65%	65%	98%	68%	
Assigned spectrum as a % of total harmonised 5G spectrum	2021	2022	2023	2023	



Spain is making an important contribution to the EU's collective efforts to reach the Digital Decade targets in digital infrastructure. The country is at the forefront of fibre deployment in the EU, standing well above the EU average on fixed very high capacity network (VHCN) (93% vs. 73%), fibre to the premises (FTTP) coverage (91% vs. 56%), at least 100 Mbps fixed broadband take-up (87% vs. 55%), and at least 1 Gbps take-up (14.6% vs. 13.8%). Regarding overall 5G coverage, Spain is slightly above the EU average (82% vs. 81%), mainly due to initial delays in auctioning all the 5G pioneer bands, but has now assigned 98% of all the 5G pioneer bands. Spain is actively proceeding with the copper switch-off process, with the objective of ending copper usage in 2026.

Spain's share of semiconductors and cutting-edge technologies production is very low despite its high importance for semiconductor-intensive manufacturers (for example, Spain has the EU's second largest car manufacturer and a top electric domestic appliance manufacturer) and despite the fact

that it hosts one of the EU's leading supercomputing centres. However, Spain is taking steps to address this challenge, including by approving the PERTE Chip.

Spain is currently implementing several measures that can help increase the level of Gigabit and 5G network deployment, notably under component 15 ('Connectivity') in Spain's RRP.

Spain is one of the EU's best performers in digital connectivity despite its large area (the second largest in the EU) and complex orography; its high population (almost 48 million people) with very low population density in certain areas; and a fragmented and diverse regulatory framework at the local level (with different planning and permit regulations). The high degree of VHCN coverage was achieved mainly through private investment encouraged by a pro-investment regulation that has made a dynamic and competitive market possible. The digital divide between urban and rural areas has been reduced due to the increasing deployment of new access networks in rural areas by both the incumbent and the alternative operators, as well as due to subsidies for deployments in white and grey areas. However, differences between urban and rural areas still exist, and the country is a middle-of-the-range performer in 5G coverage, though coverage levels may be improved with the ongoing 700 MHz deployments. Market consolidation started right after the COVID-19 pandemic's outbreak and is ongoing. 5G and VHCN deployment continues to be based on private investment but is also supported by public investment, mainly RRF funding, especially in rural and low dense areas.

In June 2022, Spain adopted a new [Telecommunications Law](#) that transposes the European Electronic Communications Code (EECC). This law updated Spain's regulatory framework in the field with the aim of further promoting and facilitating VHCN investments. The law also introduces most of the best practices of the [EU Connectivity Toolbox](#) in order to facilitate and improve the rollout of fixed and mobile VHCN as well as to reduce network operators' costs of deployment. In March 2022, Spain adopted the [Royal Decree-Law 7/2022 of 29 March](#) on requirements to ensure the security of 5G electronic communications networks and services. This regulation incorporates into national regulation both the [EU toolbox for 5G security](#) and [Commission Recommendation \(EU\) 2019/534 of 26 March 2019](#) on the cybersecurity of 5G networks.

The national regulatory authority for electronic communications services (CNMC) has adopted pro-competitive measures to encourage investment in VHCN, following the measures fostered through EU regulations. As a result of such measures, Spain is one of the Member States with the most co-investment agreements, access to physical infrastructure is widespread and a light-touch access regulation to VHCN (such as the European Commission Economic Replicability Test for active wholesale access products in less competitive areas) is applied. In this context, in 2022 the CNMC reviewed the conditions for accessing the largest operator's poles, which is key for deployment in less populated areas, and resolved a number of disputes regarding access to the largest operator's infrastructures and other stakeholders' infrastructure (based on the Broadband Cost Reduction Directive) setting relevant criteria for this area.

On 5G, all three pioneer bands have now been assigned since the 26 GHz band auction was completed on 21 December 2022 (following the auctions of the 700 MHz and 3.4-3.8 GHz bands in 2021 and 2018). The outcome was lower than expected and some spectrum was unassigned: 1.8 GHz of the national spectrum (out of 2.4 GHz offered) and one regional licence (out of 38 offered) were awarded. Spain had reserved 450 MHz in the 26 GHz band for private networks. In order to accelerate 5G deployment, Spain has also launched: 1) a reduction of 5G spectrum taxation (introduced in Spain's [Law 22/2021 of 28 December](#) on the General State Budget for 2022, to be continued in 2023); 2) the Universalisation of Digital Infrastructures for Cohesion Programme ('UNICO') [UNICO-5G Redes Backhaul](#) (budget: EUR 450 million; launched in 2022) which promotes fibre optic backhaul connection for mobile sites in areas with fewer than 5 000 inhabitants (excluding those areas where 5G coverage obligations had been set out); and 3) the [UNICO Sectorial 5G](#)

programme (the first call budget was EUR 60 million; launched in February 2023; and the second call budget was EUR 15 million and launched in July 2023) to finance projects based on 5G technology that will have an impact in different sectors. The [UNICO 5G Redes Activas](#) programme was recently published, and will have a budget of more than EUR 500 million to deploy 5G active equipment in small underserved municipalities in areas that do not have 50 Mbps mobile coverage.

On broadband and Gigabit connectivity, Spain launched: 1) [UNICO-Banda Ancha](#) (the first two calls were launched in 2021 and 2022 with a budget of EUR 494 million; and a new call will be launched in 2023 with a budget of EUR 150 million) to provide fixed broadband networks (with symmetric 300 Mbps speed upgradeable to 1 Gbps) to up to 2 million premises located in rural, remote and less populated areas; 2) [UNICO-Demanda Rural](#) (the first call was launched in December 2022; budget: EUR 84.4 million) aimed at improving take-up of at least 100 Mbps broadband services, mainly in remote rural areas by charging affordable prices to end-users and subsidising all installation costs; 3) [UNICO Bono Social](#) (budget: EUR 30 million; launched in 2021) to temporarily stimulate vulnerable groups' broadband take-up (at least 30 Mbps) through connectivity vouchers; and 4) [UNICO Demanda Bono PYME](#) (budget: EUR 50 million; to be launched in 2023) to provide broadband internet access (at 100 Mbps) and related services to SMEs in Spain.

On market developments, several nationwide operators are deploying fibre access networks and competing to provide VHCN throughout Spain. There are also regional and wholesale-only operators which focus on rural areas. The 50/50 joint venture between two large mobile players (announced in March 2022) is currently under EU's antitrust evaluation and over-the-top (OTT) platforms continue to grow in terms of market share in the media and audiovisual sector.

Spain's achievement of the connectivity target is well on track regarding VHCN fixed connectivity, but efforts need to be continued regarding mobile 5G connectivity, because private investment in 5G seems to be losing momentum. However, coverage levels may be improved with 700 MHz deployments, given that the band was put out for tender in 2021 and there has not yet been time for deployments to be completed. 5G Stand alone is beginning to become a reality with several operator announcing its deployment. The outcome of the last two 5G auctions was lower than expected (especially for the 26 GHz band) and, apart from RRF-funding investments and 5G coverage obligations in the 700 MHz band, private investment is now relatively low. However, the alternative fixed operators enjoy regulated access to physical infrastructure, which allows massive investment in new VHCNs. In addition, structurally fragmented regulation regarding permits and procedures at a regional and local level in Spain appears to be reducing the effectiveness and efficiency of network deployment.

To help Member States overcome their connectivity gap (including for their outermost regions, such as the Canary Islands) the Connecting Europe Facility Digital finances projects with a co-financing rate of up to 70% (in the case of outermost regions). The Commission has supported the region in taking up such funding opportunities at EU level in line with its Outermost Regions Communication (COM(2022) 198 final). Three submarine cable projects from the Canary Islands, which have been selected for grants worth over EUR 37 million, were successful in the first round of CEF Digital calls that was completed in 2022.

Spain is planning and implementing some measures **to increase the share of production of semiconductors in Europe**. In May 2022, Spain approved the Strategic Project for Economic Recovery and Transformation (PERTE) on microelectronics and semiconductors ([PERTE Chip](#)). This PERTE (budget: EUR 12.25 billion) is intended to strengthen the industry's design and production capacity in Spain in order to promote national and EU strategic sovereignty in line with the Digital Decade and the proposed European Chip Act. The PERTE Chip will cover the whole industry value chain, from concept and design to production and energisation of ICT electronics manufacturing, and is based

around four lines of action: 1) boosting scientific capacity, with a special emphasis on R&D&I; 2) design strategy, strengthening the design ecosystem in Spain by developing fabless, pilots and digital skills and education networks; 3) setting up manufacturing plants to produce state-of-the-art (below 5 nm) and medium-range (over 5 nm) semiconductors; and 4) stimulating ICT manufacturing industry in Spain based on the assessment of industry's state of play. Spain participates in the IPCEI on Microelectronics and Communication Technologies that will promote a more resilient EU chips supply chain, from design to production, with the aim of reducing dependency on third countries and ensuring the EU market's needs and industry's long-term sustainability. Additionally, the country participates in the IPCEI on Microelectronics and Communication Technologies with 11 direct participants active in various fields (material, open-source design, equipment, packaging, connectivity, photonics).

