

WESTERN
BALKANS

**DIGITAL
ECONOMY
SOCIETY
INDEX**

REPORT
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* This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo Declaration of Independence.

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INTRODUCTION

The era of digital transformation has brought about changes in everyday life and business – and the Western Balkans is no exception. Against the backdrop of technological advancements, the Western Balkan (WB) economies have recognised the significance of digital economy and society for strengthening bonds, building digital resilience, enhancing cooperation within the region, and increasing convergence with the European Union (EU) – ultimately making the WB region fit for the Digital Age.

Leaders of the Western Balkans endorsed the Common Regional Market (CRM) 2021-2024¹ agenda at Sofia Summit in 2020 to further regional integration into the EU Single Market. The actions proposed under CRM Regional Digital Area aim to integrate the Western Balkans region into the pan-European digital market by embracing new practices of digital transformation, ensuring better connectivity and deployment of digital infrastructure, and aligning policies and standards with the EU Digital Single Market principles and practice.

In order to provide a proper assessment of digital transformation, the Regional Cooperation Council (RCC) conducts regional activities aimed at improving availability, analysis, and monitoring of high-quality digital economy statistics, based on the Digital Economy and Society Index (DESI) of the European Union. Ensuring an equitable digital transformation, however, necessitates a sound monitoring framework that has been reconfirmed as crucial element thereof at the WB Digital Summit 2021 and 2022.² It is with this intention that DESI for Western Balkans is developed, as a valuable tool for tracking the progress of digital transformation in the region as well as supporting evidence-based policies throughout the region.

The European Commission (EC) has set the baseline by conducting a three-year research study³ to monitor progress made by WB economies towards compliance with the EU regulations for electronic communications and information society services, and convergence with the internal market.

Following the need to improve research and data collection process in the WB economies, the RCC has prepared a study on the state of application of Digital Economy Society Index in Western Balkans⁴ including identification of data gaps and needs in each Western Balkan economy. The analysis of the study finds that all WB economies, and the responsible authorities, are aware of the importance of data collection and progress measuring in the context of DESI, as well as that the WB economies can provide data for calculation of the majority of DESI indicators. This analysis served as a basis for follow-up processes connected with the preparation of WB DESI report.

The WB DESI 2022 Report provides DESI calculation for 2021 and 2022 for the WB region and helps setting the framework for permanent monitoring of digital transformation in the Western Balkans, as well as monitoring the progress towards digital strategy objectives and identifying areas that require relevant policy actions.

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1 <https://www.rcc.int/pages/143/common-regional-market>

2 <https://www.rcc.int/docs/647/conclusions-of-the-western-balkans-digital-summit-2022>

3 <https://op.europa.eu/en/publication-detail/-/publication/2e0e1320-5118-11e9-a8ed-01aa75ed71a1>

4 [Report on the State of Application of Digital Economy Society Index \(DESI\) in Western Balkan Economies](#)

The WB DESI 2022 Report serves as a factual account of digital performance, including vis-à-vis the EU, for policy makers. The analysis in the report addresses key areas where the performance and competitiveness of each WB economy could be improved by evaluating the scores of individual DESI indicators. Likewise, the report contains relative performance measurements of each WB economy compared to the WB region and the EU and identifies priority areas for improved data collection, all in line with the CRM Action Plan 2021-2024.

EXECUTIVE SUMMARY

For the first time in the WB region, the WB Digital Economy and Society Index (DESI) was calculated for the years 2021 and 2022, thus reconfirming the region's outmost efforts invested in keeping up with the digital transformation as well as monitoring developments at the economy level. With DESI in place, the region can now boast of comparable progress (with that in the EU) along various digital indicators. The methodology for WB DESI calculation is based on the EU DESI 2022 Methodology and allows the comparison with the EU DESI. Data necessary for the WB DESI calculation were supplied through Eurostat, questionnaire that was sent to WB economies' statistical offices, regulatory authorities for electronic communications, broadband competence offices and/or relevant ministries. Data for indicators that were missing for the whole observed period were provided through market research and/or desk research.

The WB DESI results for 2022 are structured around four DESI dimensions that include human capital, connectivity, integration of digital technology and digital public services.

The analysis of the data finds that WB region scores below the EU average in all DESI dimensions in 2022. Montenegro, Serbia and Albania have the highest scores for the total WB DESI for 2022.

Human capital

Policymakers in the WB region have become increasingly focused on improving digital skills of citizens, as a lack in this segment may result in less innovation, lower levels of productivity or slower overall economic growth. Despite many policy actions oriented towards improving the overall digital skills, the WB region performs well below the EU average in the Human capital dimension, mainly due to lower results in internet user skills. When compared to the EU, the WB region reports good performance in the proportion of ICT graduates and female ICT specialists, Montenegro and Serbia have the highest scores in the Human capital dimension.

While 85% of people in the WB region used the internet in the last 12 months in 2021, only 35% possessed at least basic digital skills. A general shortage of the ICT specialists in the EU labour market is also evident in the WB region. Only 2.6% of employed persons in the WB region were ICT specialists in 2021. There is also a severe gender balance issue, with only 19% of ICT specialists being women in the WB region, which is on the EU average, but far from gender equality. Individuals with a tertiary degree in ICT in the WB region represented 6% of total graduates in 2021, which is above the EU average of 4% for 2020.

Connectivity

In overall broadband connectivity, the WB region is lagging behind the EU, mainly due to 5G services which were not available in 2021. Montenegro recorded the highest score in the Connectivity dimension, followed by Serbia, Kosovo* and Albania.

In overall fixed broadband take-up, WB region is performing good compared to the EU. In 2021, 77% of households were using broadband services in the WB region compared to 78% in the EU. In 2021 almost 100% of households in Kosovo* were using broadband services, followed by Montenegro with 96%.

Coverage of Next Generation Access (NGA) technologies capable of delivering download broadband speeds of at least 30 Mbps reached almost 73% of households in the WB region in 2021, which is below the EU average of 90%. In North Macedonia and Montenegro, NGA technologies were available in more than 80% of households. Montenegro recorded the highest score in the WB region with 77% of Very High-Capacity Coverage (VHCN) that is above the EU average of 70%. Montenegro and Albania recorded the highest score in Fibre to the premises (FTTP) coverage with 67% and 56%, respectively in 2021, which is above the EU average of 50%.

Regarding mobile broadband penetration, almost 82% of people in the WB region used a mobile device to access the internet in 2021. Mobile broadband penetration is highest in Serbia and Montenegro with figures above the EU average (96% and 91%, respectively versus 87% in the EU). In 2021 WB economies did not assign any spectrum in the 5G “pioneer bands” that is ready for 5G use.

Average broadband prices in the WB region in 2022 were higher compared to the average broadband prices in the EU in 2021.

Legal instruments in the broadband connectivity segment are still to be put in place, in particular the transposition of the EECC, together with specific measures to be taken, building on the WB region’s high fixed broadband take-up and competitive broadband prices. The delays in assignment of 5G spectrum has an impact on both the availability and use of high-speed connectivity in the entire WB region.

Integration of digital technology

In the Integration of digital technology dimension, the WB region underperformed compared to the EU. Policymakers in the WB region rapidly implement programmes and strategies that support digitalisation of business, including e-commerce. Montenegro recorded the best performance in the Integration of digital technology dimension, followed by Kosovo*, Albania and Serbia.

The adoption of digital technologies by SMEs remains notably below the EU average (35% in the WB region compared to the EU average of 55%). On average, only 7% of WB enterprises used big data, 16% cloud and 3% artificial intelligence in 2021, compared to 14%, 34% and 8% in the EU, respectively.

Successive pandemic lockdowns increasingly integrated online sales channels in the WB region. In 2021, 21% of SMEs in the WB region made online sales, compared to 18.5% in the EU. Serbia (26%), Montenegro (23%) and Kosovo* (22%) reported the highest number of SMEs selling online in the WB region. Despite good results in overall online sales, only 4% of SMEs in the WB region reported sales to EU customers in 2021. Montenegro reported the highest proportion of cross-border online sales with 16% of SMEs that realised online sales in the EU in 2021.

Digital public services

The WB region made efforts to improve the availability of digital public services for citizens and businesses. Domestic portals for digital services have been established, greatly improving the ease of access to key services. The WB region has also strengthened its legal framework for the provision of digital services and the use of e-signatures. Positive developments were observed also in the increasing amount of available open data.

Despite increased policy focus, the WB region performed notably below the EU in the Digital public services dimension. Serbia is the top performer in this segment, followed by Albania and North Macedonia.

In 2021, only 35% of internet users interacted with the public administration online in the WB region, which is significantly below the EU average of 65%. The highest numbers of individuals using e-government services in 2021 were reported in Albania and Serbia.

In the WB region two thirds of online forms requiring personal information are pre-filled with data already known by the public administration (score 63 out of 100 points), which is slightly below the EU average of 64.5. Serbia, Bosnia and Herzegovina, North Macedonia and Albania recorded scores above the EU average for the pre-filled forms.

The supply of digital public services for citizens (with a score of 43 versus the EU average of 75) needs to improve considerably. The same applies to the availability of digital public services to business with a score of 59 points, which is 23 points below the EU average. Additionally, the WB region is performing significantly below the EU average in the maturity of open data (42% compared to 81%).

A more detailed analysis of the performance of each WB economy based on the index, including a description of the most important digital policy initiatives for each WB economy, is presented in the WB DESI profiles section of the Report.

In 2021, on average, 25% of data for the calculation of DESI indicators were missing in the WB region. To ensure effective, evidence-based policy making, the data collection process needs to be improved in the WB region, especially in the area of digital technology usage in enterprises as most of the missing indicators relate to this segment. Existing gaps in data availability should be addressed, control over the data collection process improved and a regular data collection process established.

ABOUT DESI

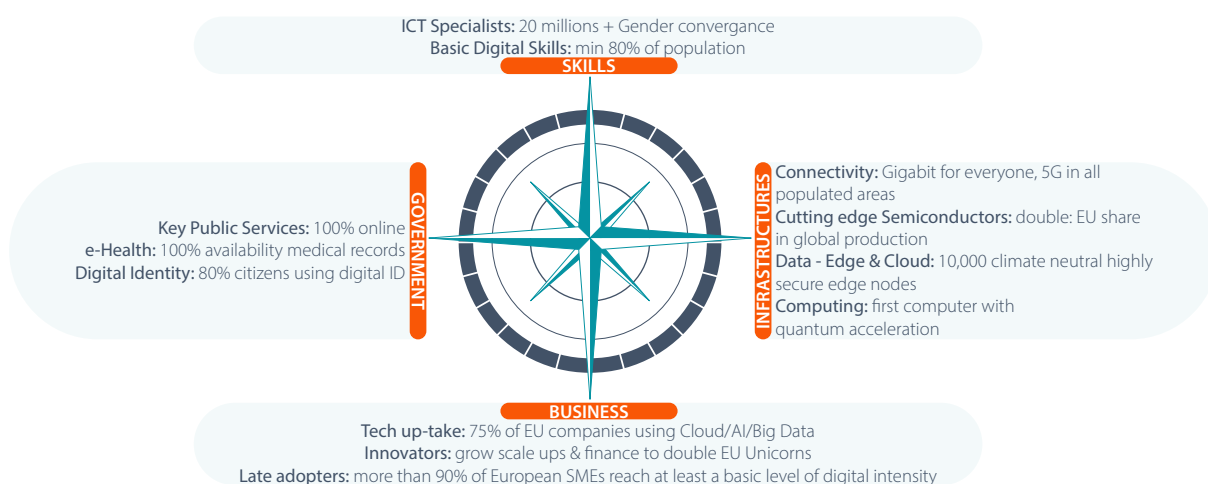
DESI was introduced in the EU in 2014 and serves to monitor progress on their digital development and identify key areas that need priority policy actions.

The DESI structure is periodically changed to reflect the latest technological and policy developments in the EU. In 2021, the European Commission significantly adjusted DESI to reflect two major policy initiatives that will have an impact on digital transformation in the EU over the coming years: the Recovery and Resilience Facility⁵ and the 2030 Digital Decade Compass.⁶

The Recovery and Resilience Facility (RRF) is a recovery instrument that entered into force in February 2021 with the aim to mitigate the economic and social impact of the Covid-19 pandemic and will distribute up to € 800 billion in grants and loans to EU Member States. Member States will use the funds to implement ambitious reforms and investments to make their economies and societies more sustainable, resilient and prepared for the green and digital transitions. The RRF is structured around six pillars: green transition, digital transformation, economic cohesion, productivity and competitiveness, social and territorial cohesion, health, economic, social and institutional resilience policies for the next generation. At this moment, Member States dedicated 131 billion EUR to digital related reforms and investments in their national Recovery and Resilience Plans that were approved by the European Commission, which represents 26% of their RRF allocation. The proposed reforms and investments have exceeded the 20% digital target.

The Digital Compass for the EU's digital decade until 2030 was introduced in March 2021 and is based on four pillars: digitally skilled population and highly skilled digital professionals, secure and sustainable digital infrastructures, digital transformation of businesses and digitalisation of public services. Key policy areas for achieving these goals include cloud computing, artificial intelligence, digital identities, data, and connectivity.

Figure 1 Digital Compass 2030



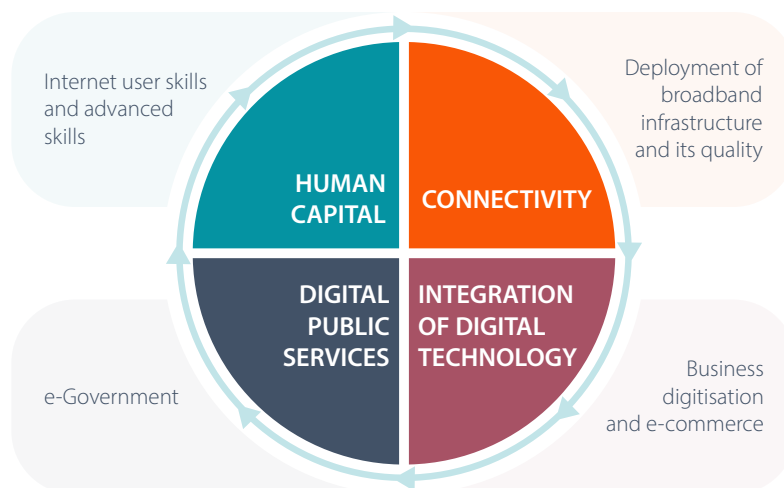
Source: European Commission

⁵ https://ec.europa.eu/info/business-economy-euro/recovery-coronavirus/recovery-and-resilience-facility_en

⁶ https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade-digital-targets-2030_en

The progress towards these 2030 digital targets is measured by individual indicators that are combined in the current DESI dimensions. As shown in Figure 2, four DESI dimensions correspond to the pillars of Digital Compass and each dimension is measuring certain aspects of digital economy and society.

Figure 2 DESI dimensions



DESI has a three-layer structure composed of dimensions, each of which is divided into a set of sub-dimensions, which consist of individual indicators.

In 2022, DESI structure remained the same, only definitions of several indicators were changed to better reflect the dimensions they are measuring.

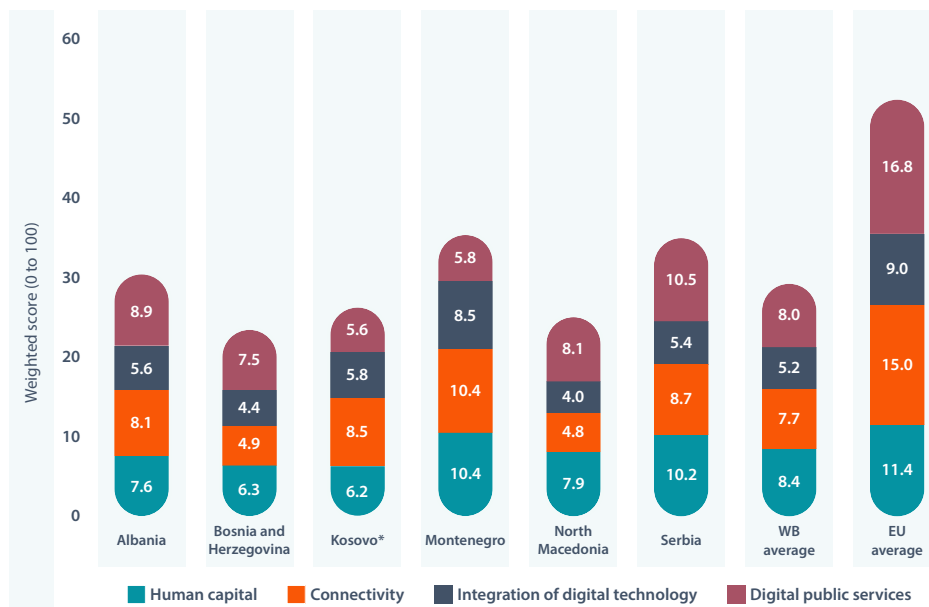
WB DESI 2022 RESULTS

The methodology for DESI calculation for the WB region is based on the EU DESI Methodology from 2022⁷ and allows comparisons of digital performance of WB economies with the average performance of the EU for the same period.

DESI for the WB region is calculated for two years, 2022 and 2021. A complete comparison of WB DESI results for 2022 with 2021 is not possible due to methodological changes and breaks in time series for several indicators in 2021.⁸ For this reason, all graphs in the report represent calculations of DESI components for the WB region for 2022 (mainly based on input data for indicators from 2021, unless otherwise stated).

WB region scored below the EU average in all DESI dimensions in 2022. Montenegro, Serbia and Albania scored above the WB average in the overall DESI for 2022.

Figure 3 WB DESI 2022 Dimensions



Source: WB DESI Calculation, EU DESI 2022 (EU average)

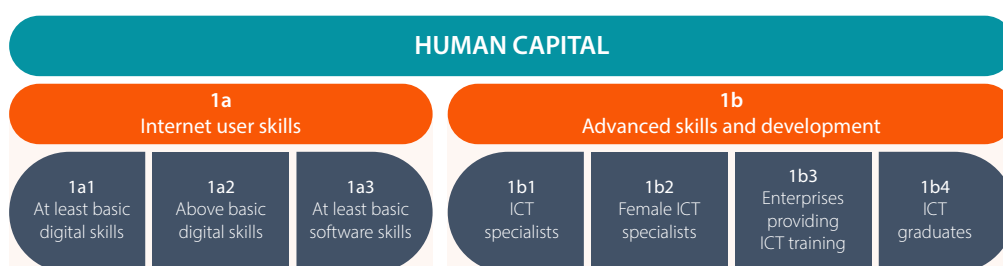
7 <https://digital-strategy.ec.europa.eu/en/library/digital-economy-and-society-index-desi-2022>

8 Indicators with break in time series include: Internet user skills indicators, SMEs with at least basic level of digital intensity, Cloud, AI, ICT for environmental sustainability and indicators under Digital public services dimension (except e-Government users).

HUMAN CAPITAL

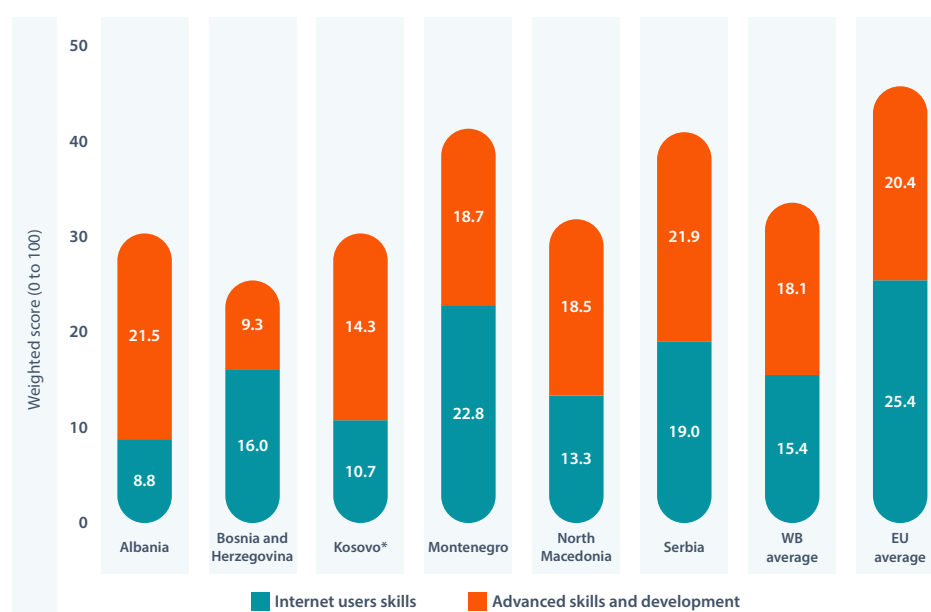
Human capital dimension measures the skills needed to take advantage of the possibilities offered by the digital society. Digital skills include wide range of abilities for using digital devices, applications and information. They are perceived as the enablers of internet use, use of digital public services and advanced digital technologies, such as Artificial Intelligence, Big Data, and Cloud. The Human capital dimension is divided into 2 sub-dimensions which are further divided into 7 indicators, as shown in Figure 4.

Figure 4 Human capital dimension



In the Human capital dimension, the WB region is performing below the EU average, mainly due to lower level of digital skills, but maintains strong performance in the proportion of ICT graduates and Female ICT specialists. Montenegro and Serbia have the highest scores in the Human capital dimension.

