Digital Economy and Society Index (DESI) 2022

Sweden

About the DESI

Since 2014, the European Commission has monitored Member States' progress in digital and published annual Digital Economy and Society Index (DESI) reports. Each year, the reports include country profiles, which help Member States identify areas for priority action, and thematic chapters providing an EU-level analysis in the key digital policy areas. The DESI Index ranks Member States according to their level of digitalisation and analyses their relative progress over the last five years, considering their starting point.

The Commission has adjusted DESI to align it with the four cardinal points set out in the Commission proposal for a decision 'Path to the Digital Decade Policy Programme' which is being negotiated by the European Parliament and the Council. The proposal sets targets at EU level to be reached by 2030 to deliver a comprehensive and sustainable digital transformation across all sectors of the economy. Of the DESI 2022 indicators, 11 measure targets set in the Digital Decade. In the future, the DESI will be aligned even more closely with the Digital Decade to ensure that all targets are discussed in the reports.

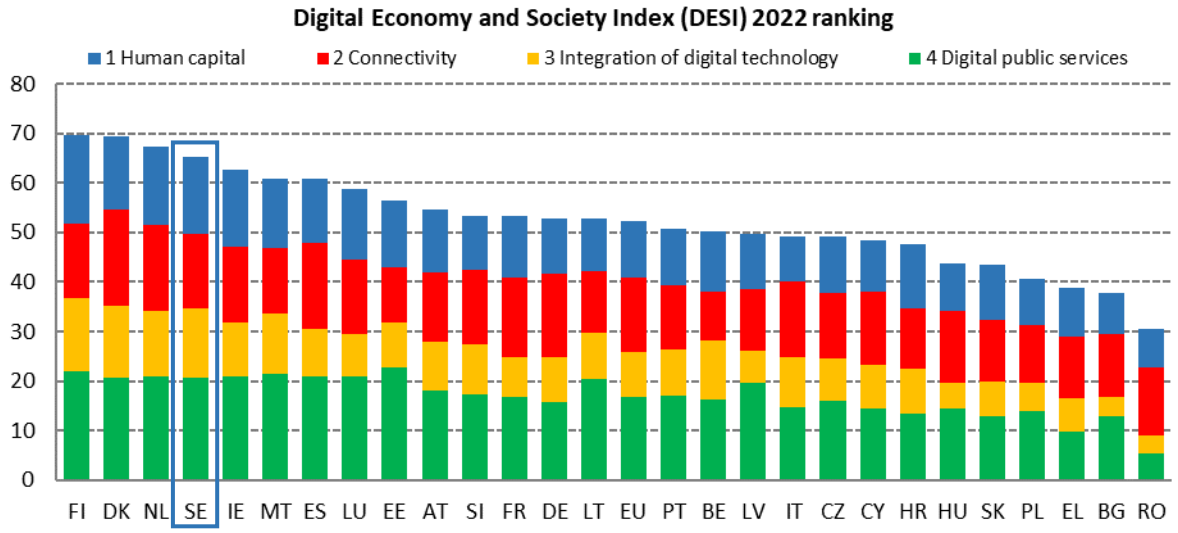
To date, digitalisation in the EU is uneven, although there are signs of convergence. While the frontrunners have remained unchanged, there is a substantial group of Member States that cluster around the EU average. Importantly, the majority of Member States that had a lower level of digitalisation 5 years ago, are progressing at a faster pace than the rest, indicating an overall convergence in digital in the EU.

Reaching the Digital Decade targets depends on a collective effort by all. Each Member State will contribute to this ambitious goal from a different starting point, determined by resources, comparative advantages and other relevant factors such as the population size, the scale of the economy and the areas of specialisation. For example, Member States with large economies or populations will need to perform well to enable Europe as a whole to reach the targets by 2030. Digital frontrunners will need to continue progressing to lead on digitalisation worldwide, while all Member States' digitalisation efforts will be driven by their economic and societal needs.

The DESI scores and rankings of previous years are re-calculated for all Member States to reflect changes in the underlying data. For further information, see the DESI website.

Overview

	Sweden		EU
	rank	score	score
DESI 2022	**4**	**65.2**	**52.3**



Sweden ranks 4th of 27 EU Member States in the 2022 edition of the Digital Economy and Society Index (DESI). Sweden performs well and has done so over the last couple of years and scores above the overall EU average although the progress is not as fast as previously[1]. On connectivity, Sweden has fallen back to 9th place and is below the EU average on 5G coverage. Concretely, Sweden scores far below the EU average (66 %) in 5G coverage of populated areas at 18 %. To remain a digital front-runner globally and contribute to the Digital Decade targets, it is important that Sweden continues to improve its performance.