Other measures will be launched in 2023, like the [Catedras Chip](#) programme (budget: EUR 80 million), which promotes the training of skilled professionals throughout the value chain of the microelectronics and semiconductor industry.

On the target of at least 10 000 climate-neutral highly secure edge nodes, Spain is expected to play an important role in the Next Generation Cloud Infrastructure and Services IPCEI (IPCEI-CIS), which is part of the Multi-Country Project on Common Data Infrastructure and Services, and in which up to 12 Member States and more than 100 companies participate. This project is to develop and deploy innovative cloud and edge solutions that will contribute to building a European Common Infrastructure and Smart Processing Services, providing the next generation of advanced, distributed, secure, sustainable, and innovative cloud-to-edge capabilities. Spain is also collaborating with other Member States with a view to proposing numerous European Digital Infrastructure Consortia.

Spain is currently implementing several measures that can contribute to achieving the EU's first computer with quantum acceleration by 2025. In 2021, Spain launched the [Quantum Spain](#) programme (budget: EUR 22 million) under component 16 in Spain's RRP with the aim of strengthening the national quantum computing ecosystem and infrastructure by: 1) creating a high-performance quantum computer; 2) creating a remote cloud access service to the quantum computer; and 3) developing useful quantum algorithms to real life problems. As a result, in October 2022, the European High Performance Computing Joint Undertaking ([EuroHPC JU](#)) selected Spain to host one of the EU's six first quantum computers. The computer (budget: EUR 12.5 million, 50% co-financed by the EU and Spain) will be installed at the Barcelona Supercomputing Center – Centro Nacional de Supercomputación ([BSC-CNS](#)) – and will be integrated into the forthcoming MareNostrum 5 supercomputer. Spain also participates in the EuroQCI multi-country project, and will (within the EuroQCI-Spain programme) deploy quantum key distribution and quantum crypto-technologies in Spain and, notably, quantum communication nodes in Madrid and Barcelona.

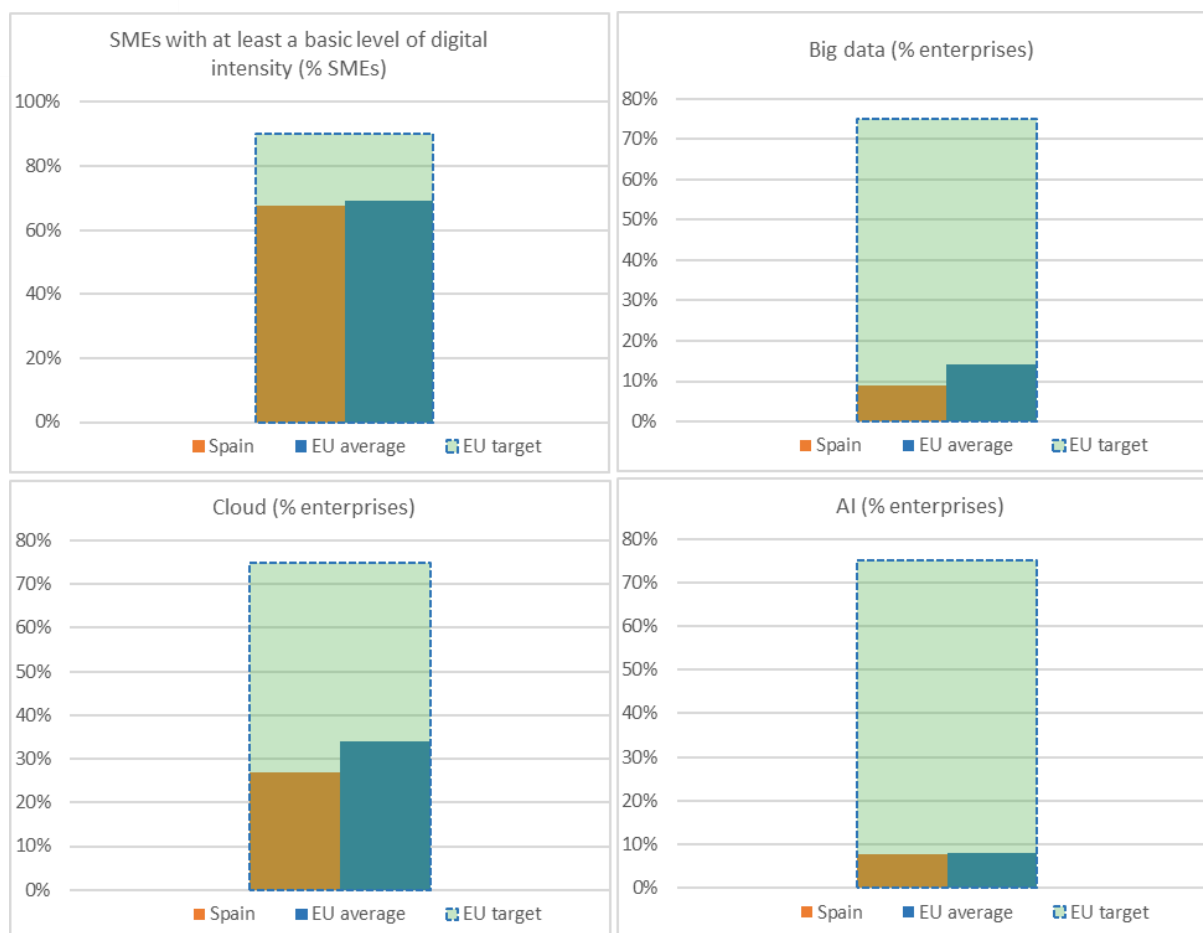
Long-impact measures and a comprehensive approach in new infrastructure initiatives (e.g. PERTE Chip, quantum computing and cloud) will further improve the country's digital ecosystem, creating economies of scale and maximising return on investments across value chains.

Spain should continue implementing its policies on digital infrastructure, in particular accelerating 5G coverage. It should accelerate the setting up of 5G ecosystems in cities, factories and relevant rural zones, and, in this context, encourage partnerships between innovative companies and large-scale companies providing the infrastructure to be deployed. Measures taken by Spain in the field of semiconductors and quantum computing should continue in order to help the EU to become a strong market player in these areas.

3 Digitalisation of businesses

	Spain			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	68%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	43%	49%	49%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	29%	39%	39%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	9%	9%	9%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud²⁵¹	NA	27%	27%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	8%	8%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	33%	33%	33%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	24%	25%	29%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	10%	9%	10%	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	7%	9%	9%	9%	
% SMEs	2019	2021	2021	2021	

²⁵¹ Enterprises buying sophisticated or intermediate cloud computing services indicator, [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).



On the digitalisation of businesses, the percentage of SMEs with at least a basic level of digital intensity is slightly below the EU average (68 vs. 69%), although the Spanish authorities are making efforts to improve enterprises' digitalisation. The percentage of e-commerce turnover (10%) and online cross-border selling (9%) is in line with the EU average, while the number of SMEs selling online is constantly increasing (up to 29% in 2022). Spain is taking positive steps towards the integration of advanced technologies by enterprises, and according with the latest data provided by Spain²⁵², referring to 2022, 12.3% of enterprises use AI and 14.3% use Big Data for internal analysis. In addition, the Spanish Statistical Office published that 41,6% of enterprises were using social media in 2022. On e-Invoices, Spain's enterprises rank slightly above the EU average (33% vs. 32%) although the data is not updated since 2020. According to data from 2021, Spain is well above the EU average on electronic information sharing (49% vs. 38%) and social media presence (39% vs. 29%).

SMEs are particularly relevant in Spain, where almost 2.7 million SMEs (over 99.9% of the total) contributed 58% of total value added (EUR 288 138 million) and employed 8.5 million people (68% of the total workforce) in 2020²⁵³. SMEs' importance relevance and share in the country's economy means that reforms and investments to improve scalability and digitalisation of SMEs not only have a direct effect on SMEs' basic and advanced digitalisation but also have an indirect multiplier impact on other dimensions and targets (e.g. the number and quality of ICT specialists, infrastructure, and digital public services) and the overall economy of the country.

²⁵² These figures were not included among the KPIs for this year's report as they do not correspond to the period of comparison between Member States (2020 and 2021), as Spain is the only country to have provided Eurostat with data for 2022.

²⁵³ Eurostat.

Spain is currently implementing several measures to increase the number of EU enterprises taking up cloud computing, big data, and AI services in Spain.

Reforms and investments under component 13 ‘Support to SMEs’ in Spain’s RRP not only affect the specific target of SMEs’ basic digital intensity but also affect the targets related to advanced digital technologies such as cloud computing, big data, and AI. In this context, Spain has launched: 1) the [Kit Digital](#) initiative (budget: EUR 3 067 million) to promote scalable, high-impact, and public-private collaboration mechanisms to accelerate the digitalisation of SMEs (especially micro-enterprises) and the self-employed; and 2) the [Agents of Change](#) programme (budget: EUR 300 million), whose bases were published in December 2022, and which will provide SMEs with grants to hire digital transformation experts. Both measures could complement and have a positive impact on this target.