Figure 5 Human Capital sub-dimensions, WB DESI 2022



Source: WB DESI Calculation, EU DESI 2022 (EU average)

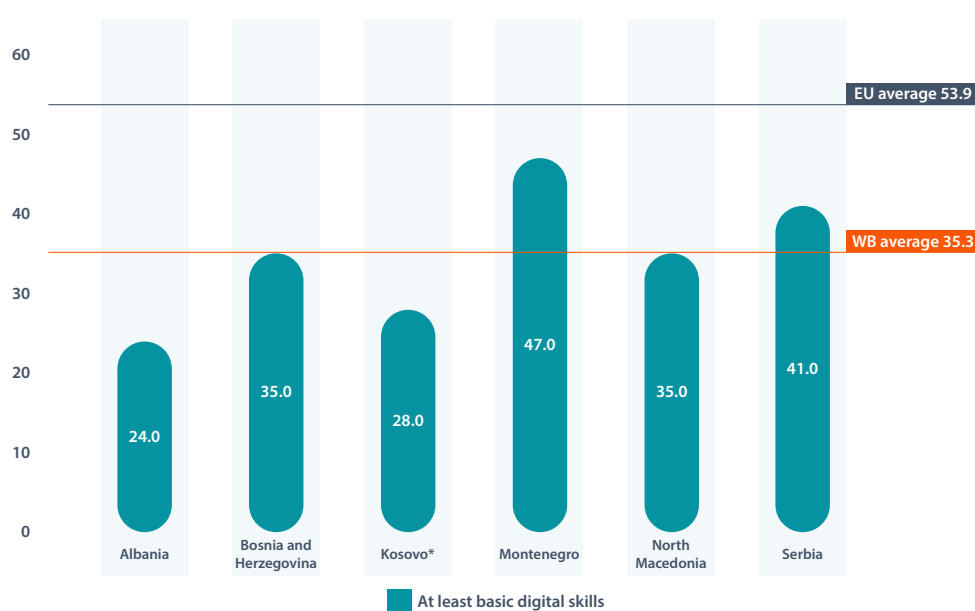
In the Internet user skills sub-dimension Montenegro, Serbia and Bosnia and Herzegovina are top performers in WB with scores above the WB average. In the advanced skills and development sub-dimension that relates mostly to the number of ICT specialists, female ICT specialist and ICT graduates, Serbia and Albania have the highest scores above the WB and EU averages, followed by Montenegro and North Macedonia with scores above the WB average.

Internet user skills

Internet user skills indicators refer to five areas of digital skills: information and data literacy skills, communication and collaboration skills, digital content creation skills, safety skills and problem-solving skills. To have at least basic overall digital skills, people must know how to do at least one activity related to each area. The methodology for computing the Internet user skills indicators has changed as of 2021 and these indicators are not fully comparable with previous years. Data for Kosovo* for Internet user skills are from 2019 and are not fully comparable to other WB economies.

While 85%⁹ of people in the Western Balkans used the internet in the last 12 months in 2021, only 35% possessed at least basic digital skills. The Montenegro and Serbia have the highest scores in the WB region, with 47% and 41% of people with at least basic digital skills, respectively.

Figure 6 At least basic digital skills (% of individuals), 2021



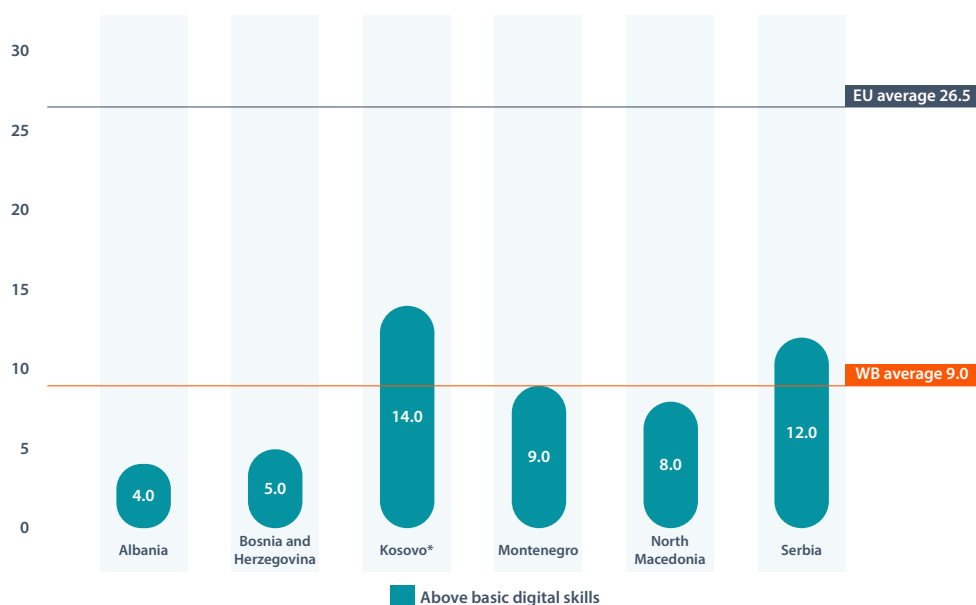
Source: Eurostat (Albania, Bosnia and Herzegovina, Kosovo*, Montenegro, North Macedonia, Serbia), EU DESI 2022 (EU average)
Data for Kosovo* from 2019

Above basic digital skills indicator measures the above basic score in activities related to all five specific areas: information and data literacy, communication and collaboration, digital content creation, safety and problem solving. Above average digital skills are important for the decent employment and competitiveness in the labour market and for the adoption of advanced digital solutions by businesses.

In 2021, 9% of individuals in the WB region had above basic digital skills which is well below the EU average of 27%. Serbia had the highest score in 2021, followed by Montenegro.

⁹ https://ec.europa.eu/eurostat/databrowser/view/isoc_ci_ifp_iu/default/table?lang=en

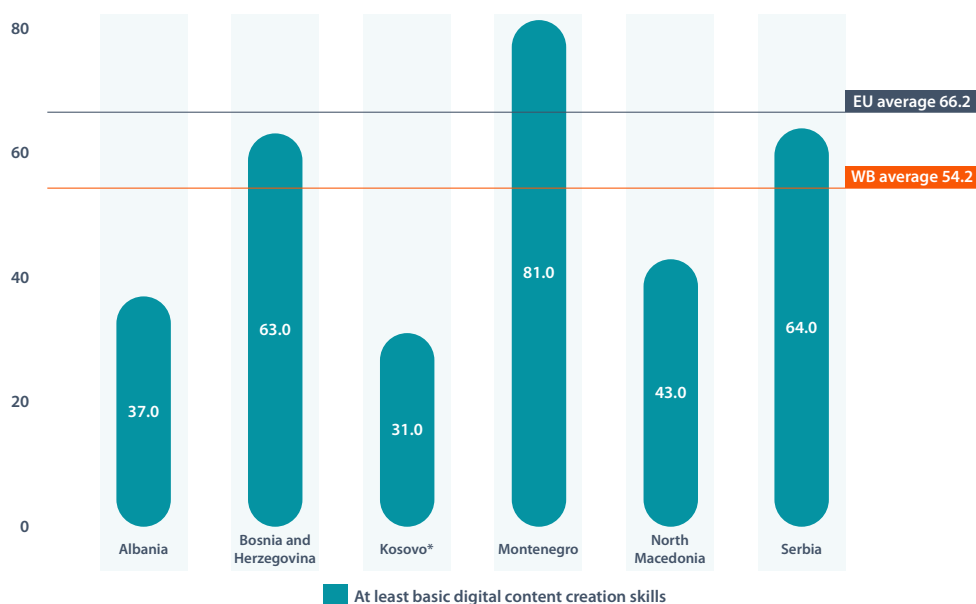
Figure 7 Above basic digital skills (% of individuals), 2021



Source: Eurostat (Albania, Bosnia and Herzegovina, Kosovo*, Montenegro, North Macedonia, Serbia), EU DESI 2022 (EU average)
 Data for Kosovo* from 2019

In Montenegro 81% of people had at least basic digital content creation skills¹⁰ in 2021, followed by Serbia and Bosnia and Herzegovina with 64% and 63% respectively.

Figure 8 At least basic digital content creation skills (% of individuals), 2021

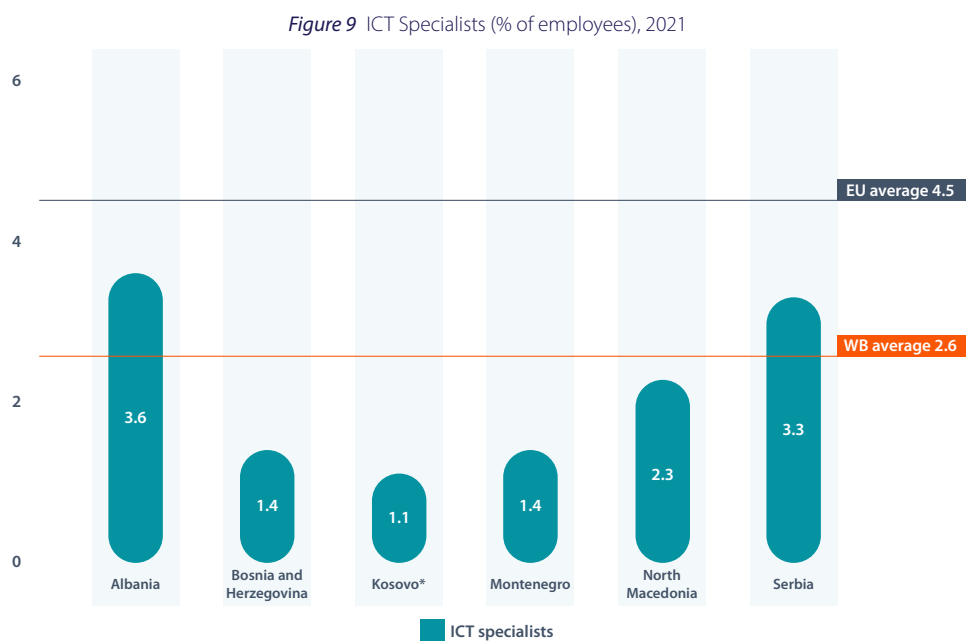


Source: Eurostat (Albania, Bosnia and Herzegovina, Kosovo*, Montenegro, North Macedonia, Serbia), EU DESI 2022 (EU average)
 Data for Kosovo* from 2019

¹⁰ Digital content creation skills include following skills: to create and edit digital content, to improve and integrate information and content into an existing body of knowledge while understanding how copyright and licences are to be applied and to know how to give understandable instructions for a computer system.

Advanced skills and development of ICT specialists and ICT graduates

A general shortage of ICT specialists¹¹ in the EU labour market is also evident in the WB region. Only 2.6% of employed persons were ICT specialists in 2021. The highest numbers were reported in Albania and Serbia with 3.6% and 3.3% of ICT specialists employed, respectively.

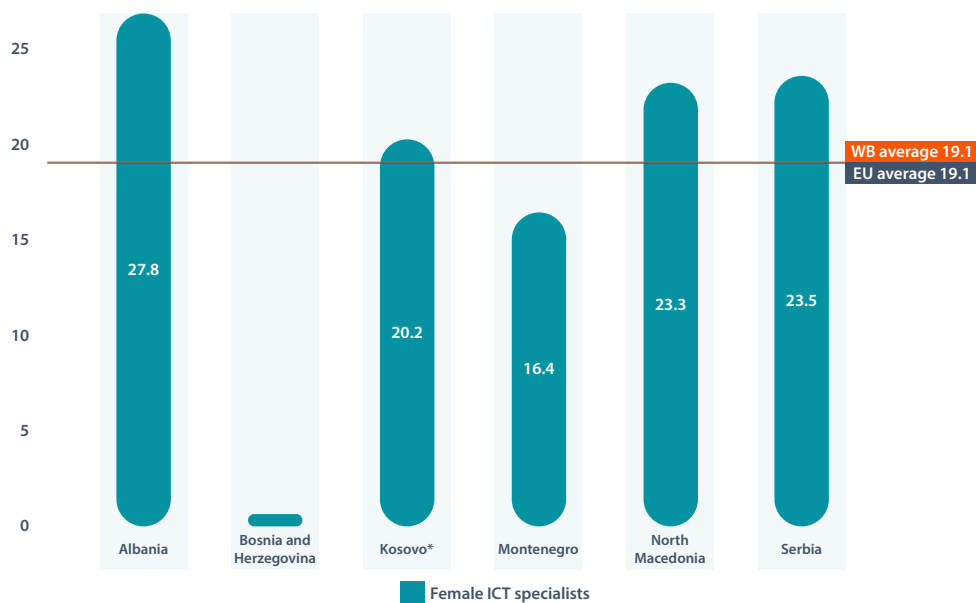


Source: Eurostat (Serbia), statistical office (Bosnia and Herzegovina, Kosovo*, Montenegro, North Macedonia), market research (Albania), EU DESI 2022 (EU average)
Data for Albania from 2022, for Kosovo and North Macedonia from 2020*

There is also a severe gender balance issue, with only 19% of ICT specialists being women in the WB region which is on the EU average of 19% in 2021, but far from gender equality. A somewhat better situation regarding females ICT specialists is evident in Albania (28%), Serbia (24%) and North Macedonia (23%).

11 Under ISCO-08, Eurostat and the OECD define ICT specialists as people with the following occupations: ICT service managers; information and communications technology professionals (software and multimedia developers and analysts, and database specialists and systems administrators); information and communications technicians (ICT operations and user support technicians, and communications technicians); electronic engineers; telecommunication engineers; graphic and multimedia designers; information technology trainers; ICT sales professionals; electronics engineering technicians; electronics mechanics and servicers; ICT installers and servicers.

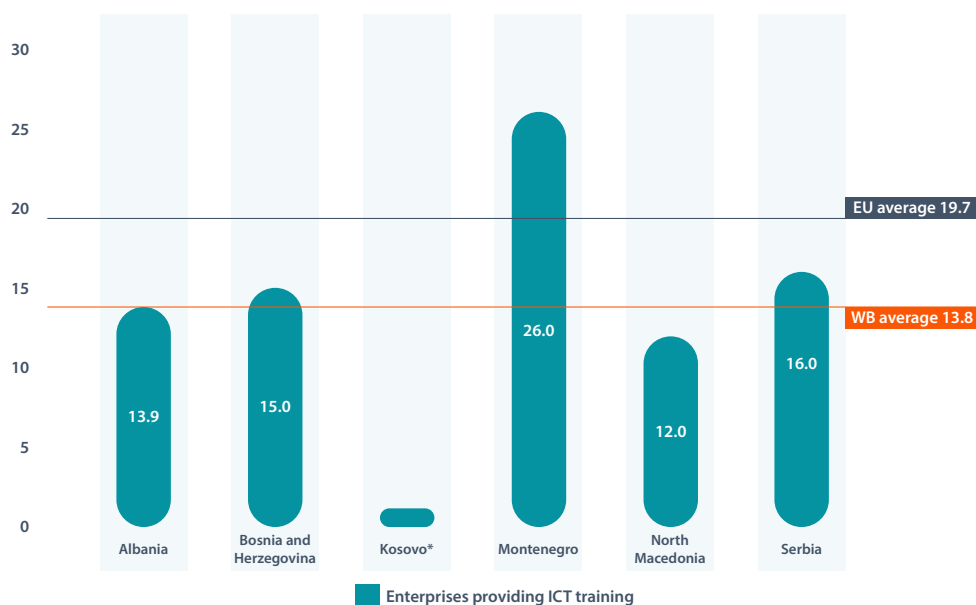
Figure 10 Female ICT Specialists (% of ICT specialists), 2021



Source: Eurostat (Bosnia and Herzegovina, Montenegro, Serbia), statistical office (Kosovo*, North Macedonia), market research (Albania), EU DESI 2022 (EU average)
 Data for Albania from 2022, for Kosovo* and North Macedonia from 2020

In the WB region 14% of enterprises provided ICT training to their employees in 2020. ICT training is relevant for all employees, especially for non-ICT specialists to enhance their ICT skills. Montenegro reported the highest share of enterprises that provided ICT training to their staff in 2020.

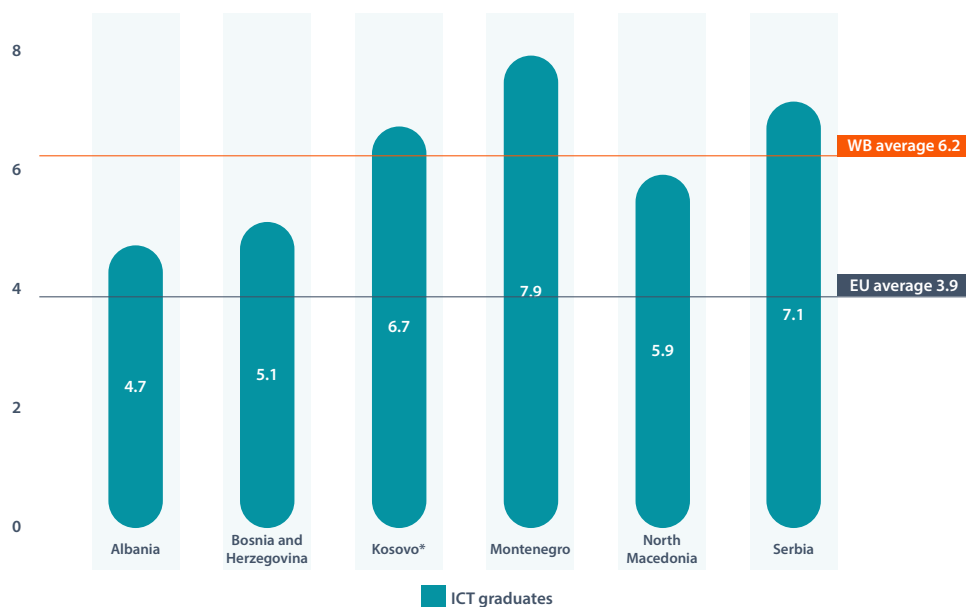
Figure 11 Enterprises providing ICT training (% of enterprises), 2020



Source: Eurostat (Bosnia and Herzegovina, Montenegro, North Macedonia, Serbia), statistical office (Albania, Kosovo*), EU DESI 2022 (EU average)

Individuals with a tertiary degree¹² in ICT in the WB region represented 6% of total graduates in 2021, which is above the EU average of 4% for 2020. Montenegro, Serbia and Kosovo* have the highest score among the WB economies with the above average number of ICT graduates.

Figure 12 ICT graduates (% of graduates), 2021



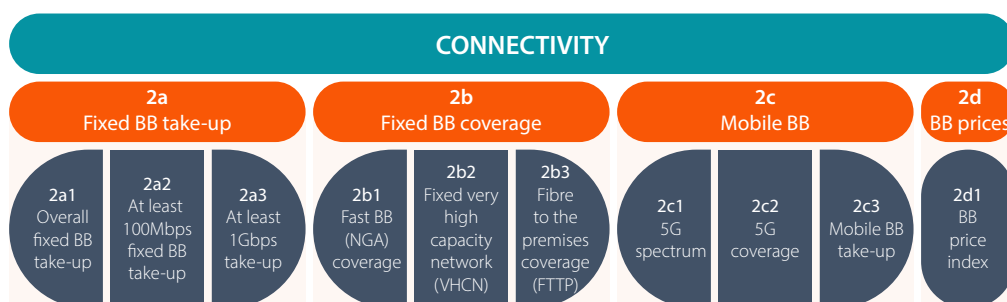
Source: Eurostat (Bosnia and Herzegovina and North Macedonia), statistical office (Albania, Kosovo* and Serbia), market research (Montenegro), EU DESI 2022 (EU average)
Data for Bosnia and Herzegovina, North Macedonia and EU from 2020

12 Tertiary education based on ISCED 2011 levels 5-8: Level 5—short-cycle tertiary education; Level 6—bachelor's or equivalent level; Level 7—master's or equivalent level; Level 8—doctoral or equivalent level.

BROADBAND CONNECTIVITY

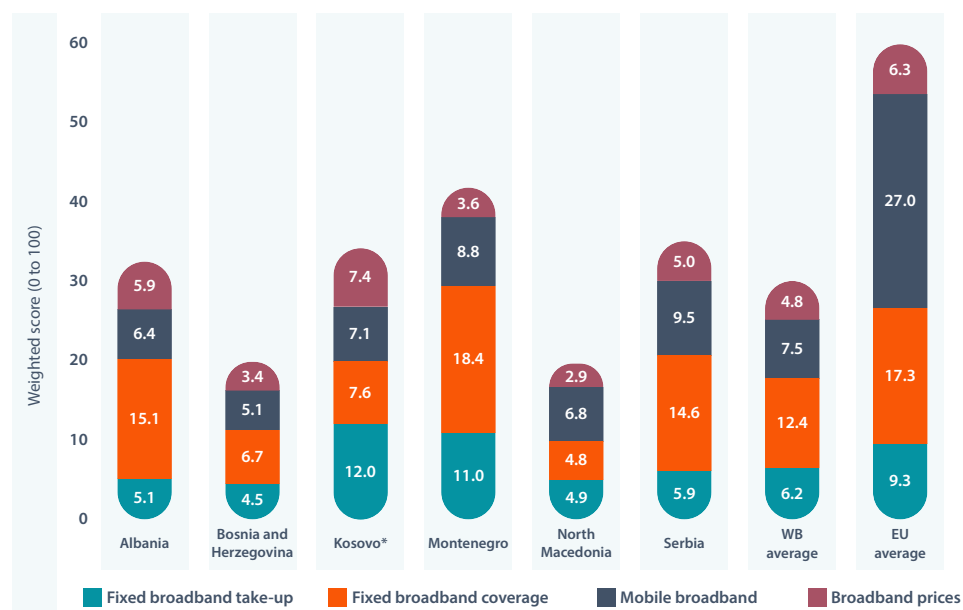
The connectivity dimension covers both the supply and demand side of fixed and mobile broadband, implying that both broadband coverage and usage are integrated into this dimension. The Connectivity dimension measures fixed broadband take-up and coverage, 5G spectrum, mobile broadband take-up and retail prices of fixed and mobile broadband offers, as shown in Figure 13.

Figure 13 Connectivity dimension



In overall connectivity, WB region is lagging behind the EU, mainly due to 5G services which were not available in the WB region in 2021. Montenegro recorded the highest score in the Connectivity dimension, followed by Serbia, Kosovo* and Albania with scores above the WB average.