Human capital, where Sweden ranks 4th, continues to be an area of strong performance compared to other countries in the EU. The general population has both a high degree of basic digital skills (67 %) and above basic digital skills (36 %) and Sweden is heading in the right direction to reach the Digital Decade target of 80 % of the population with at least basic digital skills by 2030. Despite having one of the highest percentages of ICT specialists in employment in the EU and an above-average proportion of ICT graduates, Sweden continues to struggle with the supply of ICT professionals in relation to demand, as 55.1 % of enterprises report that they find it difficult to fill vacancies. It is important that Sweden does more work to improve this, to avoid delaying the digital transformation of business and to help reach the Digital Decade target of 20 million ICT experts in the EU by 2030.

Sweden has lately made less progress on connectivity but continues to rank above EU average (9th). Broadband is continually being rolled out, particularly focusing on remote areas. The 5G auction completed in early 2021 was positively received by market actors, who have been awarded a significant share of the available spectrum. This helps Sweden aim for 1Gbps connections throughout the country, although it may have to rely on mobile technologies to reach the target. The auction also

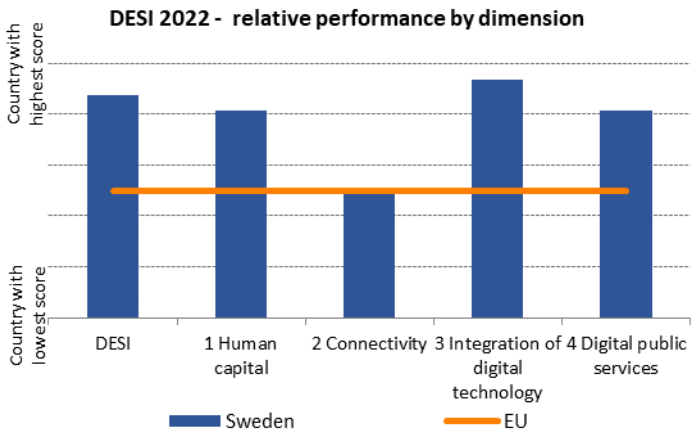
[1] Refer to section 1.3 of the DESI 2022 horizontal chapter.

paves the way for the country to reach 100 % 5G coverage of populated areas by 2030, as set as a target in the Digital Decade. With 83 % of households having access to fixed very high-capacity networks, it is also likely that the country will reach the Digital Decade target of all households being covered by a gigabit network by 2030.

Digital technologies, both existing and emerging, are increasingly being used by Swedish enterprises. Sweden ranks 3rd among the EU countries in this field. Sweden adopts new and advanced technologies at a rapid pace, led by significant joint work between academia and the business sector; this can be seen in areas such as Artificial Intelligence (AI), cloud, high performance and quantum computing. Sweden also aims to become a world-class electronics industry country, in electronic components and systems by 2025. Although Sweden is ahead of many European countries in some indicators on the integration of digital technology, it is important that the country encourages more enterprises to use big data and AI to reach the Digital Decade targets of 75 % uptake by 2030.

Sweden ranks 9th in the field of digital public services. People in Sweden are highly digitally mature, as are companies and the public sector, and the Digital Decade targets of for example 100 % online key public services by 2030 are well within reach. Further work has been done to increase the level of digitalisation and the use of advanced technologies, such as artificial intelligence, and open data by both public and private organisations. This work has shown that there is potential for further improvement, especially in areas such as data exchange and re-use. Use of open data has been identified as a key enabler for innovating in public sector services. Sweden expects to notify the Commission in 2002 that it complies with eIDAS for electronic identification.

The Swedish Digitisation strategy adopted in 2017 guides the country's work on meeting its digital goals. The original strategy is complemented by other strategies, such the National Approach to AI (2019) and the Data Strategy (2021). EU targets for 1Gbps connectivity are being closely monitored in the broadband rollout projects that are planned or in place. Even though the strategy is now more than 4 years old, it aims, together with the complementing strategies, to make Sweden the world leader in unlocking the potential that the digital transformation offers, while creating a digitally advanced public sector that provides legal certainty, availability and which contributes to the development of effective Swedish and EU policies.



Sweden has had a continuous security perspective regarding the digital sphere for a long time. Following Russia's invasion of Ukraine, this has intensified and several actions regarding cyber security have been taken. The Swedish Civil Contingencies Agency has been tasked with, together with the Swedish Police Authority, to carry out an information campaign aimed at the public as well as businesses about cyber and information security and how to protect oneself and/or one's business.

Further, The Swedish Civil Contingencies Agency has been given funds to be able to strengthen the national CSIRT, CERT-SE. The funds will enable CERT-SE to provide increased support to users as well as strengthen national resilience against cyberattacks and other it-incidents.