In addition, some measures on AI have been launched recently under component 16 ‘Artificial Intelligence’ in Spain’s RRP and the [National AI Strategy](#) presented by Spain in December 2020. In 2022, Spain launched the [Integration of AI into value chains](#) programme (budget: EUR 105 million), which includes an action line to support SMEs integrating AI and robotisation into their value chains; and the [Science and Innovation Missions on AI](#) programme (budget: EUR 125 million), which will finance businesses’ R&D&I projects to improve the competitiveness of Spanish enterprises and public-private cooperation (a minimum of EUR 20 million is reserved for SMEs’ projects). Spain also approved in March 2022, the [PERTE New language economy](#) programme (budget EUR 1.1 billion) to take advantage of the potential of Spanish and the co-official languages as a factor of economic growth and international competitiveness in areas such as artificial intelligence, translation, learning, research and science.

On big data, Spain launched in March 2022 its [Gaia-X Hub](#), which complements the work of the European Gaia-X in creating and coordinating the data-sharing ecosystem and helping enterprises solve business problems and create value in the data economy.

Regarding cloud technology, Spain is investing in both human capital and research, with a particular emphasis on women and knowledge transfer from academia to businesses. In 2022, under Spain’s RRP, the country launched the [UNICO I+D Cloud](#) programme (budget: EUR 43 million), which provides grants to support innovative cloud computing projects in public research centres and foundations as well as public universities. In the context of the IPCEI on Next Generation Cloud Infrastructure and Services (IPCEI-CIS), Spain is expected to actively contribute to increasing cloud uptake among businesses and to investing in new green-cloud infrastructure models (i.e. introducing sustainable operating models fully decarbonised with the use of natural refrigerants).

As regards the Digital Decade target of more than 90% of the EU’s SMEs reaching at least a basic level of digital intensity, the above mentioned [Kit Digital](#) programme is a successful case not only in terms of design but also in terms of implementation and monitoring. All three calls (EUR 1.5 billion; EUR 500 million each) have already been launched and awarded: the first one (enterprises from 10 to fewer than 50 employees) in March 2022; the second one (enterprises from 3 to fewer than 10 employees) in September 2022; and the third one (companies from 0 to fewer than 3 employees) in October 2022. Most of the beneficiaries are part of the retail and hospitality sectors and the main actions were classified as follows: websites (20%), process management (15%), social media management (15%), business intelligence and analytics (9%), client management (8%), and cybersecurity (7%). The effects derived from this programme are not yet reflected in the indicators for monitoring the digitisation of companies, because the first call for the programme was launched at the end of the first quarter of 2022. However, the Kit Digital programme is expected to significantly boost Spanish SMEs’ level of digitalisation. The Agents of Change initiative will support

companies from 50 to 249 employees to hire young ICT specialists to help them in their digital transformation.

Other initiatives such as [Acelera PYME](#); [Activa Industria](#); [Generación Digital PYME](#); or [Strengthening cybersecurity for citizens, SMEs, and professionals](#); are aimed at promoting digitalisation across SMEs and its ecosystem in Spain.

Spain is currently implementing several measures that can help increase the level of emerging companies and unicorns. In December 2022, Spain approved the [Start-ups Law](#), which aims to boost the number of start-ups in Spain by streamlining requirements and providing considerable tax incentives. Spain has also launched some other initiatives to improve the start-up ecosystem in Spain such as: 1) [Fondo Next Tech](#), which aims to promote the development of high-impact innovative digital projects and investment in scale-ups by strengthening public financing instruments, attracting international funds and boosting the venture capital sector; 2) Start-up Acceleration; and 3) [Desafia San Francisco](#) and [Desafia Telaviv](#). Other measures are particularly focused on women entrepreneurs (e.g. the [Female Entrepreneurship Attraction Programme 'The Break'](#) or [ENISA Emprendedoras Digitales](#)).

The new Start-ups Law and subsequent initiatives in the field lay down the necessary pro-investment conditions to further develop Spain's start-ups ecosystem, which has increased from 10 to 14 unicorns in just a year, between 2021 and 2022²⁵⁴. Effective implementation of those reforms and investments will help Spain contribute to the achievement of the Digital Decade targets.

It is worth mentioning the network of European Digital Innovation Hubs (EDIHs) that is expected to make an important contribution to the EU's collective efforts to reach the Digital Decade targets in the digitalisation of businesses. Spain has 12 EDIHs funded under the [Digital Europe](#) programme (DEP) and Spain's RRP, and 13 EDIHs labelled with a 'Seal of Excellence' that are funded directly by Spain (also under its RRP). These relate to a wide range of technologies and sectors throughout Spain and will, for example, support SMEs in identifying investors; improving digital skills, modelling, and testing; and creating an ecosystem for innovation and networking.

Digitalising industries and businesses, with a specific focus on Spanish SMEs and micro-enterprises, will help in the transition towards the digitalisation of productive processes and distribution channels. Spain's RRP sets out a wide set of measures to improve SMEs' digitalisation that is having a very positive impact on SMEs' basic level of digital intensity. Despite the great success in the implementation of the Kit Digital initiative, the real impact will be seen from 2024 onwards as the software services are often provided via annual subscriptions. In addition, the Agents of Change programme that will be deployed during 2023 will ensure the solidification of the digital transformation of SMEs, as these will have a professional guiding them in the further take-up of cloud computing, big data or AI. This will improve SMEs' productivity and scalability, reach new markets, and fully benefit from the potential of the digital economy.

Best practice: the Kit Digital programme

The Kit Digital programme, under component 13 in Spain's RRP, is good benchmark not only because of its outcome and contribution to the Digital Decade targets of digitalisation of businesses (i.e. promoting public-private collaboration mechanisms to accelerate the digitalisation of Spanish SMEs, especially micro-enterprises and the self-employed) but also because of the timely and massive integration of cutting-edge technologies (e.g. AI, cloud computing, and big data) in its design,

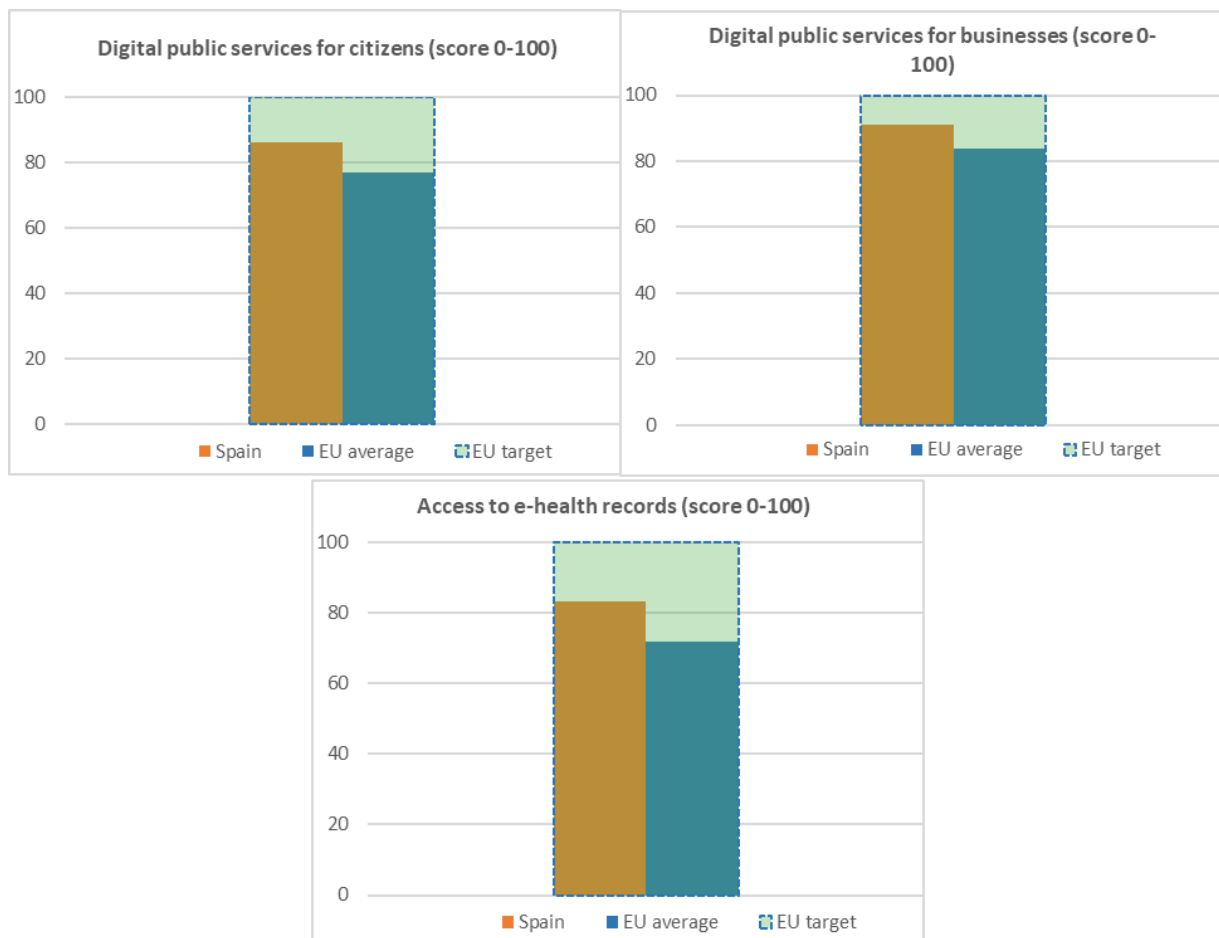
²⁵⁴ [Dealroom.co](#)

implementation, and monitoring.