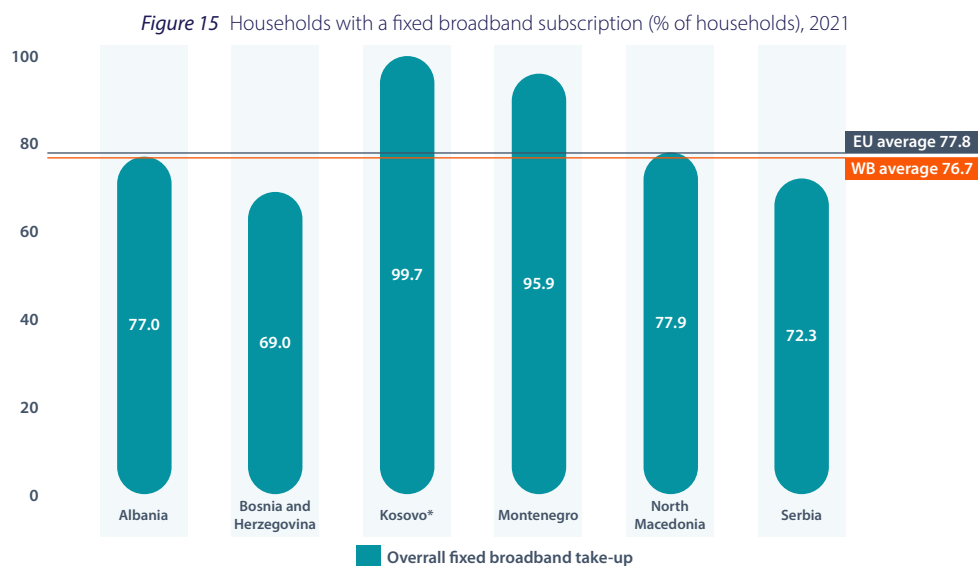
Figure 14 Connectivity sub-dimensions, WB DESI 2022



Source: WB DESI calculation, EU DESI 2022 (EU average)

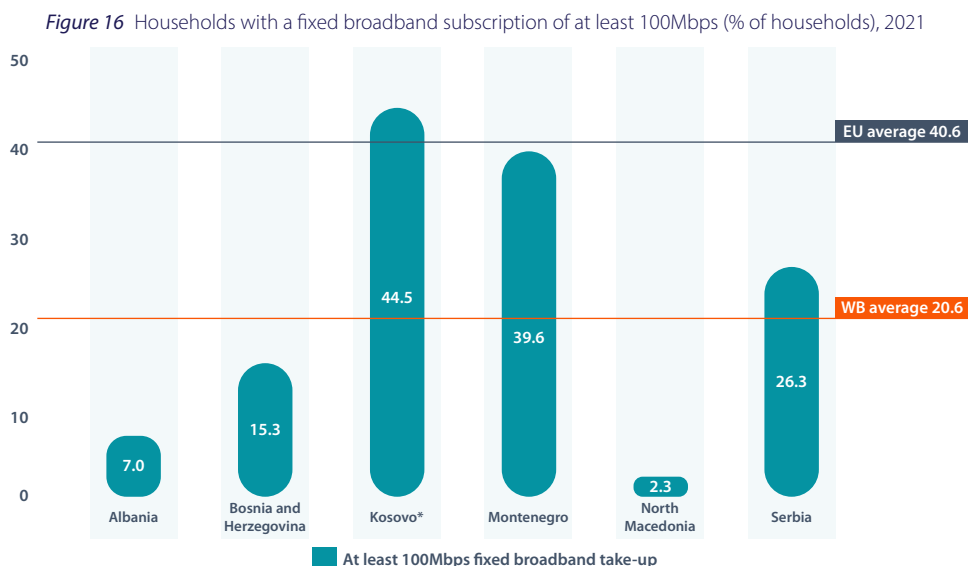
In the Fixed broadband take-up sub-dimension Kosovo* and Montenegro have the highest score that are above the WB and EU averages. In Fixed broadband coverage sub-dimension, Montenegro has the highest score that is above WB and EU average, followed by Albania and Serbia with scores above the WB average. In mobile broadband sub-dimension Serbia and Montenegro have the highest score that is above the WB average. Kosovo*, Albania and Serbia have the highest scores for broadband prices sub-dimension, which means that their prices for broadband services are lower compared to the WB average.

Fixed broadband take-up



Source: Electronic and Postal Communications Authority - AKEP (Albania), Regulatory Authority of Electronic and Postal Communications - ARKEP (Kosovo*), Communications Regulatory Agency - RAK (Bosnia and Herzegovina), Agency for Electronic Communications and Postal Services - EKIP (Montenegro), Agency for Electronic Communications – AEC / National Broadband Competence Office - BCO (North Macedonia), Regulatory Agency for Electronic Communications and Postal Services- RATEL (Serbia), EU DESI 2022 (EU average)

Looking at the broadband services, there has been a sharp increase (42%) in at least 100 Mbps fixed broadband penetration in the WB region in 2021 compared to 2020. In 2021, almost 21% of WB households subscribed to broadband services of at least 100 Mbps. Still, number of households subscribed to such services in the WB region is notably below the EU average of 41%. In Kosovo* almost half of households (45%) were using broadband services of 100 Mbps and more in 2021, followed by Montenegro with 40%.



Source: AKEP (Albania), ARKEP (Kosovo*), RAK (Bosnia and Herzegovina), EKIP (Montenegro), AEC/BCO (North Macedonia), RATEL (Serbia), EU DESI 2022 (EU average)

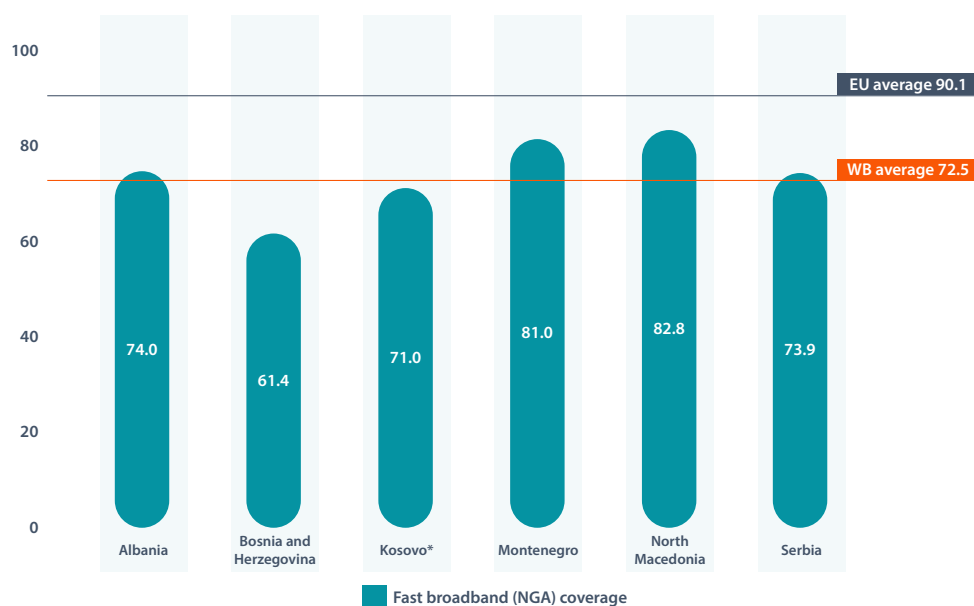
Data for North Macedonia from Q1 2022

In 2021, number of households in the WB region with access to broadband services at gigabit speeds was quite low (0.04% compared to 8% in the EU).

Fixed broadband coverage

In the WB region coverage of Next Generation Access (NGA) technologies (VDSL, FTTP and Cable Docsis 3.0.) capable of delivering download speeds of at least 30 Mbps reached almost 73% of households in 2021, which is below the EU average of 90%. In 2021, compared to 2020, NGA coverage in the WB region increased by 7%, partly due to the increase in Fibre to the Premises (FTTP) coverage. In North Macedonia and Montenegro, NGA technologies were available in more than 80% of households.

Figure 17 Fast broadband (NGA) coverage (% of households), 2021

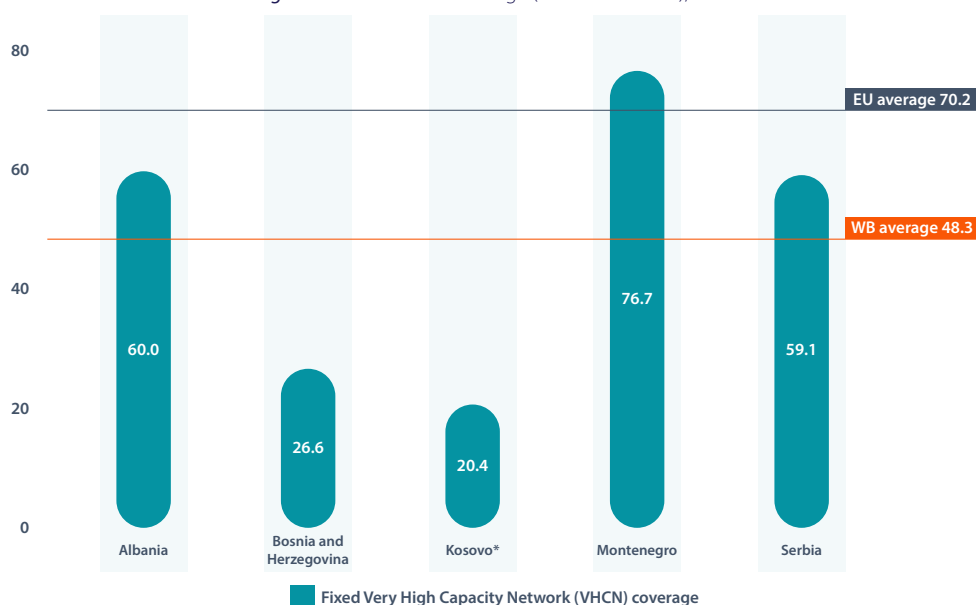


Source: AKEP (Albania), ARKEP (Kosovo*), RAK (Bosnia and Herzegovina), EKIP (Montenegro), AEC/BCO (North Macedonia), RATEL (Serbia), EU DESI 2022 (EU average)

In 2021, 48% of WB households¹³ were connected to any of Very High Capacity Networks (VHCN include FTTP and Cable Docsis 3.1.), compared to the EU average of 70%. VHCN coverage in the WB region increased by 19% in 2021 compared to previous year, mainly due to the accelerated FTTP deployments. Montenegro has the highest score in the WB region with 77% of VHCN coverage, even above the EU average of 70%. Albania and Serbia reported above WB average VHCN coverage of 60% and 59%, respectively.

¹³ WB average for the VHCN indicator is calculated excluding North Macedonia due to unavailable VHCN coverage data necessary for calculation of the indicator

Figure 18 Fixed VHCN coverage (% of households), 2021



Source: AKEP (Albania), ARKEP (Kosovo*), RAK (Bosnia and Herzegovina), EKIP (Montenegro), RATEL (Serbia), EU DESI 2022 (EU average)
 Data on VHCN coverage for North Macedonia are not available

Fibre to the premises (FTTP) coverage in the WB region¹⁴ on average increased by 15% in 2021 compared to 2020 and reached 38% of total number of households. Montenegro and Albania recorded the highest score in the WB region with FTTP coverage of 67% and 56%, respectively in 2021, which is above the EU average of 50%. In 2021 FTTP coverage in Serbia was 50% which is on the EU average and above the WB average of 38%.

Figure 19 FTTP coverage (% of households), 2021



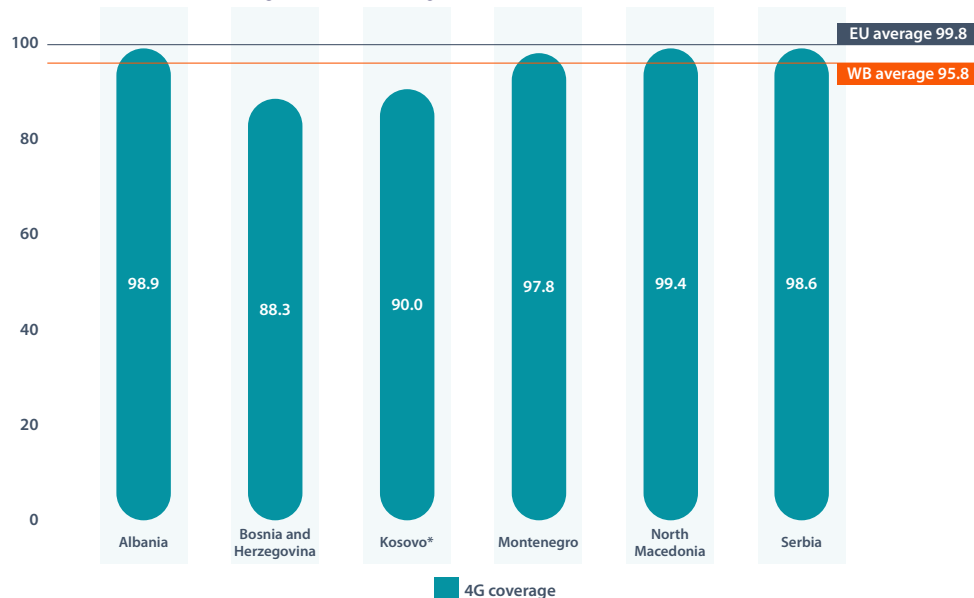
Source: AKEP (Albania), ARKEP (Kosovo*), RAK (Bosnia and Herzegovina), EKIP (Montenegro), RATEL (Serbia), EU DESI 2022 (EU average)
 Data on FTTP coverage for North Macedonia are not available

14 WB average for the FTTP coverage indicator is calculated excluding North Macedonia due to unavailable FTTP coverage data necessary for calculation of the indicator

Mobile broadband

In 2021, 4G coverage in the Western Balkans region reached almost 96% of populated areas covered by at least one operator. In the EU 4G is widespread with 99.8% of populated areas covered in 2021.

Figure 20 4G coverage in the WB (% of households), 2021



Source: AKEP (Albania), ARKEP (Kosovo*), RAK (Bosnia and Herzegovina), EKIP (Montenegro), BCO (North Macedonia), RATEL (Serbia), EU DESI 2022 (EU average)

In 2021, WB economies had not assigned any spectrum in the 5G “pioneer bands” that is ready for 5G use.

In 2021, on average almost 82% of people in the WB region used a mobile device to access the internet. Mobile broadband penetration is highest in Serbia and Montenegro with figures above the EU average (96% and 91%, respectively versus 87% in the EU).

Figure 21 Mobile broadband penetration (% of individuals), 2021

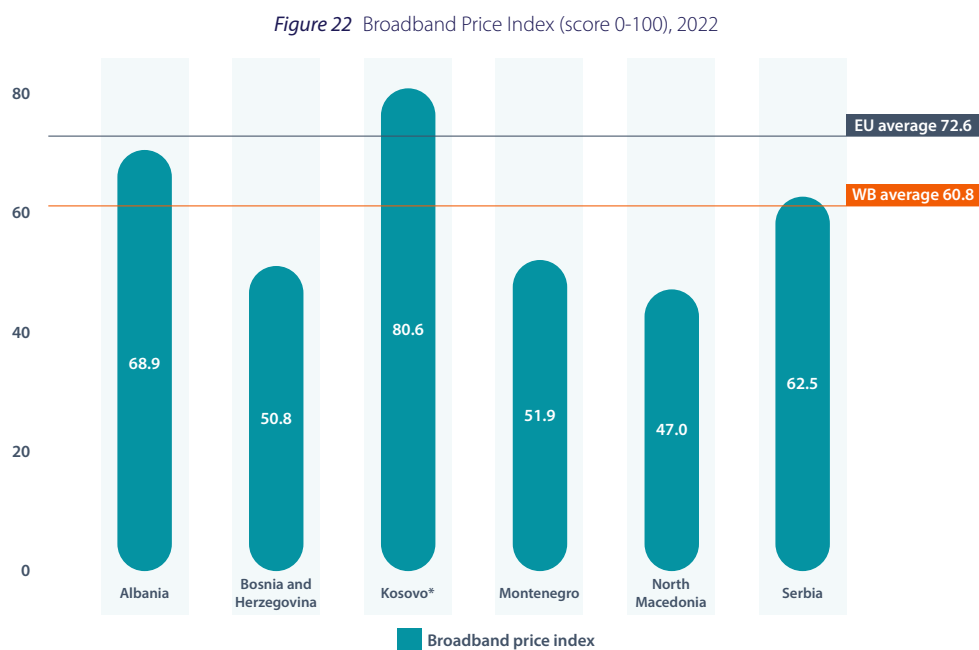


Source: AKEP (Albania), ARKEP (Kosovo*), RAK (Bosnia and Herzegovina), EKIP (Montenegro), AEC/BCO (North Macedonia), RATEL (Serbia), EU DESI 2022 (EU average)

Broadband prices

The Broadband Price Index (BPI) measures the level of prices of representative baskets of fixed, mobile and converged broadband offers. Prices of 34 broadband consumption baskets that include different services (standalone broadband, double play, triple play and quadruple play services) and different speeds are included in the BPI calculation. Higher score of the BPI means lower broadband prices. General price trend in the EU for the observed price baskets was decreasing in the period 2019-2021.

Average broadband prices in the WB region in 2022 were higher compared to the average broadband prices in the EU in 2021. Kosovo* had the lowest broadband prices in the WB region in 2022, while North Macedonia had the most expensive broadband offers.

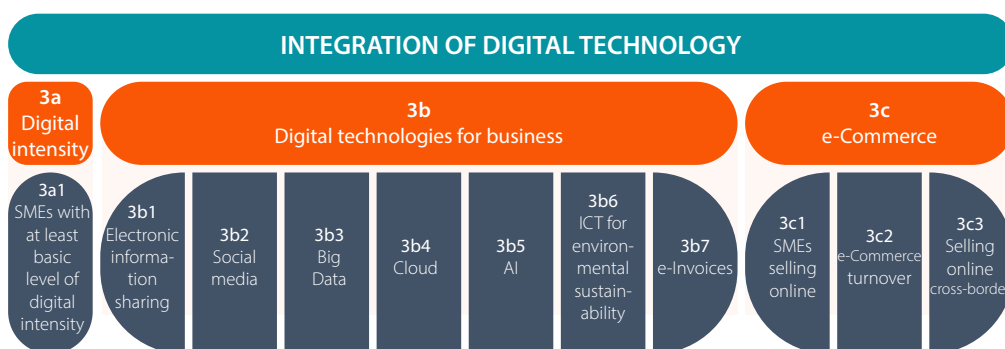


Source: Desk research of broadband prices in the WB region during October 2022, EU DESI 2022 (EU average)
Data for the EU from 2021

INTEGRATION OF DIGITAL TECHNOLOGIES BY BUSINESSES

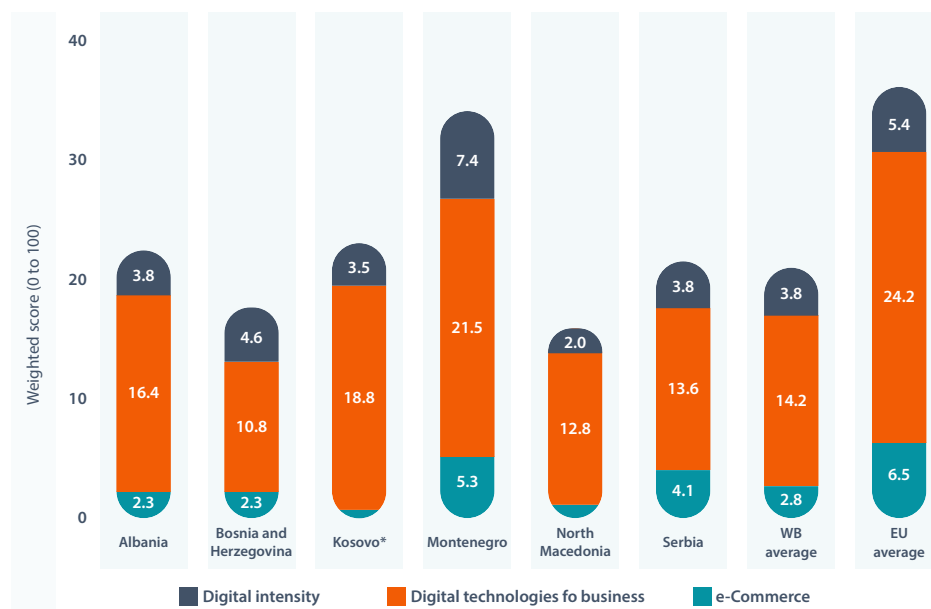
Integration of digital technology measures the digitalisation of business (use of electronic information sharing, social media and more advanced digital technologies such as cloud services, big data analytics and artificial intelligence), actions taken by enterprises regarding environmental sustainability and e-commerce. The Integration of digital technology dimension is divided into 3 sub-dimensions which are further divided into 11 indicators, as shown in Figure 23.

Figure 23 Integration of digital technology dimension



In the integration of digital technology, WB region underperformed compared to the EU. Montenegro is best positioned in the Integration of digital technology dimension, followed by Kosovo*, Albania and Serbia with scores above the WB average.

Figure 24 Integration of digital technology sub-dimensions, WB DESI 2022



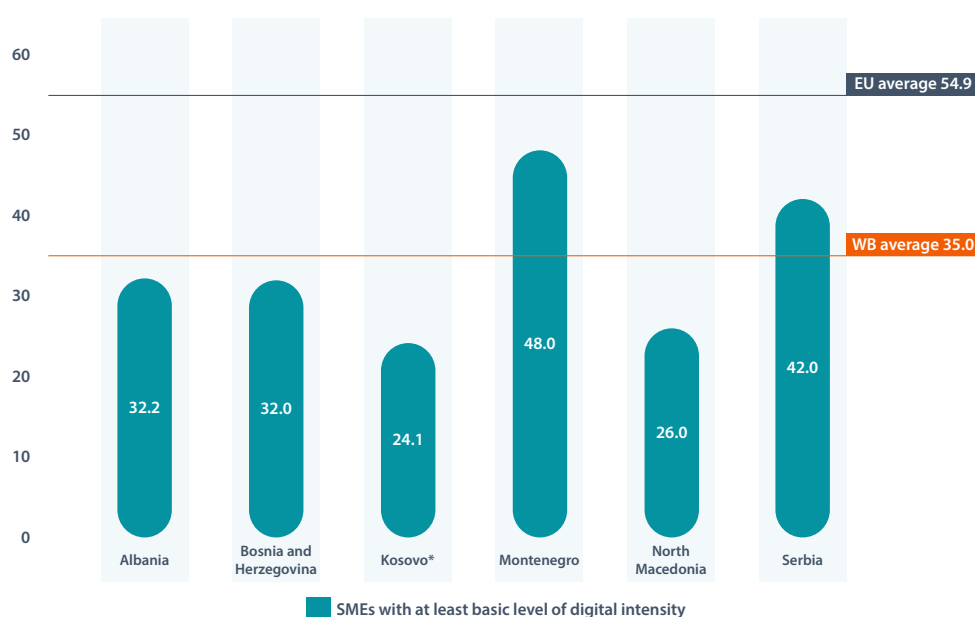
Source: WB DESI Calculation

Digital intensity

Digital intensity measures the use of different digital technologies by enterprises. The digital intensity index has a score 0-12 and is determined by how many of the 12 selected digital technologies¹⁵ enterprises use. The higher the score, the higher the digital intensity of the enterprises, ranging from very low (0-3) to very high (10-12).