Since 1 January 2022, Sweden has an agency for psychological defence, the Swedish Psychological Defence Agency. The agency is focused on fighting threats of disinformation and foreign interference. Following Russia's invasion of Ukraine, the Swedish Psychological Defence Agency has received additional funding for carrying out an information campaign.

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

The Swedish RRP includes a set of mutually reinforcing reforms and investments to support economic recovery and growth, and improve social, economic and institutional resilience. The plan has a total allocation of EUR 3.3 billion in grants (representing 0.7 % of GDP) and focuses on addressing challenges in relation to the green and digital transitions and human capital. The digital contribution is EUR 673.6 million[2] which is 20.5 % of the total contribution. The measures in the digital domain of the RRP are consistent with Sweden's Digital Strategy, launched by the Government in 2017, that sets objectives in the area of digital skills, digital security, digital innovation, digital infrastructure and digital leadership. Measures in the plan correspond to each of these dimensions. The overall goal is for Sweden to be world leader in the digital transformation.

Progress is being made on the digital transition through significant investments expanding broadband connectivity, especially in less populated areas, which will also help support territorial cohesion. The plan envisages at least 18 400 new buildings being connected to broadband in 2022. The RRP will continue to promote broadband expansion by connecting more households in 2023-2025. Moreover, it also makes provision for the deployment of e-government solutions to be accelerated, by allocating substantial funds for the development of a joint digital infrastructure for public administration. The plan also includes investments in vocational and higher education, with a particular focus on digital skills to meet the labour market needs of the future.

[2] Each recovery and resilience plan has to 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.

1 Human capital

1 Human capital	Sweden		EU
	rank	score	score
DESI 2022	4	62.0	45.7

	Sweden			EU
	DESI 2020	DESI 2021	DESI 2022	DESI 2022
1a1 At least basic digital skills % individuals	NA	NA	67% 2021	54% 2021
1a2 Above basic digital skills % individuals	NA	NA	36% 2021	26% 2021
1a3 At least basic digital content creation skills[3] % individuals	NA	NA	77% 2021	66% 2021
1b1 ICT specialists % individuals in employment aged 15-74	7.0% 2019	7.5% 2020	8.0% 2021	4.5% 2021
1b2 Female ICT specialists % ICT specialists	21% 2019	21% 2020	22% 2021	19% 2021
1b3 Enterprises providing ICT training % enterprises	32% 2019	32% 2020	32% 2020	20% 2020
1b4 ICT graduates % graduates	4.3% 2018	4.3% 2019	4.7% 2020	3.9% 2020

Sweden ranks 4th out of the 27 EU Member States when it comes to human capital. It scores significantly above the EU average on the proportion of the population with at least basic and above basic digital skills. The proportion of ICT specialists is one of the highest in the EU, at 7.5 %. 21 % of these are female. The proportion of ICT graduates is also above the EU average. Nonetheless, 55.1 % of companies seeking to recruit ICT specialists reported hard-to-fill vacancies in 2020 and whilst a third of Swedish enterprises provide ICT training to their staff, 12 percentage points higher than the EU average of 20 %.

Sweden considers digital skills a key component of basic and higher education, a tool to close the digital divide and a means to further improve the competitiveness of its businesses and to support its research institutions. Skills are central to all strategies that have been published from 2017 onwards, starting with the Swedish Digitisation strategy (2017), the National Approach to AI (2019) and the Data Strategy (2021). Sweden has also adopted a National digitalisation strategy for the school system (2017) followed by an Action plan (2019). Of the 18 initiatives proposed in the Action plan 13 are under way.

In June 2021, in an effort to bring digital skills to those who need them and bring them closer to the labour market, the Swedish Government tasked the Employment Agency, together with a number of other agencies[4], with facilitating the development of platforms for lifelong learning. The agency has

[3] Break in series for indicators 1a1, 1a2 and 1a3. Figures are not comparable with those in earlier DESI reports.
[4] The Swedish National Agency for Education, the Swedish National Agency for Higher Vocational Education, the Swedish Research Council, the Swedish Council for Higher Education, Statistics Sweden, the Swedish Agency for Digital Government and Sweden's Innovation Agency.

also been asked to streamline the way that data and information on education is made available, creating a management structure to ensure lifelong learning and skills supply.

Looking at digital aspects of daily life, the annual national digitally themed day '*Digitalidag*' ('Digitaltoday') brings together public and private stakeholders across the societal spectrum to inspire people to be part of digital development. In 2021, 250 stakeholders (up from 210 in 2020) organised 1 315 activities (up from 285 in 2020) in 210 locations across the country (up from 110 in 2020). Participation in EU Code Week fell from 11 000 participants in 2020 to 1 667 participants in 2021. 86 % of activities took place in schools, where 46 % of participants were girls.