Spain should continue implementing its policies concerning the digitalisation of businesses, notably it should continue supporting the development and deployment of advanced technologies, in particular, in SMEs, and to provide supportive framework conditions for start-ups and scale-ups.

4 Digitalisation of public services

	Spain			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	84% 2022	74% 2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	87 2021	86 2022	77 2022	100
4a3 Digital public services for businesses Score (0 to 100)	NA	94 2021	91 2022	84 2022	100
4a4 Pre-filled forms Score (0 to 100)	NA	78 2021	83 2022	68 2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	72 2021	73 2022	65 2022	
4a6 User support Score (0 to 100)	NA	86 2021	87 2022	84 2022	
4a7 Mobile friendliness Score (0 to 100)	NA	90 2021	92 2022	93 2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	83 2022	72 2022	100



Spain performs well on e-Government and digital public services in the EU. It continues to update its services and infrastructure to bring them into line with rapid technological developments and the needs of people and businesses. In particular, Spain performs well above the EU average on the indicators measuring the number of internet users that engage with e-government services (84% vs. 74%), the reuse of information across administrations (83 vs. 68), and access to e-Health records (83 vs. 72). In addition, on transparency of service delivery, design, and personal data, and on user support, the country's score is also increasing (up to 73 and 87, respectively) above the EU average (65 and 84). On digital public services for citizens (86) and for businesses (91), Spain also performs above the EU average. The only indicator Spain scores slightly below the EU average is mobile friendliness (92 vs. 93), although Spain has improved (from a score of 90 in 2021). Making progress with **the interoperability of digital public services at national, regional and local levels, is a continuous challenge** for Spain because of the country's high administrative decentralisation (17 autonomous communities (regions), two autonomous cities and up to 8 131 municipalities).

Spain is currently implementing several measures that **will improve the level of the most demanded public services accessible online both for citizens and businesses.** Under the [Plan for the Digitalisation of Spain's Public Administration 2021-2025](#), which further develops reforms and investments set out under Spain's RRP in component 11 'Modernisation of Public Administration', the country is developing and implementing important measures to improve: 1) digital transformation of the State administration; 2) high-impact projects for the public sector digitalisation and trust; and 3) the digital transformation and modernisation of the Ministry of Territorial Policy and Public Function as well as the regional and local administrations.

In 2022, Spain launched the App Factory programme for the development of mobile applications and services for citizens, thus facilitating a more fluid relationship between citizens and administration. As part of this measure, the [Citizen's Folder App](#) was launched in December 2022 to offer all its services through a new mobile application (it [has already been downloaded by](#) over 1 400 000 people and the service has been accessed by 1 900 000 different users). Spain launched two calls for tender (budget: EUR 391.4 million) in 2021 and 2022 to improve Spain's [local entities' modernisation and digitalisation](#), and a third call (budget: EUR 145.5 million) is planned for 2023. In July 2022, Spain confirmed its commitment to launching an [inter-administrative digital ecosystem](#) plan that will facilitate digital interaction across all entities participating in the [Sectoral Conferences](#) framework. In November 2022, the country launched the [National Cloud Services Strategy for Public Administrations](#) that will improve cloud services across all levels of the administration, based either on its own initiatives or through cooperation with private entities. The Spanish digital strategy encourages its public entities to use innovation procurement as a means to modernise public services at all levels across the country. Finally, the nationwide GovTechLab strategy, which is intended to incorporate innovation and advanced technologies for the transformation of public services, is expected to be rolled out in 2023 and the territorial networks of technological specialisation ([RETECH](#)) initiative will in this context articulate various regional projects on digital transformation. Spain has also developed a robotic process automation (RPA) and the [Intelligent Automation Service](#) (SAI), which will improve the services and processes of the State administration through intelligent automation technologies.

Under the [Digital Europe](#) programme, Spain is also participating in several multi-country projects: 1) Digital Credentials for Europe ([DC4EU](#)); 2) The European Blockchain Services Infrastructure - Nodes Expansion ([EBSI-NE](#)); and 3) [GovTech Incubator](#).

Spain continues to be active in cybersecurity. The National Security Scheme focuses on national cybersecurity and promotes the cybersecurity capabilities of public administrations and the private sector (particularly, providers of technology to the public sector). In 2022, the government approved the National Cybersecurity Plan, a new National Security Framework and the deployment of the Cybersecurity Operation Centres of the General State Administration; and the National Cryptologic Centre promoted the National Network of SOCs to integrate and coordinate the SOCs of the public sector in the agile and effective exchange of information in order to improve capacity to detect and respond to possible cyber incidents.

As regards the target of **100% of EU citizens having access to their electronic health records**, under component 18 of Spain's RRP 'Modernisation of the National Health System', Spain is undertaking a [health data lake](#) to collect health data, from different information systems, and to process and analyse it so as to improve a number of areas, such as diagnosis and treatments; health risk predictions; identification of patterns; and citizens' access to their health records. In addition, Spain has participated in the EU initiative [My Health@EU](#) since its creation in 2011. This initiative is aimed at ensuring citizens' continuity of care, access to safe and high-quality healthcare within the EU, and promotion of a European e-prescription interoperability system. In the particular case of MyHealth@EU digital health services, Spain is the largest EU Member State incorporated into the EU Patient Summary and ePrescription/eDispensation services. Spain's healthcare system is highly decentralised and access services to electronic health records are provided at a regional level, although the Ministry of Health does provide harmonisation criteria for national interoperability in three key services: the master patient registry of the NHS (TSI-SNS), the national ePrescription/eDispensation system (RESNS); and the national healthcare records exchange system (HCDSNS). However, health-related data availability may differ between different regions. People in Spain can access their electronic health records through an online portal by authenticating

themselves with a (pre)-notified eID that, complies with the eIDAS Regulation, but a dedicated mobile app is not yet available. Dedicated mobile apps are available in some regions, while portals allowing access to the national healthcare records exchange systems exist in all regions.

Concerning the target of **100% of EU citizens having access to secure electronic identification (eID)**, Spain's *Documento Nacional de Identidad electrónico (DNIe)* scheme has been certified with the 'high' level of assurance. Related to the ID, Spain participates in the [DC4EU consortium](#), which will test the reference wallet for its use with educational and professional diplomas and social security documents, as the country is coordinating their pilot project.

Promoting the complete automation of public services will lead to more efficient and effective public services, thus reducing administrative costs. Spain continues to make progress in the digitalisation of public services and their usability, quality, and accessibility to enterprises and people in Spain. In this regard, Spain provides a one-stop shop portal, the [General Access Point of the Administration](#), where enterprises and citizens can interact with the administration regardless of its level and jurisdiction or place. This facilitates and improves public interaction.

Spain should continue implementing its policies to digitalise public services. Notably, it should continue to increase its efforts to connect additional kinds of healthcare provider to electronic health records until full coverage is achieved. Spain should also continue taking measures to ensure that a comparable quality of service and completeness of electronic health data is provided at regional level.



Digital Decade Country Report 2023

Sweden

Introduction

Sweden is expected to make a very strong contribution to the collective efforts to achieve the Digital Decade targets.

Sweden has become digitalised at an early stage and has a long history of high connectivity and making use of digital tools. As a digitally mature country, Sweden continues to perform well across all dimensions of the Digital Decade. However, progress has slowed down on connectivity and Sweden continues to significantly lag behind on 5G coverage. The population has a high level of digital competences and skills, but it is a challenge to meet the industry's high demand for ICT specialists. The digitalisation strategy of 2017 underlines the importance of a digitally competent workforce. However, the strategy does not specify any targets.