Indicator SMEs with at least basic level of digital intensity is measuring the number of enterprises that use at least 4 out of 12 digital technologies. In 2021 only 35% of SMEs in the WB region reached at least basic level of digital intensity, compared to 55% in the EU. Montenegro and Serbia had the highest shares of enterprises with at least basic level of digital intensity, with 48% and 42% respectively.

Figure 25 SMEs with at least basic level of digital intensity (% of SMEs), 2021



Source: Eurostat (Bosnia and Herzegovina, Montenegro, North Macedonia, Serbia), statistical office (Albania), market research (Kosovo*), EU DESI 2022 (EU average)

Data for Kosovo* from 2022

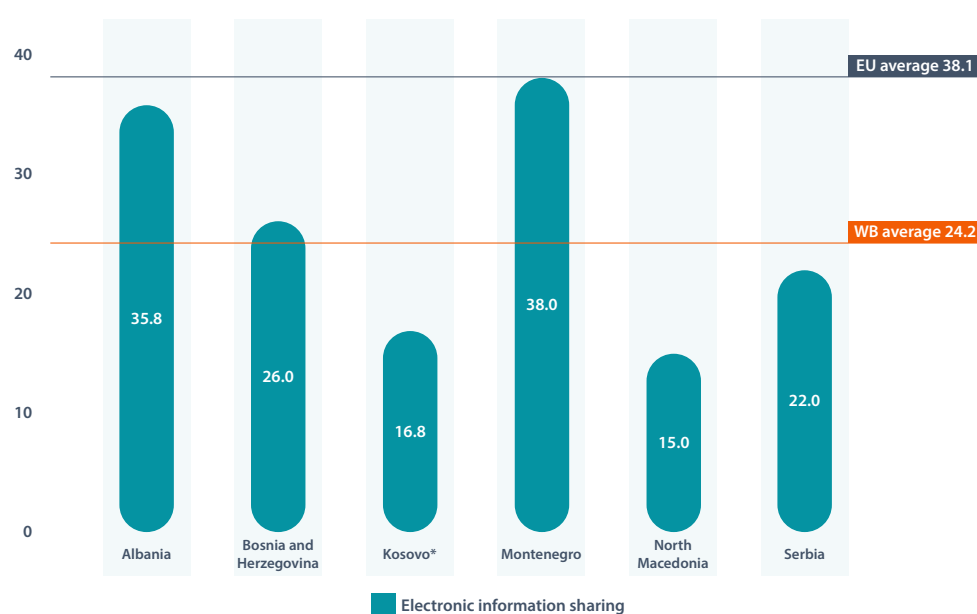
15 Selected digital technologies include: more than 50% of employees use computers with access to the Internet for business purposes, have Enterprise Resources Planning (ERP) software package to share information between different functional areas, having fixed Internet connection of at least 30 Mb/s, use any social media, use of any cloud service, have Customer Relation Management (CRM), buy intermediate-sophisticated cloud computing services, use of at least 2 social media, use any IoT, e-commerce sales of at least 1% turnover, web-sales are more than 1% of the total turnover and B2C web sales more than 10% of the web sales, use any AI technology.

Electronic information sharing

Enterprise resource planning (ERP) software application is one form of internal business integration in enterprises that is used for electronic and automatic information sharing between different business functions. ERP modules typically integrate processes relevant to planning, purchasing, marketing, sales, customer relationship, finance and human resources.

In 2021, 24% of enterprises in the WB region used ERP software applications, compared to 38% in the EU. In Montenegro and Albania more than 35% of enterprises used an ERP software to share information between different business functions in 2021, followed by Bosnia and Herzegovina with 26%.

Figure 26 Electronic information sharing (% of enterprises), 2021



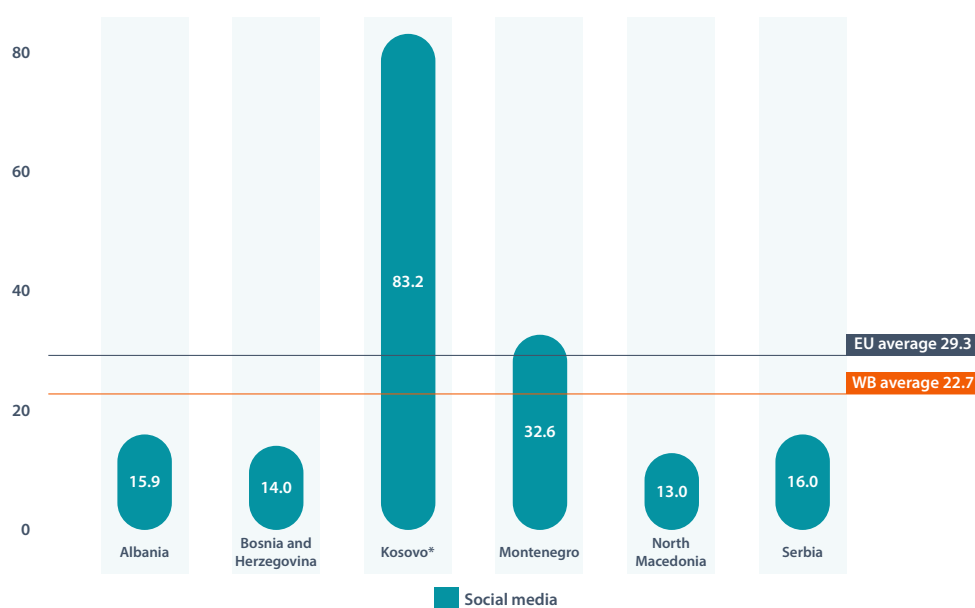
Source: Eurostat (Bosnia and Herzegovina, North Macedonia, Serbia), statistical office (Albania, Montenegro), market research (Kosovo*), EU DESI 2022 (EU average)
Data for Kosovo* from 2022

Use of social media by enterprises

Enterprises intend to increase their presence on internet by using the possibilities that social media offer. The four most widely used categories of social media are: social networks (Facebook, LinkedIn and others), corporate blogs (Twitter and others), multimedia content-sharing websites such as YouTube, Instagram and others, and wiki-based knowledge-sharing tools. Social media indicator measures usage of at least two social media categories by enterprises.

In 2021, 23% of WB enterprises used two or more of these types of social media, which is slightly below the EU average of 29%. In Kosovo* 83% of enterprises used at least two types of social media in 2020.

Figure 27 Enterprises using social media (% of enterprises), 2021



Source: Eurostat (Bosnia and Herzegovina, Montenegro, North Macedonia, Serbia), statistical office (Albania, Kosovo*), EU DESI 2022 (EU average)

Data for Kosovo* from 2020

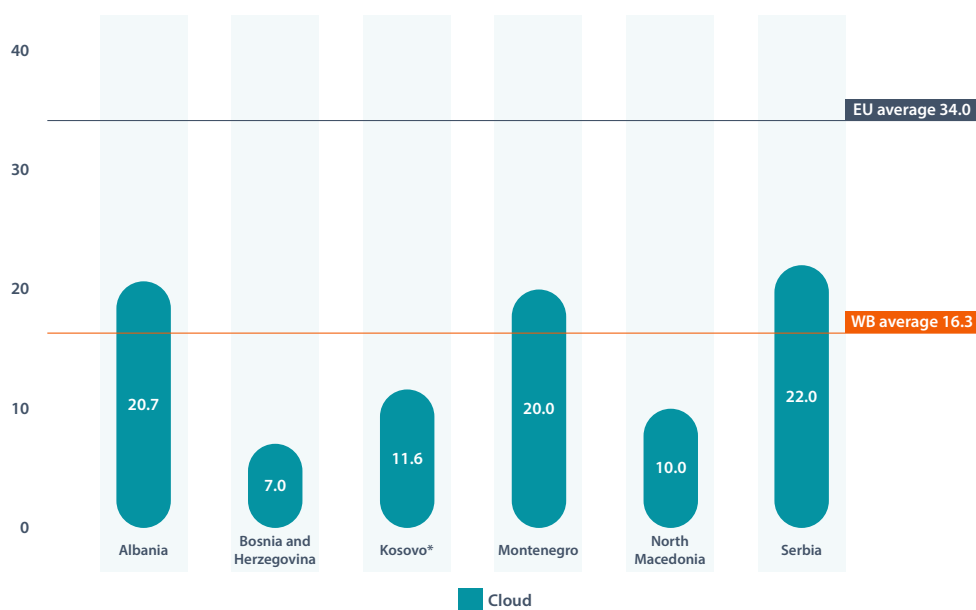
Adoption of advanced digital technologies by businesses

The increase in business digitalisation needs to be followed with the sufficient use of advanced digital technologies such as cloud computing, big data analysis and artificial intelligence.

Cloud computing provides an opportunity for businesses to access computing resources hosted by third parties on the internet (the cloud), instead of building or expanding own IT infrastructure, including hardware and software applications and databases. In 2021, on average only 16% of enterprises in the WB region incorporated at least one sophisticated or intermediate cloud computing service¹⁶ which is significantly below the EU average of 34%. Serbia, Albania and Montenegro, with more than 20% of enterprises using cloud services, have the highest score among WB economies in 2021.

16 Sophisticated or intermediate cloud computing services include: finance or accounting software applications; enterprise resource planning (ERP) software applications; customer relationship management (CRM) software applications; security software applications; hosting the enterprise's database(s); computing platform providing a hosted environment for application development, testing or deployment

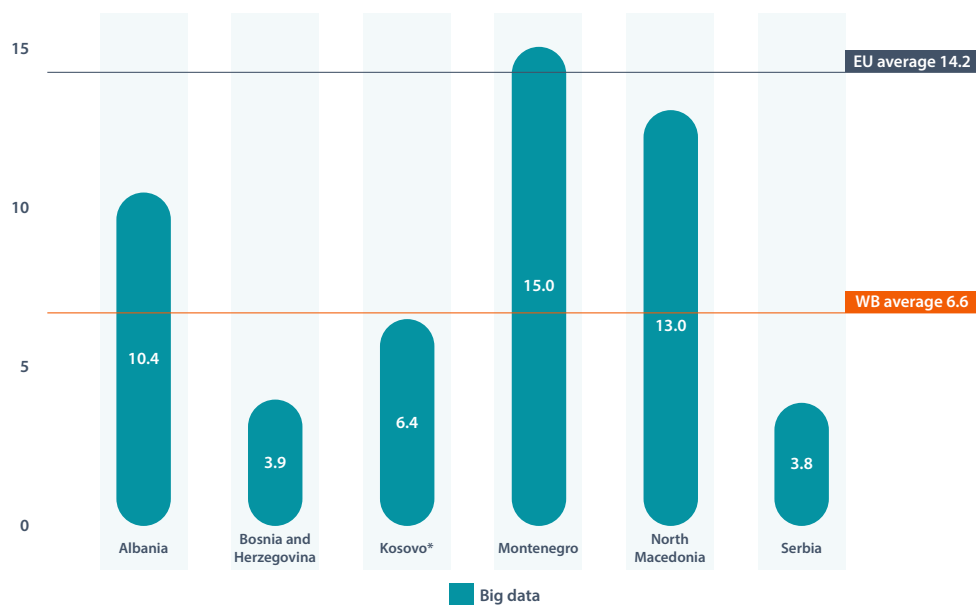
Figure 28 Use of cloud computing in enterprises (% of enterprises), 2021



Source: Eurostat (Montenegro, North Macedonia, Serbia), statistical office (Albania, Bosnia and Herzegovina), market research (Kosovo*), EU DESI 2022 (EU average)
 Data for Kosovo* from 2022

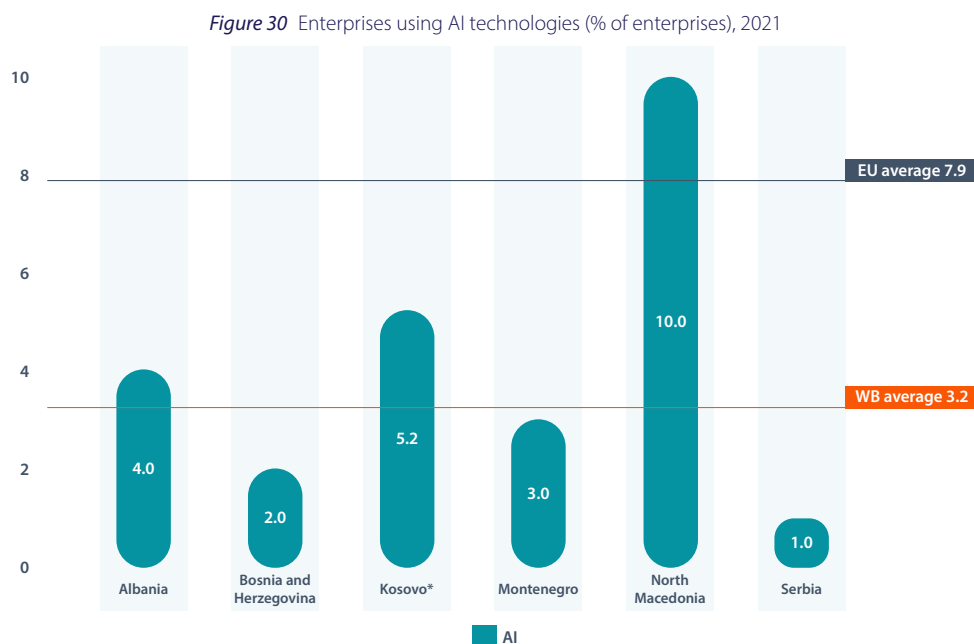
Big data analytics refers to the use of technologies, techniques or software tools such as data or text mining and machine learning, for analysing big data extracted from the enterprise's own data sources or other data sources. In 2021, 7% enterprises in the WB region carried out big data analytics. Montenegro, North Macedonia and Albania had the highest proportion of enterprises using big data in the WB region, with 15%, 13% and 10% respectively.

Figure 29 Enterprises using big data analysis (% of enterprises), 2021



Source: Eurostat (Montenegro), statistical office (Bosnia and Herzegovina, North Macedonia, Serbia), market research (Albania, Kosovo*), EU DESI 2022 (EU average)
 Data for Montenegro and the EU from 2020, for Albania and Kosovo* from 2022

Artificial intelligence systems can be software based (e.g. image recognition software, virtual assistants, speech and face recognition systems) or embedded in devices (e.g. autonomous robots, self-driving vehicles, drones). In 2021, only 3% of enterprises in the WB region used at least one AI technology.¹⁷ The above WB average share of enterprises using AI was reported in Kosovo* and Albania. Data for North Macedonia are from 2020 and are not fully comparable to 2021 due to methodological changes and breaks in time series.



Source: Eurostat (Albania, Bosnia and Herzegovina, Montenegro, Serbia), statistical office (North Macedonia), market research (Kosovo*), EU DESI 2022 (EU average)
Data for North Macedonia from 2020, for Kosovo* from 2022

ICT for environmental sustainability

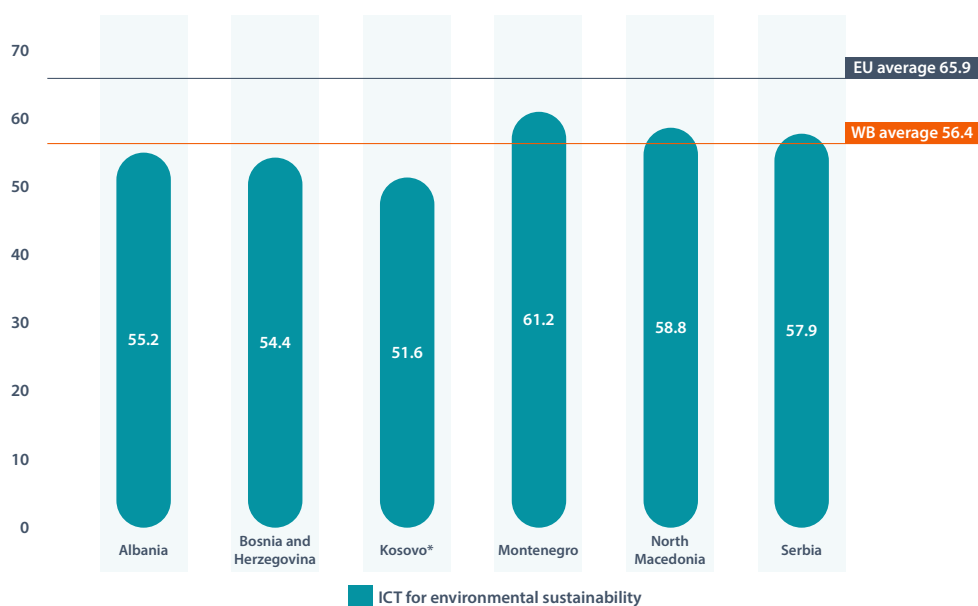
Moreover, ICT facilitates number of actions that enterprises can take to reduce their environmental footprint in practice. For measuring ICT for environmental sustainability in enterprises, the following 10 environmental actions that enterprises can take with the help of ICT are considered: using less energy, using fewer materials, equipment or consumables, virtualising products or services, facilitating teleworking, reducing business travel, offering sustainable transport alternatives, producing less waste, adopting eco-design principles, recycling equipment or products, measuring their environmental impact. Out of 10,000 EU enterprises included in the survey done for the European Commission,¹⁸ 27% can be qualified as having a high ICT green impact level (8 to 10 actions implemented as a result of ICT use), whereas 34% having a low (0 to 4 actions implemented) and 39% having a medium (5 to 7 actions implemented) ICT green impact level.

In 2022, 56% enterprises in the WB region took more than 4 environmental actions facilitated by ICT. In all WB economies more than 50% of enterprises reported that they took more than 4 actions to reduce their environmental footprint.

¹⁷ AI technologies observed include: text mining, speech recognition, natural language generation, image recognition and processing, machine learning, technologies automating different workflows or assisting in decision making, technologies enabling machines to physically move by observing their surroundings and taking autonomous decision.

¹⁸ <https://digital-strategy.ec.europa.eu/en/library/survey-contribution-ict-environmental-sustainability-actions-eu-enterprises>

Figure 31 ICT for environmental sustainability (% of enterprises), 2022

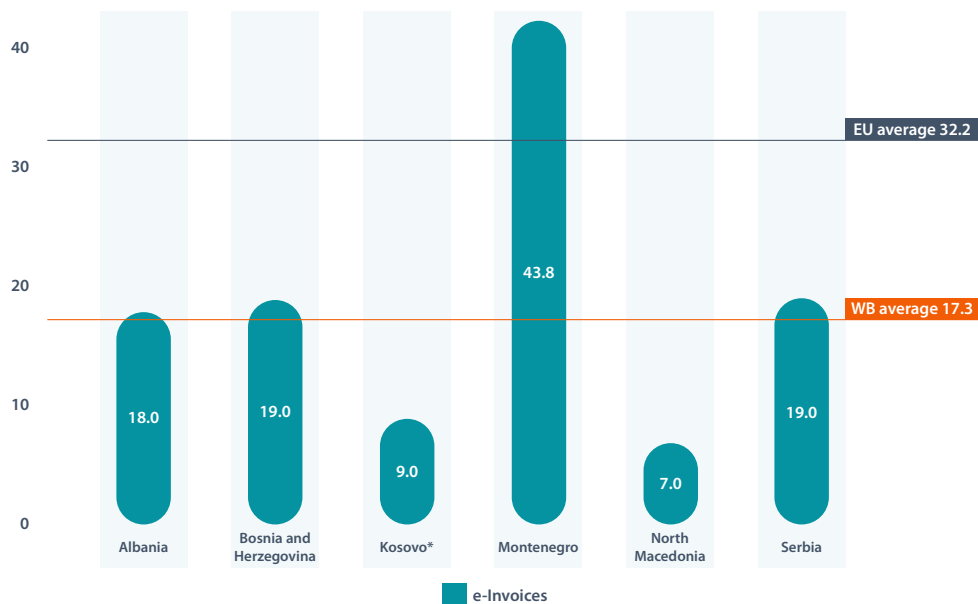


Source: Market research (Albania, Bosnia and Herzegovina, Kosovo*, Montenegro, North Macedonia), RATEL (Serbia), EU DESI 2022 (EU average)
 Data for EU from 2021

E-invoices

In the WB region, 17% of enterprises were sending e-invoices suitable for automated processing, which is below the EU average of 32%. The highest proportion of enterprises sending e-invoices (44%) was reported in Montenegro.

Figure 32 Enterprises sending e-invoices (% of enterprises), 2020



Source: Eurostat (Bosnia and Herzegovina, North Macedonia, Serbia), statistical office (Albania, Montenegro), market research (Kosovo*), EU DESI 2022 (EU average)
 Data for Kosovo* from 2022

e-Commerce

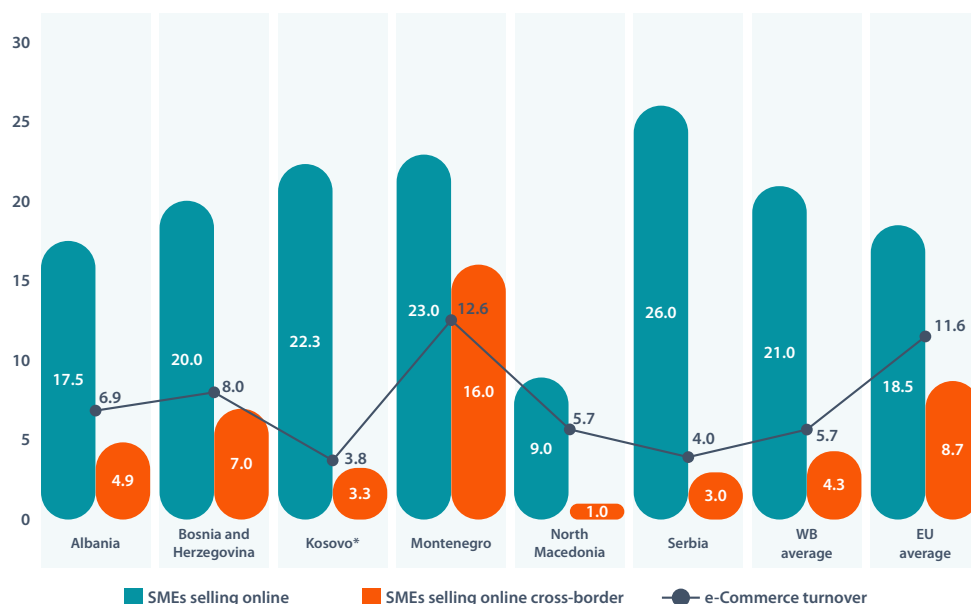
E-commerce enables enterprises to establish their presence in the domestic market and to extend their economic activities across borders. E-commerce indicator is measuring online sales realised through websites, applications or marketplaces (web sales).