In October 2021, a report published by the Swedish Agency for Economic and Regional Growth, which focuses on how to increase equality within the digital sector, concludes that there are three main intervention areas that are relevant to equality: increase the inflow of people to the digital sector, strengthen the attractiveness of staying in the sector and facilitate returning to the sector.

During 2021, several measures have been put in place to strengthen the digital maturity of SMEs. There have been specific measures focused on SMEs in rural areas to increase digital maturity, coordinated by the Swedish Agency for Economic and regional Growth. Over 5 000 digital courses are and have been offered focusing on employees in, targeting employees of SMEs.

Sweden emphasises the importance of digital skills for a functioning labour market through a variety of strategies and actions. People in Sweden already have a good level of digital skills. To meet future challenges, Sweden launched several initiatives in 2021 to further raise this level, both for those with basic skills and for those with above basic skills. The proportion of ICT specialists in employment also needs be increased to avoid delaying the digital transformation of businesses.

Highlight – Digital excellence

The Sweden's innovation agency and the Swedish Higher Education Authority was tasked by the government to analyse and propose measures that will develop the supply of digital cutting-edge expertise in 2019. The work is done in collaboration with stakeholders from universities, industry, public administration and social partners.

The initiative – Digital Skills Sweden – has produced several reports. They, for example, analyse the estimated shortage of 70 000 skilled ICT workers by 2024; look at how to define digital excellence; analyse job ads, provide future scenarios on how the availability of digital excellence may look depending on different policy decisions and how trends develop. The initiative has also made a preliminary proposal of how to promote the supply of digital excellence skills. The proposals range from boosting education and research; improved cooperation by creating a specialised Council and to improve the availability of statistics and forecasts. The final report will be published on 31 October 2022.

Human capital in Sweden's Recovery and Resilience Plan

RRF funding will be used to foster digital skills and address labour shortages in specific professions. Sweden plans to the RRF to finance more study places in higher vocational training with a special focus on fields of data/IT or other areas that contribute to the digital transition. In addition, Sweden

aims to use RRF funds to scale-up the education at universities and other higher education institutions that increase digital skills.

2 Connectivity

2 Connectivity	Sweden		EU
	rank	score	score
DESI 2022	9	60.3	59.9

	Sweden			EU
	DESI 2020	DESI 2021	DESI 2022	DESI 2022
2a1 Overall fixed broadband take-up % households	86% 2019	84% 2020	82% 2021	78% 2021
2a2 At least 100 Mbps fixed broadband take-up % households	66% 2019	67% 2020	71% 2021	41% 2021
2a3 At least 1 Gbps take-up % households	2.84% 2019	3.63% 2020	4.44% 2021	7.58% 2021
2b1 Fast broadband (NGA) coverage % households	85% 2019	87% 2020	86% 2021	90% 2021
2b2 Fixed Very High Capacity Network (VHCN) coverage % households	77% 2019	81% 2020	83% 2021	70% 2021
2b3 Fibre to the Premises (FTTP) coverage % households	77% 2019	80% 2020	82% 2021	50% 2021
2c1 5G spectrum Assigned spectrum as a % of total harmonised 5G spectrum	22% 04/2020	49% 09/2021	81% 04/2022	56% 04/2022
2c2 5G coverage[5] % populated areas	NA	14% 2020	18% 2021	66% 2021
2c3 Mobile broadband take-up % individuals	90% 2018	90% 2018	95% 2021	87% 2021
2d1 Broadband price index Score (0-100)	65 2019	69 2020	76 2021	73 2021

During 2021, Sweden has fallen behind the EU average on several metrics, ranking 9th overall. On 1Gbps take-up, Sweden is at 4.44 % compared to the EU average of 7.58 %. In 5G coverage, according to July 2021 data, Sweden (at 18 % of populated areas) now scores significantly lower than the EU average (66 %). Next 6generation access coverage in Sweden has seen a small decline compared to 2020 and is at 87 % in 2020 (85% in 2019) against the EU average at 87 %. In terms of very high-capacity networks 83% of households are covered (EU average 70 %) continuing the steady increase over the last years (77 % in 2020 and 81 % in 2021). Fibre to the Premise (FTTP) has increased from 80.5 % in 2020 to 82.5 % in 2021 (from 48.1 % to 54.3 % in rural areas). 87 % of rural households have access to a broadband connection. The overall take-up by households of fixed broadband has dropped

[5] The 5G coverage indicator does not measure users' experience, which may be affected by a variety of factors such as the type of device used, environmental conditions, number of concurrent users and network capacity. 5G coverage refers to the percentage of populated areas covered by at least one operator as reported by operators and national regulatory authorities.