Digital in Sweden's Recovery and Resilience Plan (RRP)

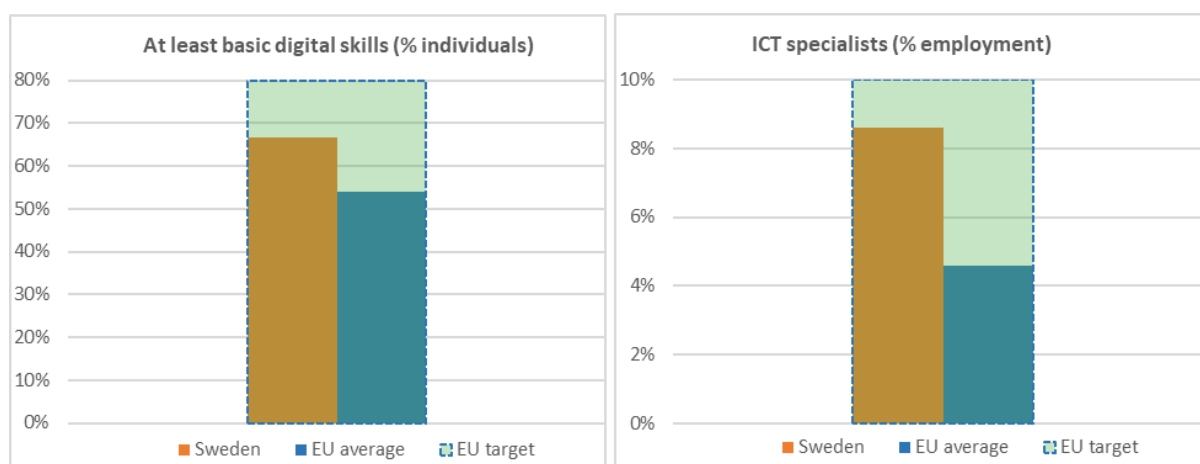
The Swedish RRP has a budget of EUR 3.3 billion of which EUR 650 million support attaining the Digital Decade targets.²⁵⁵ The RRP will in particular promote broadband expansion by using EUR 464 million to connect more households in 2023-2025.

Moreover, the plan includes investments in vocational and higher education of EUR 165 million, with a particular focus on digital skills to meet future needs of the labor market. The RRP also allocates EUR 21 million to upgrading of digital services in public administration, including a joint digital infrastructure. Sweden has not yet submitted its first payment request under the RRP. The Commission is currently reviewing the addendum to the RRP that Sweden submitted on 24 August 2023.

²⁵⁵ Each Recovery and Resilience Plan must dedicate at least 20% of the plan's total allocation to digital objectives. To this end, the plans had to specify and justify to what extent each measure contributes fully (100%), partly (40%) or has no impact (0%) on digital objectives, using Annex VII of the RRF Regulation. Combining the coefficients with the cost estimates of each measure allows assessing to what degree the plan contributes to digital objectives and whether it meets the 20% target. Furthermore, a further qualitative assessment of the data took place to allow for an estimation of the possible contribution of RRF measures to the Digital Decade targets. The information provided refers to the Recovery and Resilience Plan as adopted by the Council before 1 September 2023, without prejudice to potential ongoing revisions of the plan.

1 Digital skills

	Sweden			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
1a1 Internet use	95%	95%	96%	89%	
% individuals	2020	2021	2022	2022	
1a2 At least basic digital skills	NA	67%	67%	54%	80%
% individuals		2021	2021	2021	
1a3 Above basic digital skills	NA	36%	36%	26%	
% individuals		2021	2021	2021	
1a4 At least basic digital content creation skills	NA	77%	77%	66%	
% individuals		2021	2021	2021	
1a5 Enterprises providing ICT training	32%	32%	34%	22%	
% enterprises	2020	2020	2022	2022	
1b1 ICT specialists	7.5%	8.0%	8.6%	4.6%	20 million
% individuals in employment aged 15-74	2020	2021	2022	2022	~10%
1b2 ICT graduates	4.3%	4.7%	5.5%	4.2%	
% graduates	2019	2020	2021	2021	



Sweden is expected to make a very strong contribution to the collective efforts to achieve the Digital Decade targets on skills. Sweden's population has a high level of digital skills. Sweden scores well on the indicators for at least basic and above basic digital skills. Despite this, the Swedish industry continues to report that it is difficult to recruit ICT specialists. An increased supply of ICT specialists should improve productivity.

67% of people have at least basic digital skills, which is above the EU average of 54%. Sweden also scores above the EU average for individuals with above basic digital skills (36% in Sweden vs 26% in the EU) and at least basic digital content creation skills (77% vs 66% at EU level).

Sweden is expected to make a very strong contribution to reaching the Digital Decade targets, including that at least 80% of adults will have basic digital skills to use tech for everyday tasks and 20 million ICT experts will be employed in the EU.

Sweden is currently implementing several measures to further increase the level of basic digital skills. The Swedish National Agency for Education conducts targeted initiatives for school digitalisation, for those aged 6-16. This set the ground for basic digital skills for people aged 16-74. The government assigned several agencies (including the Swedish Public Employment Service, the Agency for Digital Government and the Swedish Agency for Innovation) to develop a cohesive data infrastructure for skills provision and lifelong learning (initiated in June 2021 as part of the data strategy). The goal of the measures is to help authorities and other actors to create and provide digital services that empower individuals in the labour market while the public and private sectors' competence needs are met.

Some private sector initiatives also support increasing the basic digital skill level. Several study associations offer adult education across Sweden. They provide different courses to increase basic digital skills.

Sweden carried out 97 activities in 2022 under **Codeweek**, with a female participation of 51%. **Digitalidag** is an annual and national day on the theme of opportunities and challenges of digitalisation. The fourth edition of Digitalidag took place on 14 October 2022 with 1 000 activities and 250 actors in 215 locations. Business, municipalities, authorities, libraries, academia, civil society and other social actors participated in order to encourage more people to want and be able to take part in digital development. During 2022, special focus was directed at helping people to complete new digital abilities regardless of age.

Sweden has a high share of ICT specialists: the percentage of employed ICT specialists in the workforce is 8.6% and remains above the EU average of 4.6%. This is not sufficient, however, to meet industry's demand for ICT specialists. 5.5% of graduates are studying in ICT programmes, which is higher than the EU average of 4.2%. In parallel, 34% of businesses provide ICT training to their employees, which is 12 percentage points above the EU average. Sweden's performance is also above the EU average as regards the presence of women in the digital sector: female ICT specialists represent 22.9% of ICT specialists, compared with an EU average of 18.9%. Sweden's performance is expected to make a significant contribution to the collective efforts to achieve the Digital Decade targets.

Sweden is currently working on several programmes and initiatives to increase the number of ICT specialists. In 2019, the Swedish Government tasked the Swedish Higher Education Authority and the Swedish Agency for Economic and Regional Growth with proposing ways to ensure access to cutting-edge digital expertise in both the short and long terms. As part of the assignment, these agencies started a dialogue on collaboration among stakeholders (particularly representatives from higher education institutions, the labour market, regional development organisations and other public authorities) about the needs of their respective organisations for cutting-edge digital expertise. The goal is to increase access to these and to improve, to the extent possible, access to statistics and forecasts on supply of and demand for cutting-edge digital expertise on the Swedish labour market.

The Swedish Higher Education Authority and the Swedish Agency for Economic and Regional Growth issued the final report on 31 October 2022. The report presented a broad package of policy suggestions on how to increase access to cutting-edge digital expertise in both the short and long terms, and on how to minimise the gender gap. The report made a number of suggestions, including the creation of 'Digital Skills Sweden', involving actions on education and research, enhanced cooperation between relevant actors and actions to enhance knowledge on the need for cutting-edge digital expertise. The government is now assessing these suggestions.

Stockholm University, with financial support from Digital Europe Programme and the Swedish Innovation Agency (Vinnova), created an advanced digital skills programme on AI and Health

together with Université Aix-Marseille, Università di Pisa and Universitat Autònoma de Barcelona. The aim of the programme is to set up a pan-European master's degree programme in AI and Health for more than 150 students, workshops and courses. The project is running from December 2022 to December 2023.

The private sector has also undertaken a considerable number of activities to address the unmet demand for ICT specialists, notably with upskilling and reskilling efforts by companies for their workforce. The industry organisation, **TechSverige**, has rolled out a campaign to attract more talent (including college graduates) to the industry. It has gathered links and tips about study and career choices. People can also take an interest test and read reports about others who already work in the tech industry.

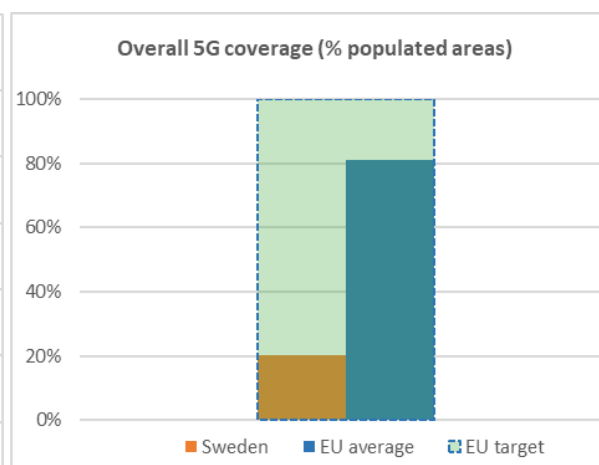
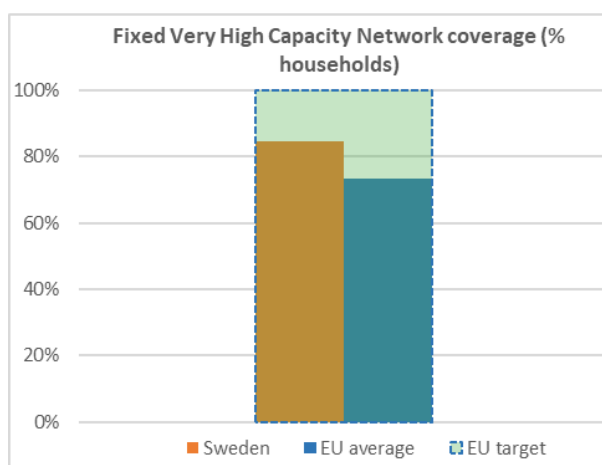
The Swedish National Digital Skills and Jobs Coalition, established in 2018, is a multi-stakeholder partnership that brings together organisations that play an active role in fostering the development of digital skills and strengthening overall digital competence in Sweden. With approximately 30 member organisations, the Swedish Coalition covers a broad range of sectors: from government agencies and universities to industry associations, private sector representatives and non-governmental organisations.