In the WB region 21% of SMEs made online sales in 2021, compared to 18.5% in the EU. Serbia (26%), Montenegro (23%) and Kosovo* (22%) lead in the number of SMEs with online sales.

Despite good results in overall online sales, only 4% of SMEs in the WB region reported sales to customers in the EU in 2021. Montenegro leads in online sales cross-border, with 16% of SMEs that realised online sales cross-border in 2021.

The turnover achieved through online sales accounted for 6% of the total turnover in the WB region in 2021, which is twice as low compared to 12% in the EU. Montenegro reported the highest value of online sales in 2021 with 13% of total sales.

Figure 33 Online sales and turnover (% of SMEs and % of sales turnover) in the WB, 2021



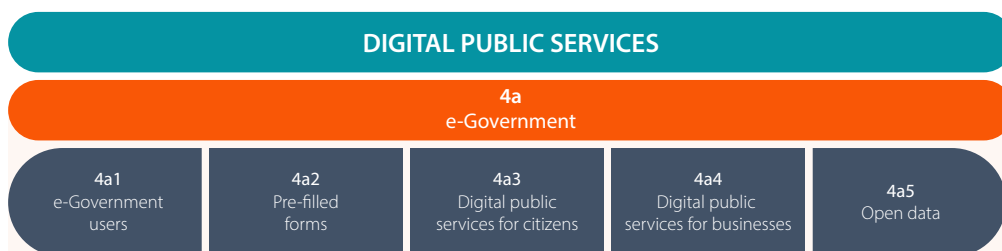
Source: Eurostat (Bosnia and Herzegovina, Montenegro for selling online cross border, Serbia), statistical office (Bosnia and Herzegovina, Kosovo* (for SMEs selling online, Montenegro for SMEs selling online and e-commerce turnover, North Macedonia for selling online cross border), market research (Albania, North Macedonia for e-commerce turnover, Kosovo* for e-commerce turnover and SMEs selling online cross border), EU DESI 2022 (EU average)

Data for Albania for 2022, for Kosovo* for SMEs selling online from 2020 and for e-commerce turnover and selling online cross border from 2022, for North Macedonia for e-commerce turnover from 2022.

DIGITAL PUBLIC SERVICES DIMENSION

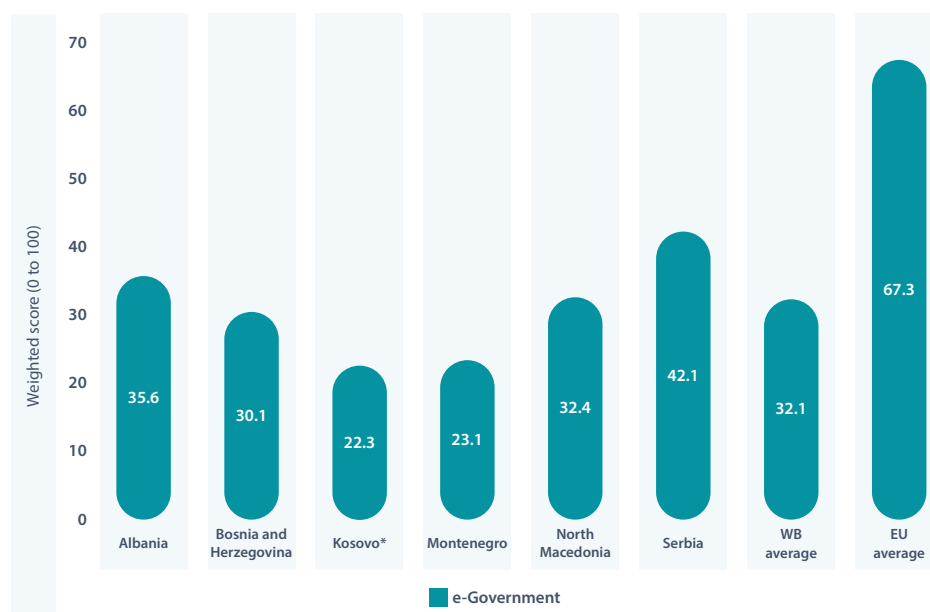
The Digital public services dimension measures digital transformation of key public services for citizens and businesses, number of e-government users as well as maturity of open data policies. This dimension consists of one sub-dimension which is further divided into 5 indicators, as shown in Figure 34.

Figure 34 Digital public services dimension



In the Digital public services dimension, WB region performed notably below the EU. Serbia has the highest score in the WB region, followed by Albania and North Macedonia with scores above the WB average.

Figure 35 Digital public services, e-Government sub-dimension, WB DESI 2022

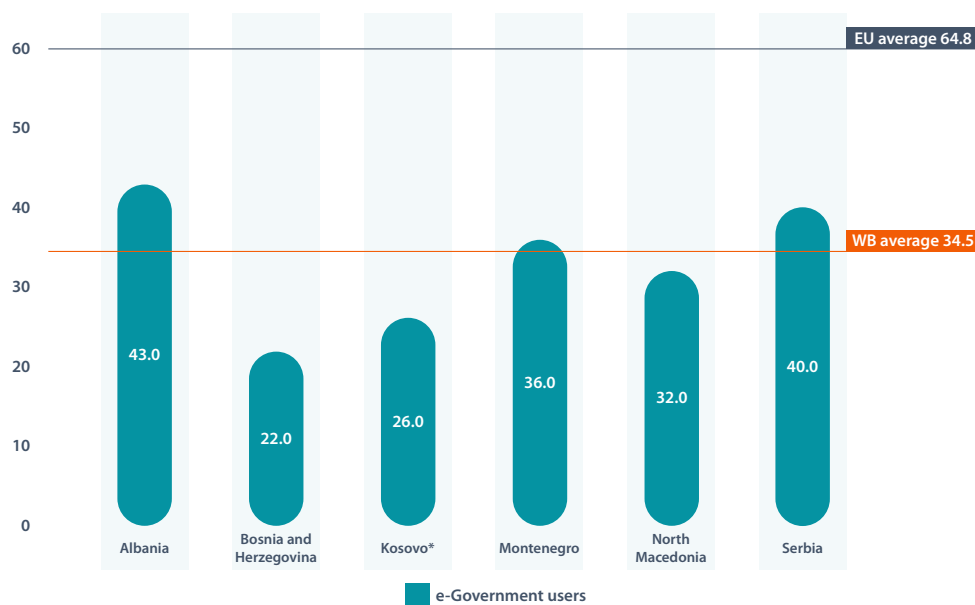


Source: WB DESI Calculation

e-Government users

This indicator is measuring the number of individuals who used the internet in the last 12 months to interact with the public authorities. In 2021, number of internet users interacting with the public administration online in the WB region reached almost 35%, which is significantly below the EU average of 65%. The highest numbers of individuals using e-government services in 2021 were reported in Albania and Serbia, with 43% and 40%, respectively.

Figure 36 e-Government users interacting online with public authorities (% of internet users), 2021



Source: Eurostat (Albania, Bosnia and Herzegovina, Montenegro, North Macedonia, Serbia), statistical office (Kosovo*), EU DESI 2022 (EU average)

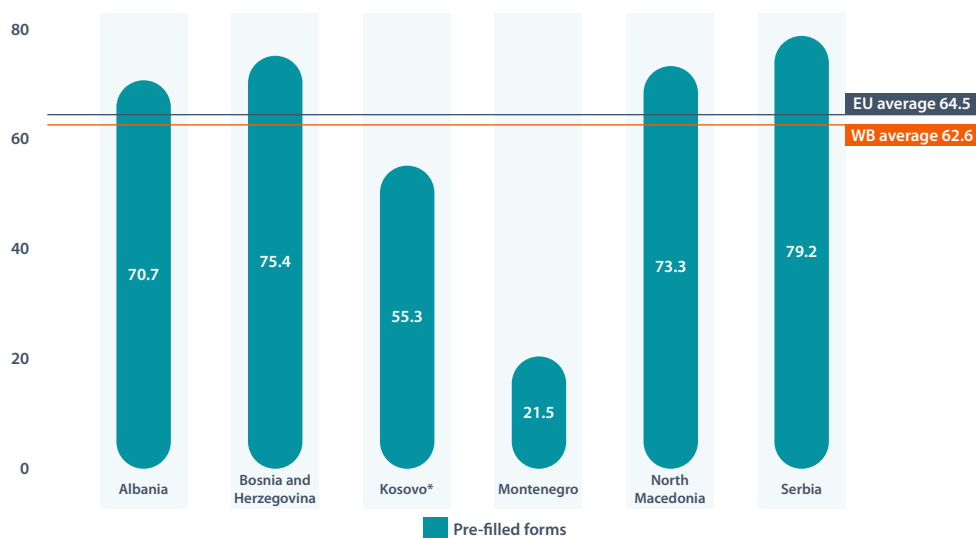
Data for Kosovo* from 2020

Pre-filled forms

Pre-filled forms indicator measures the extent of data in the online forms that are pre-filled with personal information that are already known by the public administration. Every time citizens and businesses fill in an online public administration form, they provide certain information (usually a full name, address and contact details). This information does not need to be collected multiple times, which reduces the time to complete the form and minimises typing errors.

In the WB region two-thirds of online forms requiring personal information are pre-filled with data already known by the public administration (score 63 out of 100 points), which is slightly below the EU average. Serbia, Bosnia and Herzegovina, North Macedonia and Albania scored above the EU and WB averages for the pre-filled forms.

Figure 37 Pre-filled forms (score 0 to 100), 2021



Source: E-government benchmark (Albania, Montenegro, North Macedonia, Serbia), desk research (Bosnia and Herzegovina, Kosovo*), EU DESI 2022 (EU average)

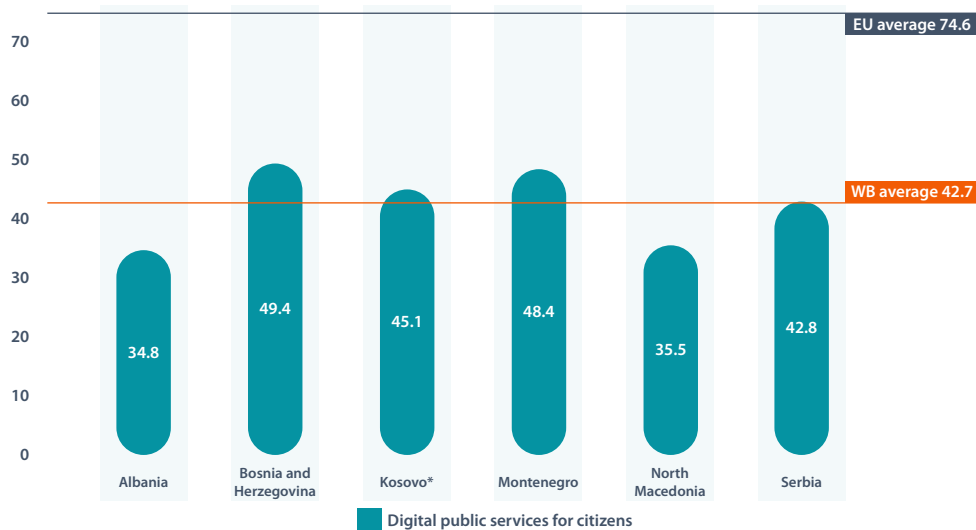
Data for Bosnia and Herzegovina and Kosovo* from 2022

Digital public services for citizens

Digital public services for citizens indicator measures the extent to which services or information on services in the citizen-related life events such as career, studying, family, health, moving, starting a small claims procedure and transport, can be fully completed online with sufficient information and can be reached via main public administration portals.

In 2021, WB region scored 43 points for this indicator, which is 32 points below the EU average. Bosnia and Herzegovina, Montenegro, Kosovo* and Serbia had the highest scores in digital public services for citizens in the WB region.

Figure 38 Digital public services for citizens (score 0 to 100), 2021



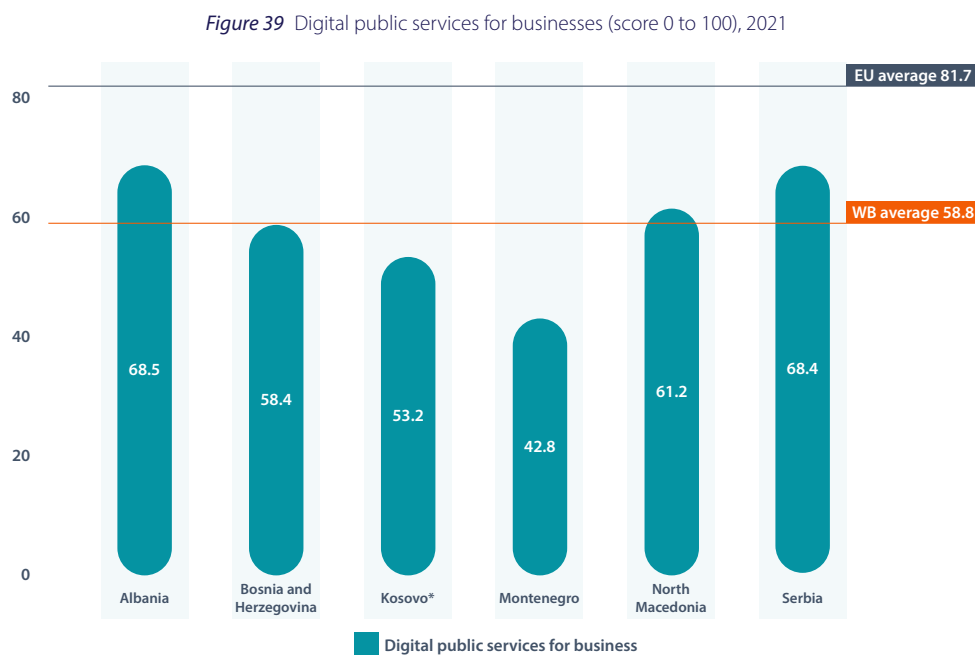
Source: E-government benchmark (Albania, Montenegro, North Macedonia, Serbia), desk research (Bosnia and Herzegovina, Kosovo*), EU DESI 2022 (EU average)

Data for Bosnia and Herzegovina and Kosovo* from 2022

Digital public services for businesses

Digital public services for businesses measures the extent to which services or information on services in the business-related life events such as starting a business and conducting regular business operations, can be fully completed online with sufficient information and can be reached via main public administration portals.

In 2021, WB region scored 59 points for this indicator, which is 23 points below the EU average. Albania, Serbia and North Macedonia had the highest scores in digital public services for businesses in the WB region.



Source: E-government benchmark (Albania, Montenegro, North Macedonia, Serbia), desk research (Bosnia and Herzegovina, Kosovo*), EU DESI 2022 (EU average)
Data for Bosnia and Herzegovina and Kosovo* from 2022

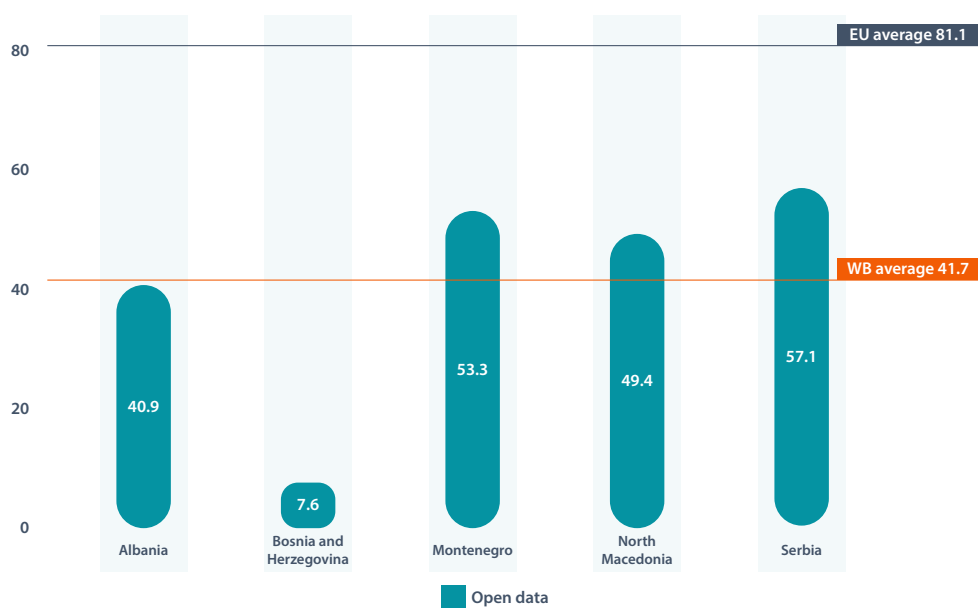
Open data

Open data refers to the information collected, produced or paid for by the public bodies and made freely available for re-use for any purpose. This composite indicator is measured through four dimensions that include existence of open data policy, impact of open data, degree of sophistication of open data portals and quality of open data in terms of data collection, timeliness, and reliability.

The WB region is performing significantly below the EU average in the maturity of open data (42% compared to 81%).¹⁹ Serbia, Montenegro and North Macedonia have the highest score in the maturity of open data with scores above the WB average in 2021.

¹⁹ WB average for the Open data indicator is calculated excluding Kosovo* due to missing data from the questionnaire necessary for calculation of the indicator.

Figure 40 Open data (% of the maximum open data score), 2021



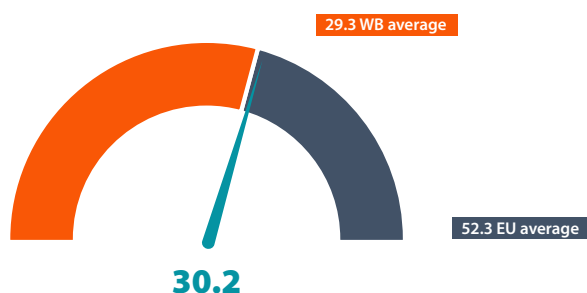
Source: Open data report (Montenegro), RATEL (Serbia), market research (Albania, Bosnia and Herzegovina, North Macedonia), EU DESI 2022 (EU average)
 Data for Kosovo* are not available

WB DESI PROFILES

ALBANIA

In total WB DESI 2022, Albania is a digital top performer, with DESI score above the WB average.

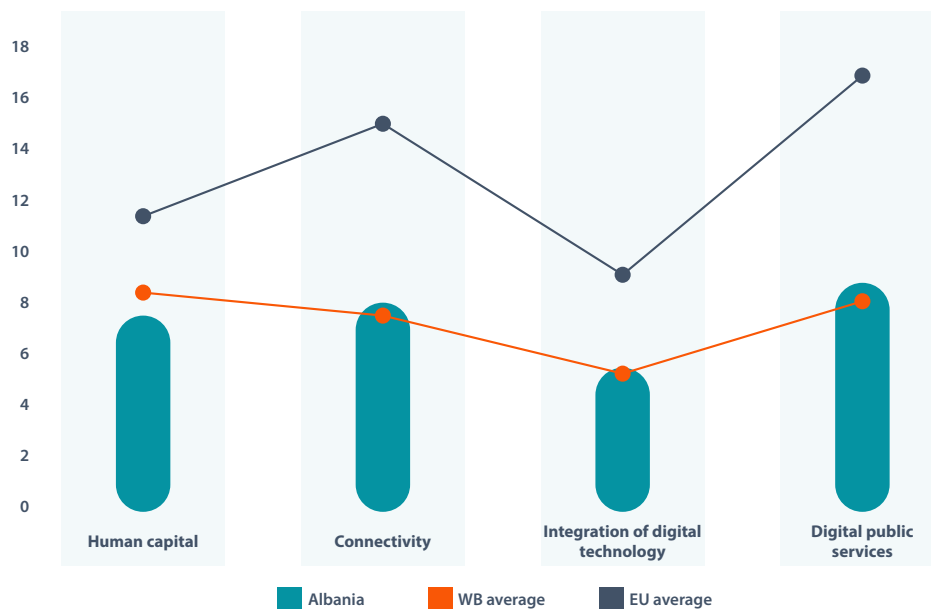
Figure 41 Total WB DESI 2022 (score 0-100), Albania



Source: WB DESI calculation

Considering WB DESI 2022 dimensions, Albania achieved strong performance in Integration of digital technology, Connectivity and Digital public services, with scores above the WB averages. Further improvements are necessary in the Human capital dimension.

Figure 42 WB DESI 2022 Dimensions (weighted score 0-100), Albania



Source: WB DESI calculation

HUMAN CAPITAL

Indicators from 2020 and 2021 that are included in the Human capital dimension for calculating WB DESI for 2021 and 2022 are given in Table 1.

Table 1 Human capital indicators, Albania

Indicator	Albania		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
At least basic digital skills % individuals	NA*	24% 2021	35%	54%
Above basic digital skills % individuals	NA*	4% 2021	9%	27%
At least basic digital content creation skills % individuals	NA*	37% 2021	54%	66%
ICT specialists % employees	NA	3.6%** 2022	2.6%	4.5%
Female ICT specialists % ICT specialists	NA	28%** 2022	19%	19%
Enterprises providing ICT training % enterprises	NA	14% 2020	14%	20%
ICT graduates % graduates	4.6% 2020	4.7% 2021	6.2%	3.9%

Source: Eurostat, Institute of Statistics (INSTAT), market research, EU DESI 2022 (for EU average)

*Data are available for 2019, but due to break in time series caused by methodological changes will not be used for comparison with 2021

**Calculated based on market research from 2022

Missing indicators in the Human capital dimension are supplied through market research process which was done in 2022 and comparison with the WB and EU averages is not fully possible for those indicators due to a difference in time periods to which data relate.