[6] Judgment of 2 September 2021 adopted in Cases C-845/19, C-5/20 and C-34/20. ECTRA had previously assessed the relevant operator's practice and concluded that it was in compliance with Regulation (EU) 2015/2120 without prejudice to any new assessment that would be deemed necessary as a result of the adoption of the Judgments of the Court of Justice.

by 2 percentage points and is now at 82 %, remaining above the EU average of 77 %. Pricing for broadband is slightly lower than the EU average, reflecting a decrease since last year.

The measures put forward in Sweden's 2016 broadband plan regarding the area of broadband connectivity are in line with the national broadband strategy. The plan could, however, be updated to include targets for 5G coverage, especially to fill the gap in levels of connectivity between densely and sparsely populated areas. The plan aimed for all households and companies to have access to 100 Mbps broadband by 2020. The Swedish Government has also set goals for 2025: 98 % of the population should have access to 1Gbps, 1.9 % to 100 Mbps, and the remaining 0.1 % access to at least 30 Mbps. The Swedish Broadband Forum was set up to solve problems related to the deployment of broadband. It is a key discussion forum, chaired by the Minister for Digital Development, which brings together stakeholders from public authorities and organisations, businesses, and operators.

While progress is being made on achieving 98 % population coverage by 2025 for 1Gbps connections, the remaining 2 percentage points are considered costly to be covered by fibre technology (and thus 1Gbps speeds) since those households are in very remote and/or sparsely populated areas and costs are prohibitive, for both public and private sectors. An investment gap of EUR 1.6-2 billion to connect 99.9 % of households via fibre infrastructure, and thus 1Gbps connectivity, has been identified. 5G, among others, has been identified as a key technology to achieve 100 % broadband access, including in remote areas. However, the broadband strategy does not include detailed 5G connectivity targets, being technology neutral, and there are no immediate plans to revisit and update this. It does aim at achieving the 1 Gbps, 100 Mbps and 30 Mbps targets described above.

For areas where next generation access either does not exist or is not planned for the next 3 years, there is a state aid scheme in place to ensure connectivity with speeds of at least 1 Gbps. This scheme is administered by the Swedish Post and Telecom Authority (PTS) and, in 2022, it is expected to grant financial aid using national funds amounting to approximately EUR 130 million, in addition to the EUR 160 million for 2021. The Swedish RRP supports broadband expansion in Sweden with a total EUR 464 million, focusing on rolling out high speed broadband in sparsely populated areas. As in the previous year, public and private-sector organisations have neither applied for nor received financing from the European Investment Bank or from the European Fund for Strategic Investments.

The 5G spectrum auction, completed in early 2021 after long delays, has generated substantial commercial interest. In the 3.6 GHz band, 320 MHz of spectrum was awarded nationwide and 40 MHz for local licenses (an additional 40 MHz may be made available considering initial demand), while another 80 MHz was awarded in the 2.3 GHz band. Sweden has not yet assigned rights of use in the 26 GHz band and intends to launch a public consultation to assess the demand for spectrum in this frequency band again during 2022. In 2021, 850 MHz in the lower end of the 26 GHz band was made available for licences with geographical limitations and for indoor use only. Meanwhile, 2G and 3G networks continue to be deactivated, to be replaced by 4G and 5G solutions, and are expected to be completely shut down by 2025 when the current licences in the 900 MHz and paired 2 GHz bands lapse.

As of February 2022, Sweden has allowed the use of 66.7 % (EU average 67.9 %) of the 700 MHz band, 90% (EU average 75%) of the 3.4-3.8 GHz band, and 85 % (EU average 29.1 %) of the 26 GHz band (compared to the EU weighted average for 5G pioneer bands). Overall, Sweden has allowed the use of 81% of total harmonised 5G (pioneer) spectrum, against the EU average of 56 %.

Continuing the trend observed over the last 10 years, mobile telephony continues to grow compared to fixed telephony. For businesses, overall the proportion of mobile telephony continues to outgrow that of fixed. This is also true for data, where mobile data traffic has increased by 36 % compared to

last year, compared to 26 % the year prior. Private mobile subscriptions are a main driver; each subscriber uses (on average) 9.6 gigabytes of traffic monthly, increased from 7.7 gigabytes a year earlier. In general, it seems that consumers are adapting to using mobile networks for their voice and data needs, while the copper switch-off continues.

In line with consumers switching to 5G devices, there is a significant increase and take up of 5G subscriptions (both private and business), offered by all major operators, up from 220 000 in January 2021 to 469 000 in June 2021, which shows significant (113 %) growth. This indicates that 5G services, among which high speed connectivity, will be taken up by consumers as the 5G infrastructure is continuously put in place.

The Swedish National Regulatory Authority noted a significant increase in demand for high speed connectivity in rural areas and secondary homes (country homes). In addition, during the COVID-19 pandemic a much higher than usual demand for high capacity home connections was noted due to teleworking, without the networks having any significant performance issues.