Sweden should continue implementing its policies in the area of digital skills. To meet the increasing demand for ICT specialists, Sweden should closely monitor plans to encourage more students to specialise in ICT by implementing specific, time-bound, and measurable actions that would improve traceability, evaluation, and follow-up of programmes and their impact on the population²⁵⁶.

²⁵⁶ The recommended policies, measures, and actions in this document reflect the Commission Communication 'Report on the state of the Digital Decade' COM(2023) 570.

2 Digital infrastructures

	Sweden			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
2a1 At least 100 Mbps broadband take-up	75%	80%	85%	55%	
% households	2020	2021	2022	2022	
2a2 At least 1 Gbps broadband take-up	4.1%	5.0%	6.1%	13.8%	
% households	2020	2021	2022	2022	
2a3 Fixed very high capacity network (VHCN) coverage	81%	83%	85%	73%	100%
% households	2020	2021	2022	2022	
2a4 Fibre to the premises (FTTP) coverage	80%	82%	84%	56%	
% households	2020	2021	2022	2022	
2b1 Mobile broadband take-up	90%	95%	95%	87%	
% individuals	2018	2021	2021	2021	
2b2 Overall 5G coverage	14%	18%	20%	81%	100%
% populated areas	2020	2021	2022	2022	
2b3 5G spectrum	49%	81%	84%	68%	
Assigned spectrum as a % of total harmonised 5G spectrum	2021	2022	2023	2023	



Sweden continues to make progress on connectivity but is falling behind the overall EU average, primarily due to the delayed deployment of 5G. Most (85% in 2023; 76% in rural areas) households have access to gigabit connectivity, but the roll-out of fibre has slowed down since reaching its peak in 2016. Despite continued high levels of investments in infrastructure, the gaps in gigabit access, especially in rural areas, need to continue being addressed. According to the latest estimates by the Swedish Post- and Telecom Authority (PTS), at most 98% of households will have gigabit access by 2025. However, take-up of gigabit connectivity is only at 6.1% (below the EU average of 13.8%).

As far as 5G is concerned, roll-out has accelerated now. The delays in auctioning the relevant spectrum have been addressed, but Sweden still lags behind as regards coverage (at around 20%, compared with 81% for the EU as a whole in 2022) and take-up. Mobile broadband take-up continues to score highly at 95%.

In October 2022, a state-owned operator announced the liquidation of its subsidiary which provided mobile broadband services to peripheral homes and small businesses. The impact is expected to be particularly noticeable in northern Sweden. Alternative options are being explored.

The main structural **market development** in 2022 was that the incumbent operator completed its divestment of 49% of its tower business in Sweden.

With regard to ensuring **gigabit connection for everyone**, Sweden's objective is set out in the Swedish National Broadband Strategy: 98% of all households and businesses should have access to broadband at a minimum capacity of 1Gbit/s by 2025. EUR 464 million or 14% of Sweden's Recovery and Resilience Facility (RRF) has been allocated to supporting broadband expansion by setting specific targets for the number of buildings to be connected every year.

The Swedish Post and Telecom Authority (PTS) has during the last 3 years coordinated the State aid programme for broadband infrastructure investments (gigabit connectivity). State aid of almost SEK 1.3 billion was approved from Q2 2022 to Q1 2023. The state aid programme focuses on sparsely populated areas that lack access to high-speed broadband infrastructure and do not have commercial prerequisites for broadband expansion. The programme makes it possible for approximately 34 000 buildings to connect to highspeed broadband.

On spectrum to support the connectivity targets, Sweden has so far assigned the 5G pioneer bands (700 MHz, 3.6 GHz and 26 GHz). The 700 MHz band was assigned in December 2018, the 3.6 GHz band was assigned in January 2021 and the 26 GHz band was made available for local licensing in November 2021. During the reporting period, the only change was that an additional 2x40 MHz (80 MHz in total) in the 3.6 GHz band was made available for local licenses. The PTS also concluded the process of regional prioritisation of areas eligible for coverage obligations within the 900 MHz band, ahead of the planned 2023 spectrum auction. From May to September 2022, the 21 regions of Sweden were offered the opportunity to identify and justify which of the areas within the regional territory that the NRA had identified as lacking coverage, should be part of the final coverage obligation.

Sweden has established a national cyber security centre with the mission of strengthening Sweden's ability to prevent, detect and manage cyber threats.

Sweden participates in the consortia forming LUMI (lumi-supercomputer.eu) of the EuroHPC JU. LUMI has been in full operation since December 2022. In May 2022, LUMI was listed as one of the world's supercomputers in the Top500 and Green500 lists. As part of EuroHPC JU, the EuroCC National Competence Centre Sweden (ENCCS) provides high-performance computing training and support for industry, academia and public administration.

Sweden has a number of ongoing projects to support the **production of cutting-edge semiconductors** within the EU. Smarter Electronic Systems started 20 new projects during 2022 with a total budget of EUR 6 million in the area of electronic systems. New projects include components for multi-antenna systems, front-end circuits for fixed-wireless access and quantum-computing components, with over 30 companies participating. The Swedish Foundation for Strategic Research (SSF) opened a call in 2022 to establish advanced research centres in semiconductor design with the objective of strengthening Sweden's status as a country at the forefront of semiconductor design. The budget is EUR 6 million. In 2022, Vinnova issued a call for interest regarding a new generation of research centres where funding is coming from Vinnova, universities, industry and SMEs. One of several focal points for research centres is semiconductor components, including wide-band-gap technologies. The budget for each research centre is approximately EUR 20 million over 5 years. The new research centres will, like previous centres, involve EU collaboration and play a role in the European Ecosystem in its area.

On climate-neutral highly secure edge nodes, TECoSA started on 26 March 2020, bringing together the Royal Institute of Technology (KTH) and 15 industrial partners. The aim is to provide methods, tools and theory for building safe, secure and predictable systems that rely on edge computing. The AI Sweden Edge Learning Lab was launched on 27 January 2021. The purpose is to explore distributed learning on edge computing in collaboration with other partners. These initiatives are intended to help Sweden make a relevant contribution to the Digital Decade edge nodes target.

The Wallenberg Centre for Quantum Technology (WACQT) is Sweden's main **quantum initiative**. It was established in 2018 and includes several universities and industrial partners. WACQT has two parts: an excellence programme for quantum-related research and a core project on quantum computing. The Chalmers quantum computer now has 25 quantum bits (or qubits). The target is 100 qubits by 2029. WACQT will build a copy of the quantum computer and make it available as a test bed for companies and researchers to run algorithms. Vinnova also provides government funding for quantum technology. The objective is to facilitate the implementation of a Swedish stakeholders' National Quantum Agenda²⁵⁷, presented in March 2023, to establish common goals for cooperation, to promote cooperation with platforms and to foster entrepreneurs in start-ups and intrapreneurs in industry. Furthermore, the Commission's European Quantum Communication Infrastructure (EuroQCI) initiative will create a secure quantum communication infrastructure spanning the whole EU, including its overseas territories. Sweden is participating with quantum research through the NQCIS project funded by Digital Europe. Sweden is therefore in a strong position to contribute to fulfilling the Digital Decade targets on quantum.

The open call for CEF Digital in 2022 will contribute to digital infrastructure projects in the EU, notably in the areas of 5G transport corridors, 5G smart communities and the upgrade of existing backbone networks such as submarine cables. Concerning submarine cables, the call made it clear that Swedish stakeholders have a strong interest in developing digital infrastructure not only via the Arctic (for example the Polar Connect/North Pole Fiber initiative aims to develop digital infrastructure to the Indo-Pacific region and North America), but also in the Baltic and the Skagerrak.

Sweden should accelerate its efforts on connectivity infrastructure. In particular, Sweden should accelerate 5G roll-out in line with emerging market demand and by assigning the remaining spectrum in 5G pioneer bands. Specifically, Sweden should regularly assess emerging market demand for the remaining unassigned spectrum in the 26 GHz band (to incentivise and facilitate deployment of 5G services for advanced applications) and assign it when the demand emerges. Moreover, Sweden should assign remaining spectrum in the 2.1 and 2.6 GHz bands and 900 MHz band without further delay.