When evaluating the overall performance in Human capital dimension, Albania is performing well in several very important digital skills indicators, such as ICT specialists which account for 3.6% of the workforce in Albania. Also, Albania scores well on female ICT specialists which participate with 28% in the total number of ICT specialists. Additionally, 21% of Albanian enterprises offer ICT training to their employees to improve their digital skills. ICT graduates account for almost 5% of all graduates in Albania, which is above the EU average of 4%, but below the WB average of 6%. Nevertheless, 24% of people between 16 and 74 years in Albania have at least basic digital skills (versus the WB average of 35%) and only 4% of individuals have above-basic digital skills notably below the WB average of 27%. Moreover, 37% of individuals in Albania have at least basic digital content creation skills (compared to the WB average of 54%).

Development of necessary skills and competences for digital transformation are recognised as top priority for Albania and there are several strategic documents with reference to digital skills development.

One of the four pillars of Digital Agenda for Albania 2022-2026²⁰ is related to digital education and digital skills and transforming learning and teaching, with the main objectives which, among others, include development of digital skills and human talent to support digitalisation in Albania.

20 <https://akshi.gov.al/wp-content/uploads/2022/06/vendim-2022-06-01-370.pdf>

National Plan for Sustainable Development of Digital Infrastructure and Broadband in the period 2020-2025 recognised development of digital skills to increase the demand and benefits of using broadband infrastructure and all services and application, including IoT and the use of AI is recognized as one of the main challenges for the broadband development.

Additionally, there are several initiatives to boost digital skills in younger generation and women, such as Techspace- technology lab available to young people, Pyramid Multifunctional Centre that includes digital skills learning for high school students (TUMO) and pilot training programme (develop digital skills) to support Albanian women to access online work opportunities.²¹

CONNECTIVITY

Indicators from 2020 and 2021 that are included in the Connectivity dimension for calculating WB DESI for 2021 and 2022 are given in Table 2.

Table 2 Connectivity indicators, Albania

Indicator	Albania		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
Overall fixed broadband take-up % households	70% 2020	77% 2021	77%	78%
At least 100 Mbps fixed broadband take-up % households	3% 2020	7% 2021	21%	41%
At least 1 Gbps take-up % households	0.05% 2020	0.10% 2021	0.04%	8%
Fast broadband (NGA) coverage % households	62% 2020	74% 2021	73%	90%
Fixed Very High Capacity Network (VHCN) coverage % households	46% 2020	60% 2021	48%	70%
Fibre to the premises (FTTP) coverage % households	46% 2020	56% 2021	38%	50%
5G spectrum % of total harmonised 5G spectrum	0% 2020	0% 2021	0%	56%
5G coverage % populated areas	0% 2020	0% 2021	0%	66%
Mobile broadband take-up % individuals	70% 2020	73% 2021	82%	87%
Broadband Price Index Score (0-100)	NA	69* 2022	61	73

Source: AKEP, desk research, EU DESI 2022 (for EU average)

*Calculated based on desk research from 2022

In 2021, Albania performed above the WB average in both Fast broadband (NGA) coverage (74% versus 73% in the WB) and Fixed Very High Capacity Network (VHCN) coverage (60% versus 48% in the WB). VHCN is mainly provided by Fibre to the Premise (FTTP) technology. FTTP increased from 46% in 2020 to 56% in 2021 and with these two indicators Albania surpassed targets stipulated in the National Plan for

²¹ <https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Publications/Digital%20Development%20Country%20Profiles/Final-Albania-Digital-Skills-Assessment.pdf>

Sustainable Development of Digital Infrastructure and Broadband 2020-2025.²² Albania also performed very well in the overall fixed broadband take-up with 77% households using fixed broadband connection. Despite high VHCN coverage, Albania is lagging behind in the take-up of fixed broadband of at least 100 Mbps (7% compared to WB average of 21%), but there was a double-digit growth in penetration for fixed broadband of at least 100 Mbps in 2021 compared to 2020. As in the whole WB region, the take-up of 1Gbps broadband is at a very low level.

When it comes to mobile connectivity, Albania performed well in mobile broadband take-up with 73% of people using mobile device to access internet. While 4G coverage reached 98.9% in 2021, the procedure for 5G spectrum assignment has not yet started due to availability of spectrum in the 5G pioneer bands.

Relatively high fixed and mobile take-up positively correlate with lower broadband prices, compared to the average broadband prices in the WB region.

Development of broadband infrastructure is recognised as a strategic priority for Albania. National Plan for Sustainable Development of Digital Infrastructure and Broadband until 2025 foresees strengthening the capacities of institutions responsible for developing broadband at the central and local (municipality) level. It aims to close the digital divide in Albania, not only through broadband infrastructure development, but also through ensured affordability and availability of e-services.

In the context of Western Balkans Investment Framework (WBIF),²³ a project for the regional broadband development in Albania was financed with more than 147 million EUR, including 2 million EUR of grants and almost 57 million EUR in loans. ICT investments covered by the project will ensure better internet connection for schools, hospitals, public institutions, local administrations and households.

INTEGRATION OF DIGITAL TECHNOLOGY

Indicators from 2020 and 2021 that are included in the Integration of digital technology dimension for calculating DESI for 2021 and 2022 are given in Table 3.

Table 3 Integration of digital technology indicators, Albania

Indicator	Albania		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
SMEs with at least basic level of digital intensity % SMEs	NA*	32% 2021	35%	55%
Electronic information sharing % enterprises	35% 2020	36% 2021	24%	38%
Social media % enterprises	10% 2020	16% 2021	23%	29%
Big data % enterprises	NA	10%** 2022	7%	14%
Cloud % enterprises	NA*	21% 2021	16%	34%

22 <https://www.infrastruktura.gov.al/wp-content/uploads/2020/07/National-Plan-BBAnd-EN.pdf>

23 <https://www.wbif.eu/project/PRJ-ALB-DII-001>

Indicator	Albania		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
Artificial intelligence % enterprises	NA	4% 2021	3%	8%
ICT for environmental sustainability % enterprises	NA	55%** 2022	56%	66%
e-Invoices % enterprises	NA	18% 2020	17%	32%
SMEs selling online % SMEs	NA	18%** 2022	21%	19%
e-Commerce turnover % SMEs	NA	7%** 2022	6%	12%
Selling online cross-border % SMEs	NA	5%** 2022	4%	9%

Source: Eurostat, Institute of Statistics (INSTAT), market research, EU DESI 2022 (for EU average)

*Data for 2020 exist but due to break in time series caused by methodological changes cannot be used for comparison with 2021

** Calculated based on market research from 2022

In 2021, 32% of Albanian SMEs had at least a basic level of digital intensity, which is very close to the WB average of 35%. Electronic information sharing is used by 36% of enterprises, above the WB average of 24%. Social media was used in 16% of Albanian enterprises, below the WB average of 23%. Advanced technologies are gaining popularity among Albanian enterprises: 21% of them use cloud solutions, 10% use big data, 4% use AI. 18% of Albanian enterprises use e-invoices which is above the WB average. As for ICT for environmental sustainability, 55% of Albanian enterprises use ICT for environmental sustainability purposes, compared to the WB average of 56%. 18% of Albanian SMEs sell online and the turnover generated from the online sales is 7% of total turnover. Selling online cross border is reported by 5% of all SMEs.

The Business Development and Investment Strategy (2021-2027) is the main policy vehicle for the provision of support services to businesses in Albania. It aims to improve the business environment and attract investments, increase competitiveness of SMEs through development and information technology, and reduce administrative barriers.

Additional important prerogative for digital transformation is the Law on Electronic Document, Electronic Identification and Trust Services in Electronic Business adopted in 2021, which provides the legal framework for the use of e-signatures and is fully aligned with the EU's eIDAS Regulation.

DIGITAL PUBLIC SERVICES

Indicators from 2020 and 2021 that are included in the Digital public services dimension for calculating WB DESI for 2021 and 2022 are given in Table 4.

Table 4 Digital public services indicators, Albania

Indicator	Albania		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
e-Government users % internet users	36% 2020	43% 2021	35%	65%
Pre-filled forms Score 0-100	NA**	71 2021	63	65
Digital public services for citizens Score 0-100	NA**	35 2021	43	75
Digital public services for businesses Score 0-100	NA**	69 2021	59	82
Open data % maximum score	NA	41%* 2021	42%	81%

Source: Eurostat, E-Government benchmark, market research, EU DESI 2022 (for EU average)

*Calculated based on Open Data questionnaire sent to National Agency for Information Society (NAIS)

**Data for 2020 exist but due to break in time series caused by methodological changes will not be used for comparison with 2021

The share of e-government users in Albania increased considerably, from 36% in 2020 to 43% in 2021, thus exceeding the WB average. Albania has the highest score in the re-use of information across administrations (pre-filled forms) with the score that is even above the EU average. However, Albania has lower score in providing digital public services to citizens compared to the WB average. Much better situation is with digital public services that are available to businesses (score 69 compared to the WB average of 59). Albania also scores well in facilitating access to and use of open data.

To achieve the goals of Digital Agenda for Albania until 2026, it is of utmost importance that the public administration modernises its services based on digitalisation and to implement advanced technologies such as artificial intelligence or advanced analytics.

Almost all public services are accessible through the **e-Albania** portal which represents the public administration's one-stop-shop for citizens and enterprises. In 2021, 95% of applications for 1,217 public services were submitted online on the e-Albania portal.²⁴ Total number of registered users on e-Albania portal was around 2.7 million in 2022.

Albania also implemented Governmental Interoperability Platform that enables the exchange of real-time data and information between public administration institutions with the aim to simplify public services offered to citizens, businesses and public administration, as well as to reduce the number of documents required from citizens or businesses to obtain public services.

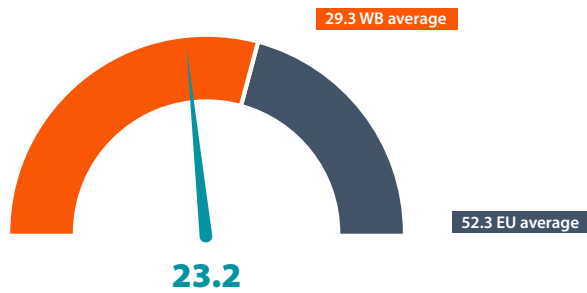
Albania's **Open Data Portal** currently provides open data from several sectors: health, treasury, customs, education, business and allows access to more than 400 datasets. Further engagement is required to bring more public bodies on board to make their data available as open data.

24 https://ec.europa.eu/commission/presscorner/detail/en/COUNTRY_22_6091

BOSNIA AND HERZEGOVINA

In total WB DESI 2022, Bosnia and Herzegovina performs below the WB average.

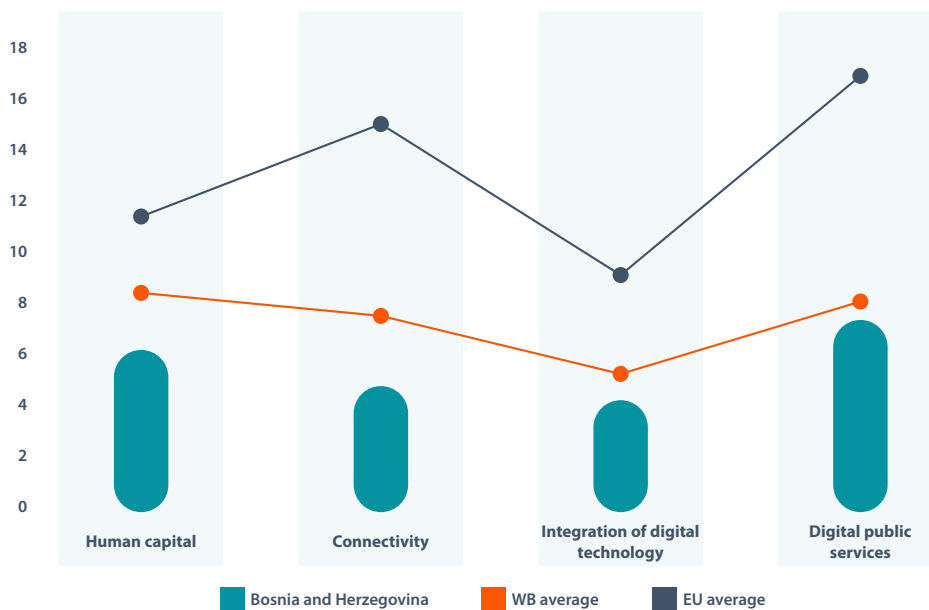
Figure 43 Total WB DESI 2022 (score 0-100), Bosnia and Herzegovina



Source: WB DESI calculation

Considering WB DESI 2022 dimensions, Bosnia and Herzegovina is approaching the WB average in Digital public services dimension, while scores for Human capital, Connectivity and Integration of digital technologies are notably below the WB average.

Figure 44 WB DESI 2022 Dimensions (weighted score 0-100), Bosnia and Herzegovina



Source: WB DESI calculation

HUMAN CAPITAL

Indicators from 2020 and 2021 that are included in the Human capital dimension for calculating WB DESI for 2021 and 2022 are given in Table 5.

Table 5 Human capital indicators, Bosnia and Herzegovina

Indicator	Bosnia and Herzegovina		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
At least basic digital skills % individuals	NA*	35% 2021	35%	54%
Above basic digital skills % individuals	NA*	5% 2021	9%	27%
At least basic digital content creation skills % individuals	NA*	63% 2021	54%	66%
ICT specialists % employees	1.3% 2020	1.4% 2021	2.6%	4.5%
Female ICT specialists % ICT specialists	0.5% 2020	0.6% 2021	19%	19%
Enterprises providing ICT training % enterprises	16% 2019	15% 2020	14%	20%
ICT graduates % graduates	4.6% 2019	5.1% 2020	6.2%	3.9%

Source: Eurostat, Agency for Statistics of Bosnia and Herzegovina, EU DESI 2022 (for EU average)

*Data are available for 2019, but due to break in time series caused by methodological changes will not be used for comparison with 2021

In Human capital dimension, Bosnia and Herzegovina is performing well in several very important digital skills indicators, such as individuals with at least basic digital skills and digital content creation skills with scores on the WB average or above the average. Additionally, 15% of Bosnian enterprises offer ICT training to their employees to improve their digital skills. ICT graduates account for more than 5% of all graduates in Bosnia and Herzegovina, which is above the EU average of 4%, but below the WB average of 6%. Nevertheless, the proportion of ICT specialists and female ICT specialists in the total employment is notably lower than the WB average, the latter significantly so (0.6% compared to 19% in the WB region).

The lack of qualified professionals is perceived as the significant challenge for the ICT sector in Bosnia and Herzegovina. 69% of enterprises in Bosnia and Herzegovina that are looking for ICT specialists reported hard-to-fill vacancies.²⁵ While this can be partly attributed to brain drain, the improvement of relevant digital skills needs to be placed as a strategic priority in Bosnia and Herzegovina.

25 https://ec.europa.eu/eurostat/statistics-explained/index.php?title=ICT_specialists_-_statistics_on_hard-to-fill_vacancies_in_enterprises

CONNECTIVITY

Indicators from 2020 and 2021 that are included in the Connectivity dimension for calculating WB DESI for 2021 and 2022 are given in Table 6.

Table 6 Connectivity indicators, Bosnia and Herzegovina

Indicator	Bosnia and Herzegovina		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
Overall fixed broadband take-up % households	67% 2020	69% 2021	77%	78%
At least 100 Mbps fixed broadband take-up % households	13% 2020	15% 2021	21%	41%
At least 1 Gbps take-up % households	0.01% 2020	0.01% 2021	0.04%	8%
Fast broadband (NGA) coverage % households	51% 2020	61% 2021	73%	90%
Fixed Very High Capacity Network (VHCN) coverage % households	25% 2020	27% 2021	48%	70%
Fibre to the premises (FTTP) coverage % households	4% 2020	5% 2021	38%	50%
5G spectrum % of total harmonised 5G spectrum	0% 2020	0% 2021	0%	56%
5G coverage % populated areas	0% 2020	0% 2021	0%	66%
Mobile broadband take-up % individuals	62% 2020	63% 2021	82%	87%
Broadband Price Index Score (0-100)	NA	51* 2022	61	73

Source: RAK, desk research, EU DESI 2022 (for EU average)

*Calculated based on desk research from 2022

In the overall broadband connectivity, Bosnia and Herzegovina performs below the WB average with significant gaps in VHCN and FTTP coverage since the rollout of fibre networks has progressed slowly. More favourable situation is with NGA coverage of 61% of households due to higher coverage of xDSL technologies. On the take-up of broadband services, Bosnia and Herzegovina performs better with the overall penetration of fixed broadband services of 69% compared to WB average of 77%. However, take-up of fixed broadband of at least 100Mbps is still modest (15% versus the WB average of 21%). As in the whole WB region, the take-up of 1Gbps broadband is at a very low level.

In mobile connectivity, mobile broadband take-up reached 63% (compared to 82% for the WB region). Considering Broadband Price Index, Bosnia and Herzegovina ranks 2nd most expensive WB economy in broadband prices.

Even though the 4G network was introduced in 2019, 4G coverage reached 88% of populated areas in 2021. Given the late adoption of 4G, currently there is no timeline for the additional spectrum assignment for 5G. Implementation of activities that will create technical and regulatory preconditions for introduction of 5G technology and liberation of spectrum for the 5G use is set as a priority in the draft Action Plan for

implementation of the Strategic Framework for Broadband Development in the period 2021-2025.²⁶ The National Broadband Strategy is drafted for the period 2021-2025 but has not been adopted yet.

INTEGRATION OF DIGITAL TECHNOLOGY

Indicators from 2020 and 2021 that are included in the Integration of digital technology dimension for calculating WB DESI for 2021 and 2022 are given in Table 7.

Table 7 Integration of digital technology indicators, Bosnia and Herzegovina

Indicator	Bosnia and Herzegovina		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
SMEs with at least basic level of digital intensity % SMEs	NA*	32% 2021	35%	55%
Electronic information sharing % enterprises	24% 2019	26% 2021	24%	38%
Social media % enterprises	14% 2019	14% 2021	23%	29%
Big data % enterprises	5% 2020	4% 2021	7%	14%
Cloud % enterprises	NA*	7% 2021	16%	34%
Artificial intelligence % enterprises	NA	2% 2021	3%	8%
ICT for environmental sustainability % enterprises	NA	54%** 2022	56%	66%
e-Invoices % enterprises	13% 2020	19% 2021	17%	32%
SMEs selling online % SMEs	19% 2020	20% 2021	21%	19%
e-Commerce turnover % SMEs	7% 2020	8% 2021	6%	12%
Selling online cross-border % SMEs	10% 2019	7% 2021	4%	9%

Source: Eurostat, Agency for Statistics of Bosnia and Herzegovina, market research, EU DESI 2022 (for EU average)

*Data for 2020 exist but due to break in time series caused by methodological changes cannot be used for comparison with 2021

**Calculated based on market research from 2022

In 2021, 32% of Bosnian and Herzegovinian SMEs had at least a basic level of digital intensity, which is very close to the WB average of 35%. Electronic information sharing is used by 26% of enterprises which is above the WB average of 24%. Social media is not widely used in Bosnian and Herzegovinian enterprises, notably below the WB average. Advanced technologies are modestly used by Bosnian and Herzegovinian enterprises: 7% of them use cloud solutions, 4% use big data, 2% use AI. E-invoices are used by 19% enterprises which is higher usage compared to the WB average. As for ICT for environmental sustainability, 54% of enterprises use ICT for environmental sustainability purposes, compared to the WB average of 56%. In e-commerce, Bosnia and Herzegovinian has good performance, with 20% of SMEs selling online.

26 <http://mkt.gov.ba/Content/OpenAttachment?id=501d77c3-9302-4d72-b310-f5c85d72358c&lang=bs>

The turnover generated from the online sales represents 8% of total turnover, more than the WB average of 6%. Selling online cross-border is reported by 7% of all SMEs (compared to 4% in the WB region).

Lack of alignment in policy and legal frameworks between Bosnia and Herzegovina's two entities leads to a fragmented digital service environment and stagnation in the development of key enablers of digital services such as electronic signature and the interoperability of government data.²⁷

DIGITAL PUBLIC SERVICES

Indicators from 2020 and 2021 that are included in the Digital public services dimension for calculating WB DESI for 2021 and 2022 are given in Table 8.

Table 8 Integration of digital technology indicators, Bosnia and Herzegovina

Indicator	Bosnia and Herzegovina		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
e-Government users % internet users	24% 2020	22% 2021	35%	65%
Pre-filled forms Score 0-100	NA	75* 2022	63	65
Digital public services for citizens Score 0-100	NA	49* 2022	43	75
Digital public services for businesses Score 0-100	NA	58* 2022	59	82
Open data % of maximum score	NA	8%** 2021	42%	81%

Source: Eurostat, desk review, market research, EU DESI 2022 (for EU average)

*Calculated based on desk research from 2022

**Calculated based on Open Data questionnaire sent to the Ministry of Communications and Transport

In Digital public services dimension, Bosnia and Herzegovina scores well in the Pre-filled forms, Digital public services for citizens and Digital public services for businesses indicators. However, it performs below the WB average in the share of e-government users (22% against the WB average of 35%). Very weak performance is recorded as regards the open data (8% compared to 42% for the WB region).

Public Administration Reform Strategic Framework 2018-2022 envisage the increase in ICT use in public administration to make government more accountable, transparent and effective. The important anticipated changes relate to: policy, organisation and human resources, IT infrastructure (including security), and automation of public administration business processes (including fundamental registries) and e-services. The relevant strategic document in Republika Srpska is the Strategy for Development of e-Government for the period 2019-2022 which sets out important aspects of e-government.

In Bosnia and Herzegovina there is no policy regulating proactive transparency, open data or their use for commercial and non-commercial purposes. At the same time, public institutions collect and produce a huge amount of data that could be of social and economic benefit, but competencies for policy development, technical support for open data initiatives, and legal protection in this domain are not clearly

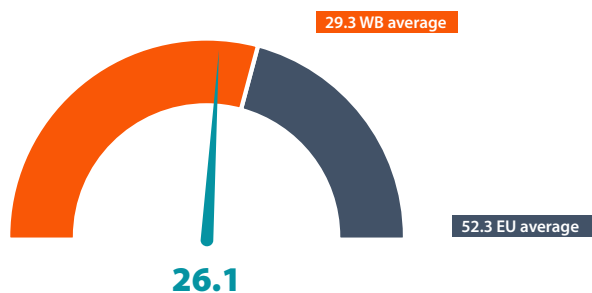
27 SME Policy Index: Western Balkans and Turkey 2022: Assessing the Implementation of the Small Business Act for Europe

defined. Also, there is a lack of open data portals that would make it easier for users to access public data. There are certain activities, such as pilot project “Open Data Portal” which enables the availability of public data through public administration infrastructure, modelled based on the European Open Data Portal. The Public Administration Reform Coordinator’s Office has developed a portal for the needs of public institutions, however it is not largely used.