To maintain its frontrunner role and reach the 2030 Digital Decade targets, Sweden needs to address the areas where it has begun to score lower on coverage and take-up, such as 1Gbps take-up and 5G and next generation access coverage. Having almost completed the fibre rollout across the country, Sweden aims to provide 98 % 1Gbit coverage by 2025. This is an ambitious goal, seemingly difficult to achieve since the current take-up is very low. There are still questions remaining on how the remaining 2 percentage points in remote and sparsely populated areas will be addressed. As the copper switch-off is underway and fibre rollout has been declining since 2016, Sweden is now focusing on mobile technologies, including 5G, to allow it to reach 100 % high speed connectivity in the entire country. The national broadband plan could also be adjusted to take account of the EU 1Gbps targets and investments made accordingly.

Main market & regulatory developments

The only significant market development in 2021 was the buyout of Open Universe and Telenor's fibre assets by Global Connect Sweden. The acquisition impacts approx. 215 000 connected homes and was made at approx. EUR 300 million.

Even though there are around 200 ISPs on the fixed broadband market, the vast majority (80 % of end consumers) are served by five companies: Telia, Telenor, Bahnhof, Tele2 (incl. ComHem, merged in 2020) and Bredband 2. The model whereby municipally owned wholesale only operators install the infrastructure and sell or rent capacity to operators is continued. Stokab (in Stockholm) and GothNet (in Gothenburg) are the two main companies. 90 % of these companies are owned by municipalities, the rest are privately owned or have a hybrid ownership model.

Sweden notified full transposition of the European Electronic Communication Code on 27 May 2022 by the new law on Electronic Communication which is in force since June3. The Commission had earlier addressed a Reasoned Opinion to Sweden on 23 September 2021, in accordance with the procedure set out in Article 258 TFEU. The Commission services are assessing the notified measures.

Sweden has not participated actively in work related to the Connectivity toolbox, as the country considers that most of the best practices identified in the toolbox have already been implemented and that most of the issues addressed by the toolbox have already been solved in Sweden. Moreover, and while appreciating that telecom markets are to a high degree harmonised in the EU, Sweden considers that differences in public administration between

Member States should be taken into account, in particular the autonomy that Swedish public administration bodies have.

Zero rated services (typically social media and/or access to digital TV services) are offered by all four major operators to both private and business users. Telia with big private and business user bases, offers zero rate services without added constraints. Tele2 and Telenor offer add-on zero rated services to people who subscribe to their TV and streaming services. The compliance of the relevant offer with the regulatory framework might need to be assessed against the Case Law adopted by the Court of Justice of the EU on 2 September 2021.

The number of consumer complaints in particular relating to electromagnetic fields is decreasing. Similar complaints were addressed to the National Regulatory Authority when the rollout of both 3G and 4G networks took place. These complaints are handled by the Radiation Protection Institute. The number of overall complaints is stable, decreasing by 1 % compared to 2020. The complaints are in the areas of 5G, copper switch-off, number issues (e.g. portability), service interruption and coverage.

Connectivity in Sweden's Recovery and Resilience Plan

Sweden will use the RRF to support the expansion of broadband connectivity with EUR 464.2 million under the RRF. This represents 14.1 % of Sweden's total allocation. The investments in digital infrastructure aim at addressing remaining connectivity gaps in view of an increasingly digital society. Sweden has already an overall well-developed broadband infrastructure but needs to accelerate broadband roll-out in sparsely populated areas. The purpose of the relevant RRF measure is therefore to invest in fixed high-speed broadband networks in areas where access would not be provided on commercial basis alone.

3 Integration of digital technology

3 Integration of digital technology	Sweden		EU
	rank	score	score
DESI 2022	3	56.2	36.1

	Sweden			EU
	DESI 2020	DESI 2021	DESI 2022	DESI 2022
3a1 SMEs with at least a basic level of digital intensity % SMEs	NA	NA	86% 2021	55% 2021
3b1 Electronic information sharing % enterprises	37% 2019	37% 2019	35% 2021	38% 2021
3b2 Social media % enterprises	40% 2019	40% 2019	48% 2021	29% 2021
3b3 Big data % enterprises	10% 2018	19% 2020	19% 2020	14% 2020
3b4 Cloud % enterprises	NA	NA	69% 2021	34% 2021
3b5 AI % enterprises	NA	NA	10% 2021	8% 2021
3b6 ICT for environmental sustainability % enterprises having medium/high intensity of green action through ICT	NA	73% 2021	73% 2021	66% 2021
3b7 e-Invoices % enterprises	36% 2018	45% 2020	45% 2020	32% 2020
3c1 SMEs selling online % SMEs	30% 2019	31% 2020	33% 2021	18% 2021
3c2 e-Commerce turnover % SME turnover	18% 2019	15% 2020	19% 2021	12% 2021
3c3 Selling online cross-border % SMEs	10% 2019	10% 2019	11% 2021	9% 2021

On integrating digital technology in business activities, Sweden ranks 3rd in the EU. Sweden has the highest proportions of SMEs with at least basic level of digital intensity (86 %) and enterprises using cloud services (69%) in the EU. 19% of enterprises analyse big data and 10 % of enterprises use AI technologies which brings Sweden above the EU average. Sweden is one of the leaders in the EU when it comes to SMEs selling online (33%) and total turnover from e-commerce (19 %). However, only 11 % sell online cross-border.