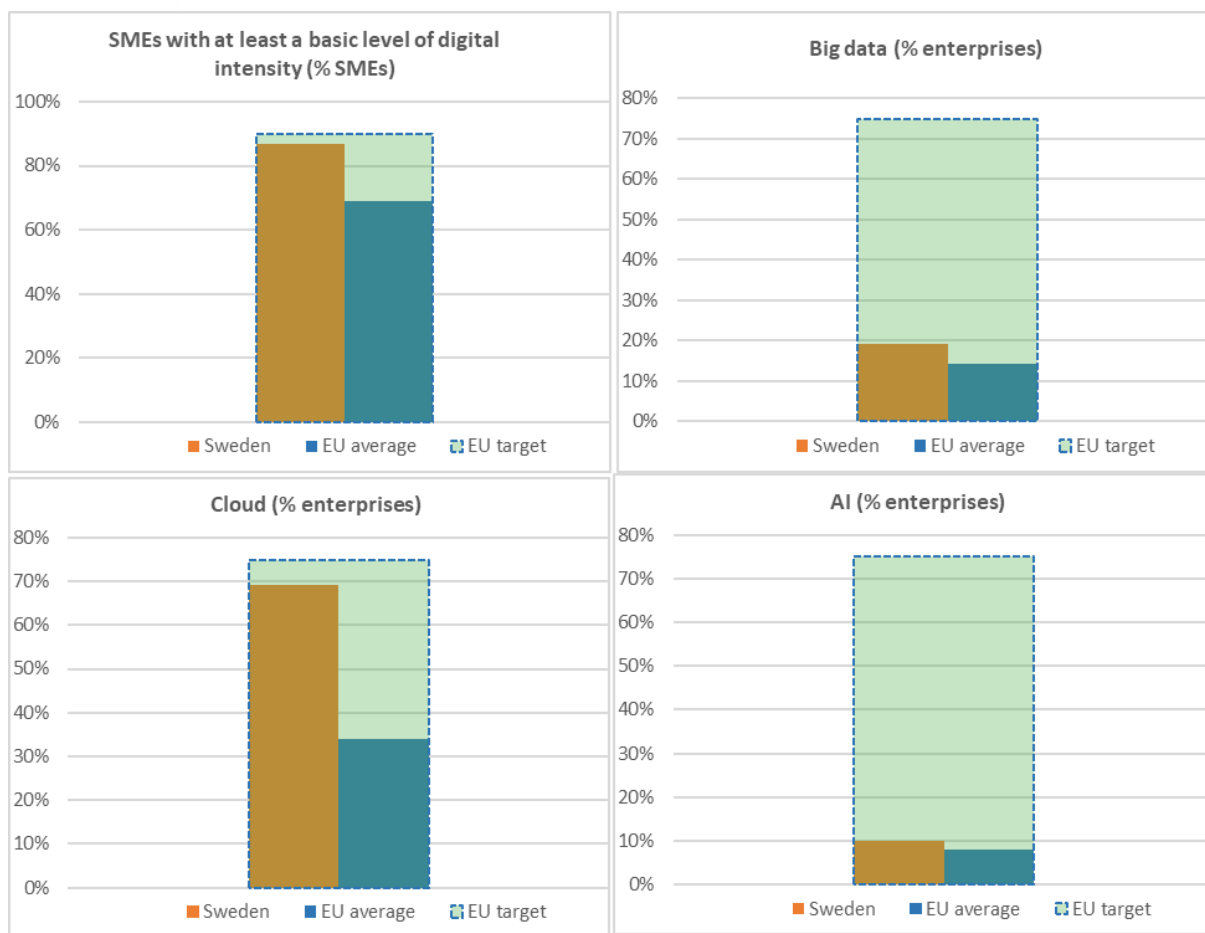
Measures taken by Sweden in the field of semiconductors, edge and quantum computing should continue in order to help the EU to become a strong market player in these areas.

²⁵⁷ <https://www.vinnova.se/globalassets/bilder/publikationer/the-swedish-quantum-agenda.pdf?cb=20230328130156>

3 Digitalisation of businesses

	Sweden			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
3a1 SMEs with at least a basic level of digital intensity	NA	NA	87%	69%	90%
% SMEs			2022	2022	
3b1 Electronic information sharing	37%	35%	35%	38%	
% enterprises	2019	2021	2021	2021	
3b2 Social media	40%	48%	48%	29%	
% enterprises	2019	2021	2021	2021	
3b3 Big data	19%	19%	19%	14%	75%
% enterprises	2020	2020	2020	2020	
3b4 Cloud²⁵⁸	NA	69%	69%	34%	75%
% enterprises		2021	2021	2021	
3b5 AI	NA	10%	10%	8%	75%
% enterprises		2021	2021	2021	
3b6 e-Invoices	45%	45%	45%	32%	
% enterprises	2020	2020	2020	2020	
3c1 SMEs selling online	31%	33%	36%	19%	
% SMEs	2020	2021	2022	2022	
3c2 e-Commerce turnover	15%	19%	16%	11%	
% SME turnover	2020	2021	2022	2022	
3c3 Selling online cross-border	10%	11%	11%	9%	
% SMEs	2019	2021	2021	2021	

²⁵⁸ Enterprises buying sophisticated or intermediate cloud computing services indicator, see [Digital Economy and Society Index \(DESI\) 2023 Methodological Note](#).



Sweden is expected to make a significant contribution to the collective efforts to achieve the Digital Decade targets on the digitalisation of businesses. Sweden performs above the EU average on the use of cloud, AI, or big data.

Sweden already has several initiatives to **promote the use of cloud, AI and big data** by companies across the country. Between 2021 and 2024, the Swedish Agency for Economic and Regional Growth is implementing efforts to strengthen micro and small businesses in rural areas by harnessing the potential of digitalisation. The network of regional digitalisation coordinators, under the Swedish Agency for Economic and Regional Growth is working to ensure that the opportunities of digitalisation are better exploited in Sweden's 21 regions. The regional digitalisation coordinators work together and coordinate the strategic development within the framework of regional economic development work. The Royal Swedish Academy of Engineering Sciences' has a smart industry project to encourage digital transformation in SMEs by a number of means, including highlighting and sharing good examples.

Vinnova funds innovation in all sectors. Projects using or developing AI are common in all thematic calls. Specific calls, such as 'Advanced and innovative AI', support Swedish development of advanced and innovative solutions in AI. The purpose is to strengthen Sweden's capacity and ability to innovate in the area. The call welcomes well-defined projects that aim at high potential and state of the art solutions. Vinnova also offers support for short-term staff exchange for applied AI. In the call, companies can apply for a grant for staff exchange between Sweden and international partners to increase an organisation's AI competence and initiate long-term cooperation.

The Advanced Digitisation program was launched in 2021 to help Sweden and Swedish businesses become world leaders in the development of digital technology in selected areas of strength and to introduce and realise the effects of new technology in various industries and sectors of society. The

programme involves cooperation between the government and businesses with half of the funding from public funds. It has so far launched 10 calls for proposals with 92 granted projects and a total of 230 involved actors from universities, institutes, and large and small companies. Interest has exceeded the current scope of the programme. The Swedish government has so far invested around SEK 480 million. One of the projects is a pilot project to set the vision and technical standards for a Swedish cloud infrastructure.

To achieve the target of more than 90% of SMEs reaching at least a basic level of digital intensity by 2030, the Royal Academy of Engineering Sciences (IVA) is running a project called Smart Industry which promotes the digitalisation of SMEs and helps strengthening Swedish industry's competitiveness and green transition. The project started in 2016 and will run until 2024.