KOSOVO*

In total WB DESI 2022, Kosovo* is performing below the WB average, mainly due to low scores in Human Capital and Digital public services dimensions.

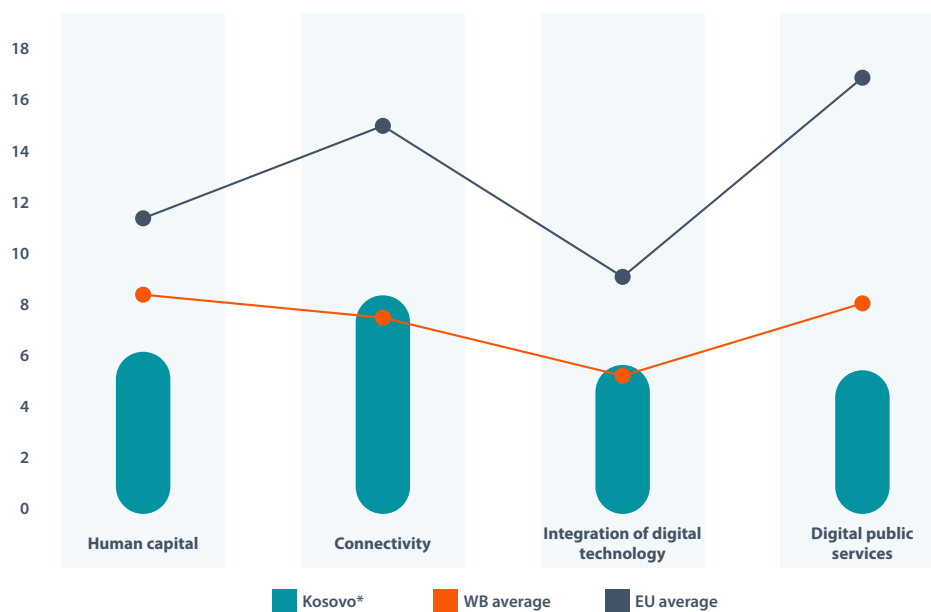
Figure 45 Total WB DESI 2022 (score 0-100), Kosovo*



Source: WB DESI calculation

Considering WB DESI 2022 dimensions, Kosovo* has good performance in Connectivity and Integration of digital technology dimensions with scores above the WB averages. Further improvements are needed in Human capital and Digital public services dimensions.

Figure 46 WB DESI 2022 Dimensions (weighted score 0-100), Kosovo*



Source: WB DESI calculation

HUMAN CAPITAL

Indicators from 2020 and 2021 that are included in the Human capital dimension for calculating WB DESI for 2021 and 2022 are given in Table 9.

Table 9 Human capital indicators, Kosovo*

Indicator	Kosovo*		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
At least basic digital skills % individuals	NA	28% 2019	35%	54%
Above basic digital skills % individuals	NA	14% 2019	9%	27%
At least basic digital content creation skills % individuals	NA	31% 2019	54%	66%
ICT specialists % employees	NA	1.1% 2020	2.6%	4.5%
Female ICT specialists % ICT specialists	NA	20% 2020	19%	19%
Enterprises providing ICT training % enterprises	NA	1% 2020	14%	20%
ICT graduates % graduates	NA	6.7% 2021	6.2%	3.9%

Source: Eurostat, Kosovo* Agency of Statistics, EU DESI 2022 (for EU average)

Considering that the methodology for calculating digital skills indicators was changed in 2021, there is a break in time series for all three digital skills indicators and the comparison with the 2019 data available for Kosovo* for those indicators is not entirely possible.

The proportion of ICT specialists represented a relatively low share of the workforce (1.1% versus 2.6% in the WB region) in 2020. The proportion of female ICT specialists is slightly better (14%) compared to the WB and EU average. In addition, the percentage of ICT graduates among all graduates stands at 6.7% which is above the WB average of 6.2% in 2021. In 2020, only 1% of enterprises provided ICT training to their employees, compared to 14% in the WB region.

With the support of ALLED2 (Aligning Education for Employment) project and Kosovo* Chamber of Commerce, a set of three statistical barometers was launched in 2021 to strengthen the skills agenda and establish a framework approach to skills intelligence. The Skills Barometer²⁸ is a report on Kosovo*'s current and future skills needs. The five-year forecast into the skills and occupations demanded by different sectors and economic activities offers an important tool for evidence-based policy making in education, training and SME policy, particularly in terms of VET planning and identifying priority sectors across specific regions. The Skills Barometer currently addresses only the demand side because supply-side information on those leaving education and training institutions is unavailable, highlighting the ongoing challenge of data availability.

Currently, Ministry of Economy is implementing two projects that support young people for ICT and soft skills training:

28 <http://alled.eu/wp-content/uploads/2022/02/Kosovo-Skill-Barometer-1.pdf>

- IPA 2017 Project EU Support for the competitiveness of Kosovo's* ICT Sector²⁹ offers specialised ICT training. A specific [webpage](#) is dedicated to informing all interested young people about training. The target is to train at least 1440 beneficiaries and 90 participants for business trainings. The project is expected to be completed in 2023 at least 1,000 people already trained.
- KODE – Youth Online and Upward Programme supported by the World Bank. It aims to train at least 2,000 unemployed or under-employed young people in the most in-demand digital and soft skills in 5 to 6 months of physical training sessions delivered in 7 regions of Kosovo*. In 2022, more than 300 young people were certified by the program and the Programme is expected to achieve the total number of 2,000 beneficiaries³⁰ by May 2024.

CONNECTIVITY

Indicators from 2020 and 2021 that are included in the Connectivity dimension for calculating DESI for 2021 and 2022 are given in Table 10.

Table 10 Connectivity indicators, Kosovo*

Indicator	Kosovo*		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
Overall fixed broadband take-up % households	99.7% 2020	99.7% 2021	77%	78%
At least 100 Mbps fixed broadband take-up % households	28% 2020	45% 2021	21%	41%
At least 1 Gbps take-up % households	0% 2020	0% 2021	0.04%	8%
Fast broadband (NGA) coverage % households	52% 2020	71% 2021	73%	90%
Fixed Very High Capacity Network (VHCN) coverage % households	17% 2020	20% 2021	48%	70%
Fibre to the premises (FTTP) coverage % households	17% 2020	20% 2021	38%	50%
5G spectrum % of total harmonised 5G spectrum	0% 2020	0% 2021	0%	56%
5G coverage % populated areas	0% 2020	0% 2021	0%	66%
Mobile broadband take-up % individuals	78% 2020	78% 2021	82%	87%
Broadband Price Index Score (0-100)	NA	81* 2022	61	73

Source: ARKEP, desk review, EU DESI 2022 (for EU average)

*Calculated based on desk research from 2022

In terms of fixed broadband take-up Kosovo* has the highest score in the WB region in the overall fixed broadband take-up with 99.7% of households subscribed to any kind of fixed broadband connection in 2021, compared to 78% in the EU. Kosovo* performs very well with subscriptions of at least 100 Mbps

²⁹ https://neighbourhood-enlargement.ec.europa.eu/system/files/2017-12/ipa_2017_040506.08_ks_eu_support_for_the_competitiveness_of_kosovos_ict_sector.pdf

³⁰ <https://kodeproject.org/en/digita-work-and-empowerment/>

fixed broadband - 45% of households used such a connection in 2021, which is above the EU average of 41% for the same indicator. Fast broadband (NGA) coverage reached 71% of households which is close to the WB average of 73%, mainly as a result of high coverage of xDSL technologies. On the other hand, Kosovo* performs below the WB average with gaps in VHCN and FTTP coverage, since the rollout of fibre networks has progressed slowly.

When it comes to mobile connectivity, mobile broadband take-up reached 78% (compared to 82% in the WB region). In 2021, 4G coverage reached 90% of populated areas. ARKEP plans to start the procedure for the assignment of new frequencies for 5G at the beginning of 2023.

Considering Broadband Price Index, Kosovo* ranks as the least expensive WB economy in terms of broadband prices.

In order to address the growing demand for broadband services, Kosovo* Digital Economy (KODE) Project³¹ is initiated to expand the broadband infrastructure into uncovered, rural areas and provide high-speed broadband access for more than 200 villages by 2023, with schools and hospitals included, and to support projects which aim to deploy 5G networks. Objective of connecting all white areas has been reached and 203 villages, 107 schools and 43 ambulances have been covered with fixed broadband infrastructure.³² Also, another important activity started in 2020 through KODE project – connecting mobile towers with fiber optics. More than 36 towers owned by two mobile network operators (MNOs) were connected in two years. This activity aims to support MNOs in encouraging investment in 5G deployment.

Ministry of Economy has drafted Digital Agenda 2030 which includes, among others, strategic and specific objectives related to the development of a secure, reliable and sustainable digital infrastructure including fixed and mobile ICT networks and services for smart businesses, smart communities and public safety. Digital Agenda 2030 is expected to be adopted in 2023.

INTEGRATION OF DIGITAL TECHNOLOGY

Indicators from 2020 and 2021 that are included in the Integration of digital technology dimension for calculating WB DESI for 2021 and 2022 are given in Table 11.

Table 11 Integration of digital technology indicators, Kosovo*

Indicator	Kosovo*		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
SMEs with at least basic level of digital intensity % SMEs	NA	24%* 2022	35%	55%
Electronic information sharing % enterprises	NA	17%* 2022	24%	38%
Social media % enterprises	NA	83% 2020	23%	29%
Big data % enterprises	NA	6%* 2022	7%	14%

31 <https://kodeproject.org/en/project-framework/>

32 <https://mf.rks-gov.net/desk/inc/media/23D2D3B1-81C1-41FE-B6C0-2D5C739A6F69.pdf>

Indicator	Kosovo*		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
Cloud % enterprises	NA	12%* 2022	16%	34%
Artificial intelligence % enterprises	NA	5%* 2022	3%	8%
ICT for environmental sustainability % enterprises	NA	52%* 2022	56%	66%
e-Invoices % enterprises	NA	9%* 2022	17%	32%
SMEs selling online % SMEs	NA	22% 2020	21%	19%
e-Commerce turnover % SMEs	NA	4%* 2022	6%	12%
Selling online cross-border % SMEs	NA	3%* 2022	4%	9%

Source: Kosovo* Agency of Statistics, market research, EU DESI 2022 (for EU average)

*Calculated based on market research from 2022

Most enterprises in Kosovo* do not exploit the opportunities offered by digital technologies. 17% of enterprises use an Enterprise Resource Planning (ERP) software to share information electronically and 9% of enterprises send e-invoices, notably below the WB averages for both indicators. The situation is similar for advanced technologies: in cloud computing and big data analytics, Kosovo* scores below the WB average, too. Uptake of AI is higher with 5% of enterprises using any AI technology (compared to the WB average of 3%). SMEs require a special policy focus, as only 24% of them have at least basic level of digital intensity which is well below the WB average of 35%. On the other hand, Kosovo* enterprises rely heavily on social media, 83% of enterprises reported the use of social media in 2020 which is much above the EU average of 29%. As for ICT for environmental sustainability, 52% of enterprises reported to use ICT for environmental actions, which is close to the WB average of 56%. In e-commerce, Kosovo* has a good performance, with 22% of SMEs selling online. Selling online cross border is reported by 3% of SMEs (compared to 4% in the WB region), but the turnover generated from the online sales is at a lower level - 4% compared to the WB average of 6%.

Kosovo* made improvement in the area of digital transformation with the adoption of the Law on Electronic Identification and Trust Services for Electronic Transactions which is aligned to the EU Electronic Identification, Authentication and Trust Services Regulation.³³

Since Kosovo* National Development Strategy (2016-2021) expired in 2021, the new National Development Strategy (2022-2030) and the Action Plan are being drafted. The upcoming National Development Strategy will include actions in relation to advanced and secure digital transformation, digital transformation of businesses, digitalisation of public services (e-governance), digital skills and innovative ecosystem for R&D and strengthening cybersecurity system. The National Strategy for Innovation and Entrepreneurship (2019-2023), with the vision for digital economy that bases its economic competitiveness on the effective use of knowledge, creativity and innovation and the Private Sector Development Strategy (2018-2022) as the main strategic document for the SME policies, are very important strategic documents focused on digitalisation.

33 https://neighbourhood-enlargement.ec.europa.eu/kosovo-report-2022_en

DIGITAL PUBLIC SERVICES

Indicators from 2020 and 2021 that are included in the Digital public services dimension for calculating WB DESI for 2021 and 2022 are given in Table 12.

Table 12 Integration of digital technology indicators, Kosovo*

Indicator	Kosovo*		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
e-Government users % internet users	NA	26% 2020	35%	65%
Pre-filled forms Score 0-100	NA	55* 2022	63	65
Digital public services for citizens Score 0-100	NA	45* 2022	43	75
Digital public services for businesses Score 0-100	NA	53* 2022	59	82
Open data % of maximum score	NA	NA**	42%	81%

Source: Kosovo* Agency for Statistics, desk review, EU DESI 2022 (for EU average)

*Calculated based on desk research from 2022

**Open Data questionnaire was sent to the Agency for Information Society and the answer is still missing

Kosovo* performs below the WB average on all digital public services indicators, except for the availability of digital public services for citizens (a score of 45, compared to the WB average of 43). The digital interaction between public authorities and users was low as well, as only 26% of internet users were using e-government services in 2020.

Limited number of electronic services in the e-Kosova platform, non-application of electronic payment module, the need of investing in modernisation of public IT infrastructure, the need of expanding the implementation of Interoperability Platform for systems integration are identified as the key obstacles for digital transformation in the Economic Reform Programme 2022-2024.³⁴

e-Kosova online portal for digital services was launched in 2021 as a result of Public Administration Modernisation Strategy (2015-2020). The portal aims to serve as a one-stop-shop for digital services for businesses and citizens. However, the portal is still in the early stages of development, as it currently provides only 36 digital services, the majority of which are oriented towards citizens, not businesses. Moreover, many services remain purely informational or are still only provided through the websites of their respective institutions and are not yet accessible through e-Kosova. Data quality and reliability remain a challenge.³⁵ By the end of 2022, the portal had 746 thousand registered users. Full implementation of electronic signature and its adoption by businesses should allow faster rollout of digital services to be accessible through the e-Kosova portal, particularly those requiring a high level of security.

Kosovo* has an [Open Data Portal](#) which aims to provide society with information made available by public administration. As of 2022, the portal contains 205 datasets that can be extracted in various formats and further processed.

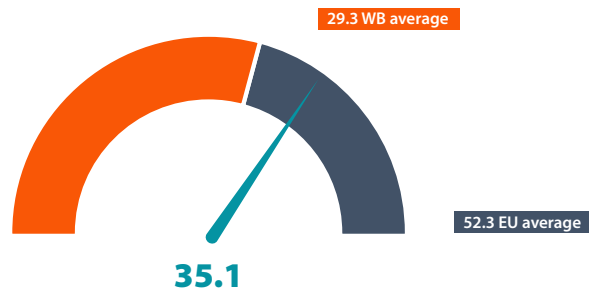
34 <https://mf.rks-gov.net/desk/inc/media/23D2D3B1-81C1-41FE-B6C0-2D5C739A6F69.pdf>

35 https://neighbourhood-enlargement.ec.europa.eu/kosovo-report-2022_en

MONTENEGRO

In total WB DESI 2022, Montenegro has the highest total DESI score in the WB region.

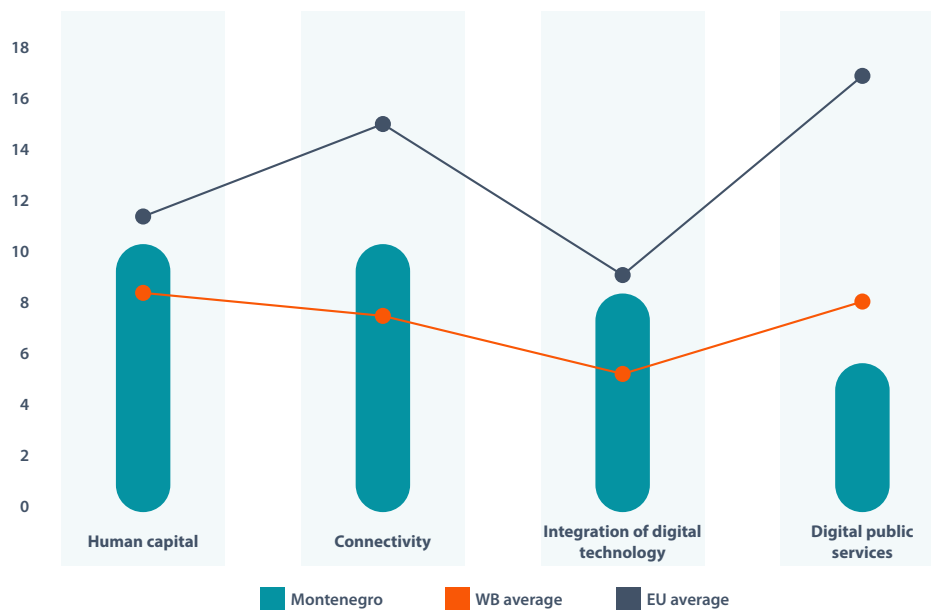
Figure 47 Total WB DESI 2022 (score 0-100), Montenegro



Source: WB DESI calculation

Considering WB DESI 2022 dimensions, Montenegro shows strong performance in Human capital, Connectivity and Integration of digital technology dimensions with scores notably above the WB average. Further improvements are needed in Digital public services dimension.

Figure 48 WB DESI 2022 Dimensions (weighted score 0-100), Montenegro



Source: WB DESI calculation

HUMAN CAPITAL

Indicators from 2020 and 2021 that are included in the Human capital dimension for calculating WB DESI for 2021 and 2022 are given in Table 13.

Table 13 Human capital indicators, Montenegro

Indicator	Montenegro		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
At least basic digital skills % individuals	NA*	47% 2021	35%	54%
Above basic digital skills % individuals	NA*	9% 2021	9%	27%
At least basic digital content creation skills % individuals	NA*	81% 2021	54%	66%
ICT specialists % employees	1.7% 2020	1.4% 2021	2.6%	4.5%
Female ICT specialists % ICT specialists	NA	16% 2020	19%	19%
Enterprises providing ICT training % enterprises	24% 2019	26% 2020	14%	20%
ICT graduates % graduates	6.5% 2020	7.9%** 2021	6.2%	3.9%

Source: Eurostat, Statistical Office of Montenegro (MONSTAT), market research, EU DESI 2022 (for EU average)

*Data are available for 2019, but due to break in time series caused by methodological changes will not be used for comparison with 2021

**Calculated based on market research

Montenegro performs very well in overall digital skills. The number of individuals with at least basic digital skills and individuals with at least basic digital content creation skills is notably higher compared to the WB averages. The share of individuals with above basic digital skills is equal to the WB average. Additionally, the share of enterprises providing ICT training is 26% which is 12 percentage points over the WB average. The share of ICT graduates steadily increases and is above the WB average. However, more attention needs to be paid to the lack of ICT specialists (especially women) as this directly affects digital transformation of businesses. The proportion of ICT specialists in the workforce shows a decreasing trend with only 1.4% of employed ICT specialists in 2021, out of which only 16% are women.

The Strategy for Development of Vocational Education in Montenegro in the period 2020-2024³⁶ (VET Strategy) with the Action Plan 2020-2022 recognises the importance of digital skills that should be widely integrated in VET programmes.

One of the main objectives of Digital Transformation Strategy of Montenegro³⁷ for the period 2022-2026 is strengthening digital skills and development of ICT professionals to enable digital transformation.

The very important specific activity initiated in Montenegro with the aim of fostering digital skills is Digital Academy project - a platform for education and networking of all relevant stakeholder working on building digital and leadership skills of public servants, students and vulnerable groups of strategic importance.

36 <https://www.gov.me/dokumenta/3f8ece83-b549-4c84-8ae9-a8620ff67928>

37 <https://www.gov.me/en/documents/59dcab9b-b0e8-48b7-830b-6e4eab690521>

CONNECTIVITY

Indicators from 2020 and 2021 that are included in the Connectivity dimension for calculating WB DESI for 2021 and 2022 are given in Table 14.

Table 14 Connectivity indicators, Montenegro

Indicator	Montenegro		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
Overall fixed broadband take-up % households	93% 2020	96% 2021	77%	78%
At least 100 Mbps fixed broadband take-up % households	29% 2020	40% 2021	21%	41%
At least 1 Gbps take-up % households	0% 2020	0.01% 2021	0.04%	8%
Fast broadband (NGA) coverage % households	80% 2020	81% 2021	73%	90%
Fixed Very High Capacity Network (VHCN) coverage % households	76% 2020	77% 2021	48%	70%
Fibre to the premises (FTTP) coverage % households	66% 2020	67% 2021	38%	50%
5G spectrum % of total harmonised 5G spectrum	0% 2020	0% 2021	0%	56%
5G coverage % populated areas	0% 2020	0% 2021	0%	66%
Mobile broadband take-up % individuals	87% 2020	91% 2021	82%	87%
Broadband Price Index Score (0-100)	NA	52* 2022	61	73

Source: EKIP, desk research, EU DESI 2022 (for EU average)

*Calculated based on desk research from 2022

Montenegro ranks first among WB economies in the Connectivity dimension. The Fixed Very High-Capacity Network (VHCN) coverage reached 77% of households in 2021, which is the highest value in the WB region and above the EU average. Quite remarkably, FTTP coverage reached 67% of households in 2021, which is higher compared to the WB and EU averages. Moreover, this excellent performance is also reflected in the high-speeds broadband uptake, with 40% (up from 29% in 2020) of households having at least 100 Mbps broadband connection, which is close to the EU average of 41% and notably above the WB average of 21%. Overall fixed broadband penetration reached 96% of households, which is well above the EU average of 78% and WB average of 77%. As in the whole WB region, the take-up of 1 Gbps broadband is at a very low level.