To support digitalisation on a regional level, Sweden has selected 15 digital innovation hubs that will be financed with approximately EUR 2.2 million. They will also be supported by the Swedish Agency for Economic and Regional Growth and may become part of the European network of Digital Innovation Hubs. Sweden pre-selected 15 European digital innovation hubs in 2021. Thereof four European digital innovation hub proposals have a successful evaluation result[7] and additional six European Digital Innovation Hub proposals have received a Seal of Excellence.

Sweden continues to participate in the European Blockchain Partnership and the European Blockchain Services Infrastructure. Sweden is developing an information management service based on blockchain technology for enterprises. Furthermore, in 2021 the Swedish Tax Agency was assigned to

[7] I.e. are invited for grant agreement preparation (which is not a formal commitment for funding).

follow the Swedish hub of Gaia-X (the European cooperation project focused on data and cloud issues for the future European data economy, supporting Sweden's implementation and participation in the European Data Strategy, including legislation and high-impact projects e.g. common European data spaces). The future Gaia-X cloud marketplace is intended to create a more transparent market for buyers of cloud services, such as SMEs.

Sweden has increased its involvement in relation to high performance computing both at national level, allocating EUR 12 million per year to high performance computing research capacity, and at EU level, being an active partner in EuroHPC, an activity financed with EUR 3 million per year.

The Wallenberg Centre for Quantum Technology runs spans until 2029 and is coordinated by Chalmers Technical University. It includes many other Swedish universities and industry partners. Quantum sensing is coordinated by Lund University and quantum communication by the Royal Institute of Technology (KTH). The centre has a budget of EUR 140 million. It aims to create a high-end quantum computer and to develop and secure Swedish expertise in the main areas of quantum technology: quantum computing and simulation, quantum communications and quantum sensing.

To promote the development of advanced edge/AI, e.g. for climate and security applications of space data. The European Space Agency will open a series of break-through innovation labs in Europe called Φ-lab. The first one, Φ-lab@Sweden, will be focused on edge learning for AI. It will open at AI Sweden, in cooperation with the Swedish Space Agency.

AI is expected to have a clear impact on Swedish society. The national approach to AI (2018), aims to make Sweden a leader in seizing the opportunities that AI can offer to strengthen Sweden's welfare and competitiveness. AI Sweden, the national centre for applied artificial intelligence, is leading several initiatives, such as the development of large-scale language models for the Swedish language and supporting 100 SMEs in making better use of the potential of AI-driven businesses and services. The significance of research in AI is evident from the research bill for 2021-2024 in which AI is one of the focus areas. Positioned to directly finance higher education and research institutions, it has a budget of at EUR 320 million for 2022, EUR 330 million for 2023 and EUR 370 million for 2024. In addition to AI, the budget bill also emphasises the importance of more research into cyber security and how to better apply digital technologies.

Strongly linked to AI and digital innovation, the 2021 data strategy, sees data as an underused resource in Sweden and emphasises the untapped potential in using an ever increasing amount of data in a central, rather than supporting role for both the private and public sectors. It is structured around six goals: 1. increased access to data; 2. open and controlled data sharing; 3. cooperation and culture; 4. steering, regulating and monitoring; 5. research, development and competence; and 6. EU and international cooperation.

The 'smarter electronics systems' innovation programme brings together academia, industry and the public sector in an effort to build on the successes of the country's electronics components and systems industry (3 600 companies employing 50 000 people). By 2025, it aims to become a world-class industry, including in semiconductor components. Power electronics, sensors and smart systems are areas where a leap forward could help put Sweden on the path to the Digital Decade.

Sweden is traditionally early in adopting and developing new technologies. The trend from previous years of using private-public partnerships to make the research, development, and transfer of knowledge as fast and efficient as possible is present across all interventions at national level, in all areas of digital technology.