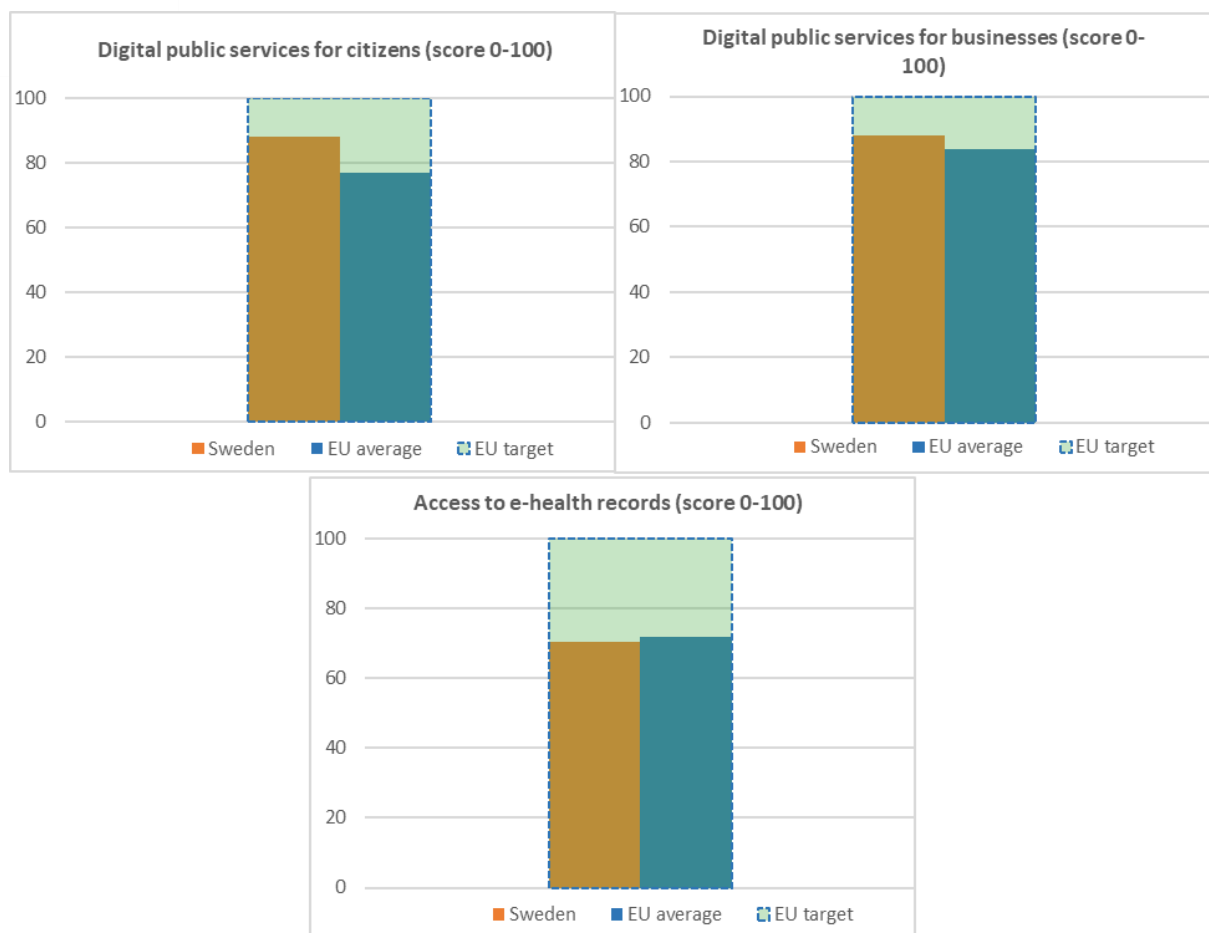
A combination of funds from DIGITAL and ERDF has been identified by the government as a possible co-financing response **for the European Digital Innovation Hubs (EDIH)**. During the year, the Swedish Agency for Economic and Regional Growth has worked with the regions, primarily through the digitalisation coordinators, but also via the forums that the Swedish Agency for Economic and Regional Growth has at its disposal, including regional dialogues. To make co-financing with the ERDF possible, the Swedish Agency for Economic and Regional Growth has ensured that the application and decision processes are suited to handle applications with co-financing from DIGITAL.

Sweden is one of the frontrunners in the EU in the number of unicorns. To further increase the number of unicorns in the EU, Vinnova and Formas are financing 17 strategic innovation programmes. Through cooperation in areas that are strategically important for Sweden, conditions are created for sustainable solutions to address global societal challenges and increased international competitiveness. As part of the programmes, companies, academia and organisations jointly develop the sustainable products and services of the future. In September 2021, the government tasked Vinnova and the Swedish Agency for Economic and Regional Growth with developing the conditions for research-intensive companies with long development cycles to grow in Sweden. The report showed that, although access to capital is relatively good for Swedish start-ups in general, financing is still a challenge for deep tech start-ups. One key recommendation from the report was to strengthen access to capital for deep tech start-ups.

Sweden should continue implementing its policies in the area of digitalisation of businesses. In particular, Sweden should continue to support the development and deployment of advanced technologies, including AI/big data/cloud computing, in particular by participating in relevant multi-country projects.

4 Digitalisation of public services

	Sweden			EU	EU
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-Government users % internet users	NA	NA	96% 2022	74% 2022	
4a2 Digital public services for citizens Score (0 to 100)	NA	85 2021	88 2022	77 2022	100
4a3 Digital public services for businesses Score (0 to 100)	NA	88 2021	88 2022	84 2022	100
4a4 Pre-filled forms Score (0 to 100)	NA	85 2021	86 2022	68 2022	
4a5 Transparency of service delivery, design and personal data Score (0 to 100)	NA	63 2021	66 2022	65 2022	
4a6 User support Score (0 to 100)	NA	77 2021	79 2022	84 2022	
4a7 Mobile friendliness Score (0 to 100)	NA	100 2021	100 2022	93 2022	
4b1 Access to e-health records Score (0 to 100)	NA	NA	70 2022	72 2022	100



Sweden scores above average in terms of online provision of key public services for citizens and businesses. Most public administrations are offering online interactions. There is guidance for user-driven development that has been developed to support public organisations. The guidance describes how an organisation can identify, analyse and evaluate needs, also when they extend across organisational boundaries.

Sweden is already a strong performer on innovation procurement of digital solutions (3rd in the EU). The national digital strategy promotes innovation procurement as a key tool that public authorities should use to drive the digital transformation. The level of investments in transformative digital technologies, including those that are new to the market, is well above the EU average. However, Sweden could benefit from higher investment levels, both in R&D procurements and in public procurements that focus on the adoption of innovative ICT solutions. This would help further accelerate the adoption of advanced digital solutions in public services (such as AI / big data, virtual reality / metaverse, robotics, HPC, blockchain etc). Tackling this challenge is key to offer top quality public services with a rich set of functionalities that enable interaction in a more efficient and personalised way.

GovTech Sweden is an exchange platform for ideas and innovations to secure and increase societal value in the digital transformation. GovTech Sweden has increased its efforts to make better use of innovation procurement in public procurement procedures to allow start-ups and innovative SMEs to compete with larger private-sector actors.

JobTech Development is the Swedish public employment service's investment in a sustainable and common infrastructure for digital matching services in Sweden. It is based on the idea of fewer silos

and more common technical solutions and standards. In collaboration with others, the idea is to contribute to innovation and sustainable solutions that are easy for everyone to use. At Jobtech Development, actors from the private and public sector gather in an open digital ecosystem to collaborate and share data. The ecosystem currently has around 200 companies and organisations that actively share the platform data, knowledge and code that are freely available for everyone to use.

Sweden currently has three eID means notified under the Swedish eID (Svensk e-legitimation) scheme. Sweden is involved via public and private entities in two of the large-scale pilot projects funded under the Digital Europe Programme, with an overall grant request of over EUR 2.4 million. Sweden is coordinating one of the pilot projects with a particular focus on digital travel credentials, payments and organisational digital identity. Sweden has a high uptake of access to secure eID and eIDs are widely used.

With an eID, Swedes can access and read their health records through the e-service portal 1177.se which had 169 million visits in 2022. With a composite score of 70 out of 100, Sweden ranks 17th in the EU (two points below the EU-average of 72) regarding the degree of citizens' online access to their electronic health records. Citizens can access their electronic health records (Journalen) online via 1177.se, and the dedicated mobile app, which is provided by the regions that are responsible for organising local healthcare. 80-100% of Sweden's national population has access to electronic health records, albeit with some regional differences. The access service is jointly financed by municipalities and by public primary, secondary and tertiary healthcare providers. Rehabilitation centres as well as pharmacies are connected to the service and supply relevant health-related data for the Journalen. This also includes private providers that are publicly funded. The Journalen provide citizens with frequently updated information on current diagnoses, current and relevant past medicines, ePrescription and eDispensation, laboratory test results and hospital discharge reports. However, for example, medical imaging reports or medical images are not yet accessible. Sweden has the ambition of becoming a world leader in using digitisation and e-health to make it easier for people to achieve good and equal health care and welfare, and to develop and strengthen their own resources for increased independence and participation in social life.

In June 2022, the government tasked the Agency for Digital Government (Digg) to analyse and submit proposals for the production and operation of a government eID. On 31 January 2023, Digg outlined a proposal for a technical solution for a new eID. On 22 December 2022, the government decided to appoint a special inquiry that will submit proposals for the introduction of an eID in Sweden at the highest security level. The inquiry will report no later than 31 May 2024.

Best practice: Mina ombud - digital powers of attorneys

Sweden has implemented a national infrastructure for a standardised and secure handling of digital powers of attorneys called Mina ombud. Currently, this service significantly eases the process for legal persons by providing them with a centralised, digital platform to manage and oversee their legal representation in an easy, secure, and efficient manner. The aim is to extend this service to cover natural persons in the near future. 'Mina ombud' makes it possible to represent legal persons in digital services, thus minimising the administrative burden and freeing up time for service providers to focus on their core operations.

'Mina ombud' makes it possible to grant permissions via attributes so that anyone with a power of attorney (regardless of their role) can assist an organisation. It includes a national webservice for the digital powers of attorneys whereby users can manage various actions (e.g., creating new powers

and revoking a power of attorney.

'Mina ombud' also stores powers of attorneys and allows service providers to administer templates and permissions for powers of attorneys. This level of transparency and traceability for all representative relationships not only simplifies life for legal persons but also plays a crucial role in preventing economic crime. By making it harder for dishonest actors to exploit the system for illegal purposes such as money laundering or fraud, 'Mina ombud' has become a powerful tool to protect the economy from criminal activities. Its utility and reach will increase still further as the service is extended to natural persons.

Sweden should continue implementing its policies to digitalise public services. In particular, it should ensure that all individuals have access to an eID scheme. Sweden should also increase its investments to support advanced digital technologies in its public services.