4 Digital public services

4 Digital public services[8]	Sweden		EU
	rank	score	score
DESI 2022	9	82.4	67.3

	Sweden			EU
	DESI 2020	DESI 2021	DESI 2022	DESI 2022
4a1 e-Government users % internet users	88% 2019	88% 2020	93% 2021	65% 2021
4a2 Pre-filled forms Score (0 to 100)	NA	NA	85 2021	64 2021
4a3 Digital public services for citizens Score (0 to 100)	NA	NA	85 2021	75 2021
4a4 Digital public services for businesses Score (0 to 100)	NA	NA	88 2021	82 2021
4a5 Open data % maximum score	NA	NA	84% 2021	81% 2021

Sweden ranks 9th in the EU on digital public services. It has the highest proportion of e-Government users in the EU. This proportion increased 5 percentage points to 93 % in 2021. Digital public services for both individuals and businesses rank higher than the EU average. Sweden scores 85 out of 100 when it comes to the amount of data that is pre-filled in public services online forms. On open data, Sweden performs just above the EU average (84 % versus an EU average of 81 %).

Digital services are central to the Swedish public administration and, as with education, there is a high degree of decentralisation. Public administration bodies are free to implement and offer services to both individuals and businesses, in line with the overarching goals set out in the Swedish digitalisation strategy and other strategies that have been published since. However, the decentralised model requires more coordination in some cases, in particular regarding data interoperability issues.

Digitalisation is seen as a key method of simplification, for example in, better regulation for businesses. The Swedish Agency for Public Management is tasked with developing a methodology and indicators for how this is measured and followed up on.

User-centricity is an important aspect of developing and launching services, but as authorities do this in a decentralised way, the Swedish Agency for Digital Government (DIGG), ensures consistency and provides direction. In June 2021, the Swedish Government tasked DIGG with coordinating a project to improve the conditions for public authorities and increase their use of artificial intelligence. The project also involved the Swedish Public Employment Service, the Swedish Companies Registration Office and the Swedish Tax Agency. The project has a EUR 0.5 million budget and will run until the end of 2022.

The decentralised nature of the Swedish administration and the ambition to make the 'once only' principle central to the way it operates has led to a realisation that the need to provide a uniform way of accessing services may need stronger central coordination. To support the 'once only' principle and as national coordinators of the Single Digital Gateway Regulation, DIGG wants to implement a national

[8] There is break in the series for indicators 4a2, 4a3, 4a4 and 4a5. As a result, no comparison of indicator and dimension results is possible over time.

digital public sector infrastructure, for example to facilitate data exchange between public bodies and authorities. In the EU, DIGG works with the Greek 'once only principle' pilot partners.

As regards the digitalisation of justice, eleven government agencies are engaged in an extensive cooperation on data exchange, especially related to the flow of data within criminal proceedings.

Having already reached the target of 80 % of the population aged over 16 using a digital means of identification, Sweden is now looking at extending this to those aged 13 or over. DIGG supervises the issuers of Swedish digital identification solutions, such as banks. Sweden participates actively in most of the eIDAS toolbox working groups on EU level. Swedes are offered three alternative eID schemes[9] for facilitating their interactions with public organisations and business. All schemes offer the possibility to interact with public organisations via a smart device. In total, eight million citizens (or 77 % of the citizens) use at least one of these three schemes One scheme (i.e. BankID) is widely used and is issued by a private entity in collaboration with the government.

Another example of the need for centralised coordination is the fact that, while medical records can be accessed through the national healthcare hub 1177.se (*Vårdguiden*), they do not necessarily always interoperate, depending on the healthcare provider. To address this, the Swedish eHealth Agency was tasked by the Swedish Government in April 2021 with suggesting improvements. The conclusions were published in a report in February 2022. They argue that critical data must be made available in a standardised format and recommend that this should be an obligation for all health-care providers and related actors in the future. The report also recommends that a new legal framework should be developed.

In summary, Sweden remains a top performer in digital public services. The decentralised model that it uses to implement its strategies has advantages and disadvantages, and the country is actively trying to address the latter. To progress on this, Sweden needs to ensure further coherence and interoperability where necessary and continue to implement and develop open data policies.

Digital public services in Sweden's Recovery and Resilience Plan

Sweden's RRP aims to support the digitalisation of the Swedish public administration with EUR 20.7 million. The objective is to achieve greater efficiency and security in handling public data, whilst offering citizens and businesses standardised solutions across the public administration. Sweden aims to develop a national framework for basic data, new and improved digital services, as well as elements for the exchange and handling of information and a common trust and security framework. This would lead to standardised solutions for citizens and businesses across the public administration.

Sweden also plans to use funds from the RRP to foster synergies between tackling the green and digital transition. The RRP aims to support the use of digital technologies to increase energy efficiency of buildings. A public support scheme should incentivise property-owners to renovate multi-dwelling buildings and apply smart energy systems as part of the renovation effort.

[9] BankID, Freja eID Plus and AB Svenska Pass