Concerning mobile connectivity, mobile broadband take-up reached 91% (compared to 82% for the WB region). 4G was available in 98% of populated areas in 2021 and 5G services were commercially launched in March 2022, based on Dynamic Spectrum Sharing (DSS) which enables parallel use of LTE and 5G technology in the same frequency band. In December 2022 Montenegro awarded frequencies in the 700 MHz and 3.6 GHz bands to Crnogorski Telekom, Mtel and One Montenegro operators for the rollout of 5G mobile networks. Considering Broadband Price Index, prices of broadband services are higher compared to the WB average.

INTEGRATION OF DIGITAL TECHNOLOGY

Indicators from 2020 and 2021 that are included in the Integration of digital technology dimension for calculating WB DESI for 2021 and 2022 are given in Table 15.

Table 15 Integration of digital technology indicators, Montenegro

Indicator	Montenegro		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
SMEs with at least basic level of digital intensity % SMEs	NA*	48% 2021	35%	55%
Electronic information sharing % enterprises	NA	38% 2021	24%	38%
Social media % enterprises	32% 2019	33% 2021	23%	29%
Big data % enterprises	15% 2020	15% 2020	7%	14%
Cloud % enterprises	NA*	20% 2021	16%	34%
Artificial intelligence % enterprises	NA	3% 2021	3%	8%
ICT for environmental sustainability % enterprises	NA	61%** 2022	56%	66%
e-Invoices % enterprises	NA	44% 2020	17%	32%
SMEs selling online % SMEs	19% 2020	23% 2021	21%	19%
e-Commerce turnover % SMEs	4% 2020	13% 2021	6%	12%
Selling online cross-border % SMEs	10% 2019	16% 2021	4%	9%

Source: Eurostat, Statistical Office of Montenegro (MONSTAT), market research, EU DESI 2022 (for EU average)

*Data for 2020 exist but due to break in time series caused by methodological changes cannot be used for comparison with 2021

**Calculated based on market research from 2022

Montenegro has the highest score in the WB region in the Integration of digital technology dimension, scoring well above the WB average on most indicators. Almost half of Montenegrin SMEs have at least a basic level of digital intensity, considerably above the WB average of 35%. Montenegrin enterprises show a high uptake of advanced digital technologies within their operations. Most notable is the number of enterprises using cloud solutions (20%) and big data (15%) with above WB average values for both indicators. The proportion of companies that share information electronically is on EU average - 38%, but well above the WB average of 24%. Montenegrin enterprises use social media more (33%) compared to the WB average of 23%. E-invoice is used by 44% of enterprises which is the highest share in the WB region and significantly above the WB average (17%) and the EU average (32%). Use of ICT for environmental actions is reported by 61% of enterprises. Additionally, Montenegrin SMEs show very strong performance in all e-commerce indicators.

Digital Transformation Strategy of Montenegro for the period 2022-2026 with the Action Plan 2022-2023 is a key strategic document concerning digital transformation. The first strategic goal focuses on improving the capacities and capabilities for digital transformation at all levels.

The Law on Electronic Identification and Electronic Signature is one of the fundamental pillars of digital transformation process, as it governs the conditions and method of using essential digital management tools and it governs the conditions for recognition of electronic identification tools of other foreign jurisdictions. The Law is fully aligned with EU eIDAS regulation.³⁸

DIGITAL PUBLIC SERVICES

Indicators from 2020 and 2021 that are included in the Digital public services dimension for calculating WB DESI for 2021 and 2022 are given in Table 16.

Table 16 Digital public services indicators, Montenegro

Indicator	Montenegro		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
e-Government users	38%	36%	35%	65%
% internet users	2020	2021		
Pre-filled forms	NA*	22	63	65
Score 0-100		2021		
Digital public services for citizens	NA*	48	43	75
Score 0-100		2021		
Digital public services for businesses	NA*	43	59	82
Score 0-100		2021		
Open data	NA	53%	42%	81%
% maximum score		2021		

Source: Eurostat, E-Government benchmark, Open data report, EU DESI 2022 (for EU average)

*Data for 2020 exist but due to break in time series caused by methodological changes will not be used for comparison with 2021

In 2021, the proportion of active users of e-government services (36%) decreased since 2020 and is very close to the WB average (35%). On open data maturity, with 53%, Montenegro performs above the WB average of 42%. However, with a score of 22 for pre-filled forms, Montenegro performs significantly below the WB average (63). Also, Montenegro scores notably below the WB average on digital public services for businesses with a score of 43 compared to the WB average of 59. The low score for this indicator is the result of the late adoption of digital services for business in the e-Uprava portal. More favorable situation is with digital public services for citizens, with the score of 48 that is above the WB average of 43.

Montenegro adopted a new, comprehensive framework for digital government which aims to significantly advance digital availability of government services and horizontally guide digital transformation of the economy. The Law on Electronic Government seeks to improve the environment in which public administration provides services to citizens and businesses. The Digital Transformation Strategy 2022-2026 is in line with the goals of the new Public Administration Reform Strategy 2022-2026 in the area of

38 https://neighbourhood-enlargement.ec.europa.eu/montenegro-report-2022_en

e-Government and includes objectives such as further developing digital government services through the e-Uprava portal and advancing interoperability and data openness.

Montenegro has an online portal for digital government services - [e-Uprava](#). Digitalisation of existing services depends on relevant ministries and other institutions and many key services are not digitalised to the extent possible. The number of e-government services is 410, from 50 institutions.³⁹

Montenegro has achieved important progress in the availability of data sets on the [Open Data Portal](#). Since June 2020, the Open Data Portal has been integrated with the European open data portal. The number of datasets on the open data portal has increased to 197.⁴⁰ A Rulebook exists to ensure that datasets provided through the open data portal by public institutions are machine readable and provided in open format to allow for their reuse.

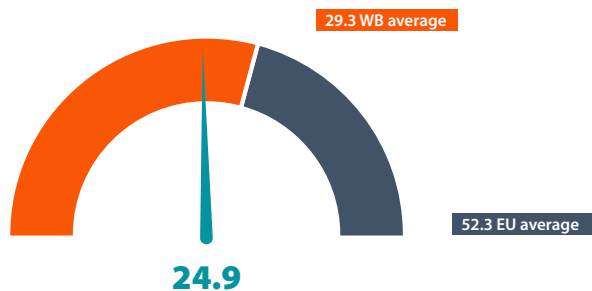
.....
39 https://neighbourhood-enlargement.ec.europa.eu/montenegro-report-2022_en

40 https://neighbourhood-enlargement.ec.europa.eu/montenegro-report-2022_en

NORTH MACEDONIA

In total WB DESI 2022, North Macedonia is performing below the WB average due to lower scores in the Human capital, Connectivity and Integration of digital technology dimensions.

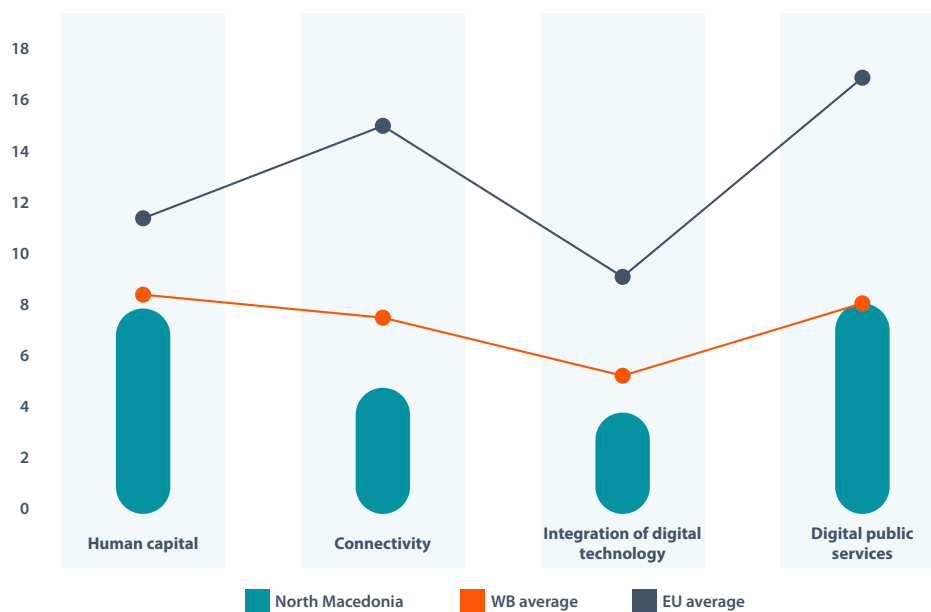
Figure 49 Total WB DESI 2022 (score 0-100), North Macedonia



Source: WB DESI calculation

Considering WB DESI 2022 dimensions, North Macedonia has good performance in Digital public services dimension with the score above the WB average. Improvements are mainly needed in the Integration of digital technology dimension.

Figure 50 WB DESI 2022 Dimensions (weighted score 0-100), North Macedonia



Source: WB DESI calculation

HUMAN CAPITAL

Indicators from 2020 and 2021 that are included in the Human capital dimension for calculating WB DESI for 2021 and 2022 are given in Table 17.

Table 17 Human capital indicators, North Macedonia

Indicator	North Macedonia		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
At least basic digital skills % individuals	NA*	35% 2021	35%	54%
Above basic digital skills % individuals	NA*	8% 2021	9%	27%
At least basic digital content creation skills % individuals	NA*	43% 2021	54%	66%
ICT specialists % employees	1.9% 2019	2.3% 2020	2.6%	4.5%
Female ICT specialists % ICT specialists	24% 2019	23% 2021	19%	19%
Enterprises providing ICT training % enterprises	NA	12% 2020	14%	20%
ICT graduates % graduates	7% 2019	5.9% 2020	6.2%	3.9%

Source: Eurostat, State Statistical Office of North Macedonia, EU DESI 2022 (for EU average)

*Data are available for 2019, but due to break in time series caused by methodological changes will not be used for comparison with 2021

In Human capital dimension, North Macedonia is performing well in several very important digital skills indicators, such as individuals with at least basic digital skills and above basic digital skills with scores on WB average or slightly below the average. Additionally, in 2020 ICT graduates accounted for almost 6% of all graduates in North Macedonia, down from 7% in 2019, but still above the EU average of 4%. The proportion of ICT specialists is close to the WB average, while the number of female ICT specialists in total employment (23%) is above the WB and EU average of 19%. Nevertheless, 43% of the individuals in North Macedonia have at least basic digital content creation skills, notably below the WB average which stands at 54%. 12% of Macedonian enterprises offer ICT training to their employees to improve their digital skills, which is below the WB average of 14%. However, 56% of enterprises in North Macedonia that are looking for ICT specialists reported hard-to-fill vacancies.⁴¹

North Macedonia Progress Report for 2022⁴² entails development and adoption of digital skills strategy and a reference framework for digital literacy throughout the society, since improving digital literacy is a priority to ensure digital transformation through a cross-cutting approach.

North Macedonia prepared the draft National ICT Strategy 2021-2025 and one of the key pillars relates to improving the digital skills of citizens, workforce and experts.

⁴¹ https://ec.europa.eu/eurostat/statistics-explained/index.php?title=ICT_specialists_-_statistics_on_hard-to-fill_vacancies_in_enterprises

⁴² https://neighbourhood-enlargement.ec.europa.eu/north-macedonia-report-2022_en

Digital literacy and ICT in schools is incorporated as a topic in the Education Strategy 2018-2025 and the Action Plan.⁴³ The Strategy defines ICT and digital literacy as one of the five general topics related to the overall education system and specifies it as a priority to ensure widespread use of ICT in education and training and digital literacy.

Regarding gender equality the support is offered by organisations like the Women in Tech Macedonia Chapter through programmes that seek to educate, equip and empower women with the necessary skills to succeed in STEM careers. The Macedonian Chapter of women in tech has also organised a bootcamp for women entrepreneurs. Additionally, North Macedonia has launched a gender equality index, which allows comparison of its performance with other EU MS.

CONNECTIVITY

Indicators from 2020 and 2021 that are included in the Connectivity dimension for calculating WB DESI for 2021 and 2022 are given in Table 18.

Table 18 Connectivity indicators, North Macedonia

Indicator	North Macedonia		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
Overall fixed broadband take-up % households	74% 2020	78% 2021	77%	78%
At least 100 Mbps fixed broadband take-up % households	NA	2% 2021	21%	41%
At least 1 Gbps take-up % households	NA	0.02%* 2022	0.04%	8%
Fast broadband (NGA) coverage % households	83% 2020	83% 2020	73%	90%
Fixed Very High Capacity Network (VHCN) coverage % households	NA	NA	48%	70%
Fibre to the premises (FTTP) coverage % households	NA	NA	38%	50%
5G spectrum % of total harmonised 5G spectrum	0% 2020	0% 2021	0%	56%
5G coverage % populated areas	0% 2020	0% 2021	0%	66%
Mobile broadband take-up % individuals	65% 2020	76% 2021	82%	87%
Broadband Price Index Score (0-100)	NA	47** 2022	61	73

Source: AEC/BCO, desk review, EU DESI 2022 (for EU average)

*Data refer to Q1 2022

**Calculated based on desk research from 2022

43 <https://planipolis.iiep.unesco.org/sites/default/files/ressources/macedonia-education-strategy-for-2018-2025-and-action-plan-strategija-za-obrazovanie-eng-web-1.pdf>

Data for calculating VHCN and FTTP coverage indicators are missing for North Macedonia. In September 2022, Agency for Electronic Communications (AEC) adopted amendments to the Rulebook on the method of construction of public electronic communication networks and related assets which facilitates data collection process for the two missing indicators.

North Macedonia surpassed the WB average in both overall fixed broadband take-up with 78% of households using the fixed broadband connection and in fast broadband (NGA) coverage with 83% of homes passed versus 73% in the WB region. Despite the high NGA coverage, North Macedonia is lagging behind the WB region in the take-up of fixed broadband of at least 100 Mbps (2% compared to WB average of 21%). As in the whole WB region, the take-up of 1Gbps broadband is at a very low level.

When it comes to mobile connectivity, North Macedonia performs well in mobile broadband take-up with 76% of people using mobile broadband, while 4G reached 99.4%⁴⁴ of populated areas in 2021. Relatively high fixed and mobile take-up do not correlate with low broadband prices, as North Macedonia is ranking as the most expensive WB economy in the Broadband Price Index.

North Macedonia is the first WB economy that assigned spectrum for 5G use in 700 MHz and 3.6 GHz frequency bands. The procedure for spectrum allocation was finalised in July 2022 and spectrum was assigned to two mobile operators, Makedonski Telekom and A1 Macedonija in 700 MHz and 3.6 GHz frequency bands.

North Macedonia adopted the National Operational Broadband Plan for 2019-2029⁴⁵ which is aligned with the strategic objectives of Digital Agenda for Europe and EU's Gigabit Society, and articulates concrete broadband targets which relate to 5G coverage and use of broadband services of at least 100 Mbps.

INTEGRATION OF DIGITAL TECHNOLOGY

Indicators from 2020 and 2021 that are included in the Integration of digital technology dimension for calculating WB DESI for 2021 and 2022 are given in Table 19.

Table 19 Integration of digital technology indicators, North Macedonia

Indicator	North Macedonia		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
SMEs with at least basic level of digital intensity % SMEs	NA*	26% 2021	35%	55%
Electronic information sharing % enterprises	NA	15% 2021	24%	38%
Social media % enterprises	NA	13% 2021	23%	29%
Big data % enterprises	13% 2020	13% 2021	7%	14%

⁴⁴ <https://bco.mioa.gov.mk/wp-content/uploads/2022/04/%D0%98%D0%B7%D0%B2%D0%B5%D1%88%D1%82%D0%B0%D1%98-%D0%B1%D1%80.-5-%D0%A3%D0%A1%D0%92%D0%9E%D0%95%D0%9D-30032022-EN-3.pdf>

⁴⁵ https://mioa.gov.mk/sites/default/files/pbl_files/documents/reports/north_macedonia_national_operational_broadband_plan_final_en.pdf

Indicator	North Macedonia		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
Cloud % enterprises	NA	10% 2021	16%	34%
Artificial intelligence % enterprises	NA	10% 2020	3%	8%
ICT for environmental sustainability % enterprises	NA	59%** 2022	56%	66%
e-Invoices % enterprises	NA	7% 2020	17%	32%
SMEs selling online % SMEs	6% 2020	9% 2021	21%	19%
e-Commerce turnover % SMEs	NA	6%** 2022	6%	12%
Selling online cross-border % SMEs	1% 2019	1% 2021	4%	9%

Source: Eurostat, State Statistical Office of North Macedonia, market research, EU DESI 2022 (for EU average)

*Data for 2020 exist but due to break in time series caused by methodological changes cannot be used for comparison with 2021

**Calculated based on market research from 2022

Considering that the methodology for calculating the Artificial intelligence indicator was changed in 2021, there is a break in time series and the comparison with the 2020 data available for North Macedonia is not entirely possible.

Advanced technologies are gaining popularity among Macedonian enterprises: 13% of them use big data and 10% use Cloud and AI technologies. Usage of big data in North Macedonia is above the WB average. Concerning SMEs digital intensity, 26% of Macedonian SMEs have at least a basic level of digital intensity, which is below the WB average of 35%. As for ICT for environmental sustainability, 59% of enterprises use ICT for environmental sustainability purposes, compared to the WB average of 56%. E-invoices (7%), electronic information sharing (15%) and social media (13%) are not widely used. Additionally, Macedonian enterprises are not taking full advantage of the opportunities presented by online commerce: only 9% of SMEs sell online (notably below the WB average of 21%) while only 1% of all SMEs are selling across borders with 6% of turnover coming from the online segment.

The digital transformation is part of the Economic Reform Programme for the period 2021 - 2023 and of the Ministry of Information Society and Administration's Strategic Plan 2021-2023. The long-term ICT strategy 2021-2026 was drafted but still has not been adopted and the preparation of a National Strategy for Artificial Intelligence is underway.

To help improve SMEs competitiveness, North Macedonia developed a National Strategy for SMEs 2018-2023,⁴⁶ which establishes a framework for public, private and civil society stakeholders to collaborate in the support of SME development and innovation.

To further enhance digital transformation, North Macedonia adopted three laws that set up the bases for implementation and promotion of digital services for citizens, businesses and public administration:

46 <https://www.economy.gov.mk/Upload/Documents/SME%20Strategy%20EN%20FINAL.pdf>

- The Law on Central Population Register, which regulates the structure, content and exchange of information between the Central Population Register and the competent bodies and entities.
- The Law on Electronic Management and Electronic Services, which regulates the operation of electronic exchange of data and documents, as well as the functioning of the National e-Services Portal, Service Catalogue, Single Point of Service and Interoperability.
- The Law on Electronic Documents, Electronic Identification and Trust Services, which complements the above with regulation on the creation, preservation and processing of electronic documents, electronic identification and trust services and gives equal legal value to electronic documents and e-signatures as traditional documents and signatures. This Law needs to be further aligned with the EU's Regulation on electronic identification and trust services for electronic transactions in the internal market (eIDAS Regulation).⁴⁷

DIGITAL PUBLIC SERVICES

Indicators from 2020 and 2021 that are included in the Digital public services dimension for calculating WB DESI for 2021 and 2022 are given in Table 20.

Table 20 Digital public services indicators, North Macedonia

Indicator	North Macedonia		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
e-Government users % internet users	30%	32%	35%	65%
Pre-filled forms Score 0-100	NA*	73 2021	63	65
Digital public services for citizens Score 0-100	NA*	36 2021	43	75
Digital public services for businesses Score 0-100	NA*	61 2021	59	82
Open data % maximum score	NA	49%** 2021	42%	81%

Source: Eurostat, E-Government benchmark, market research, EU DESI 2022 (for EU average)

*Data for 2020 exist but due to changed methodology will not be used for comparison with 2021

**Calculated based on Open Data questionnaire sent to the Ministry of Information Society and Administration

North Macedonia scores very well on open data (49% compared to 42% for the WB). Additionally, on pre-filled forms, North Macedonia scores much better compared to the EU and WB averages (with a score of 73 points). 32% of internet users relies on e-government services, which is very close to the WB average of 35%. However, North Macedonia underperforms on the availability of digital public services for citizens, with a score of 36 compared to the WB average of 43. Availability of digital public services for businesses stands better compared to the WB average with the score of 61 points.

The strategy and the plan for the public sector reform are outlined in the Public Administration Reform Strategy 2018-2022⁴⁸ accompanied with the Action Plan 2018-2022. The strategy and action plan are focusing on the public administration reform and its digitalisation.

47 https://neighbourhood-enlargement.ec.europa.eu/north-macedonia-report-2022_en

48 https://mioa.gov.mk/sites/default/files/pbl_files/documents/strategies/par_strategy_2018-2022_final_en.pdf

In North Macedonia, the **e-services portal** is a digital services portal for citizens and businesses to access e-services. It has been upgraded and currently offers single-sign-on access to 151 e-services, information on 789 administrative services, and data from 1,288 public institutions.⁴⁹

North Macedonia has completed the implementation of its Open Data Strategy (2018-2020), with establishment of **Open Data Portal** with increasing number of available data - 324 as of February 2022, and improving its transparency and accountability as a result of increasing number of institutions publishing open data on the portal - 63 institutions as of February 2022.⁵⁰

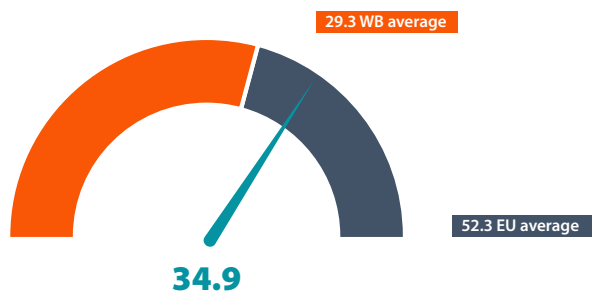
49 <https://www.itu.int/en/ITU-D/Regional-Presence/Europe/Documents/Events/2021/Regional%20Innovation%20Forum/NorthMacedonia.pdf>

50 SME Policy Index: Western Balkans and Turkey 2022: Assessing the Implementation of the Small Business Act for Europe

SERBIA

Serbia is a digital top performer in the WB region, with the total WB DESI 2022 score above the WB average.

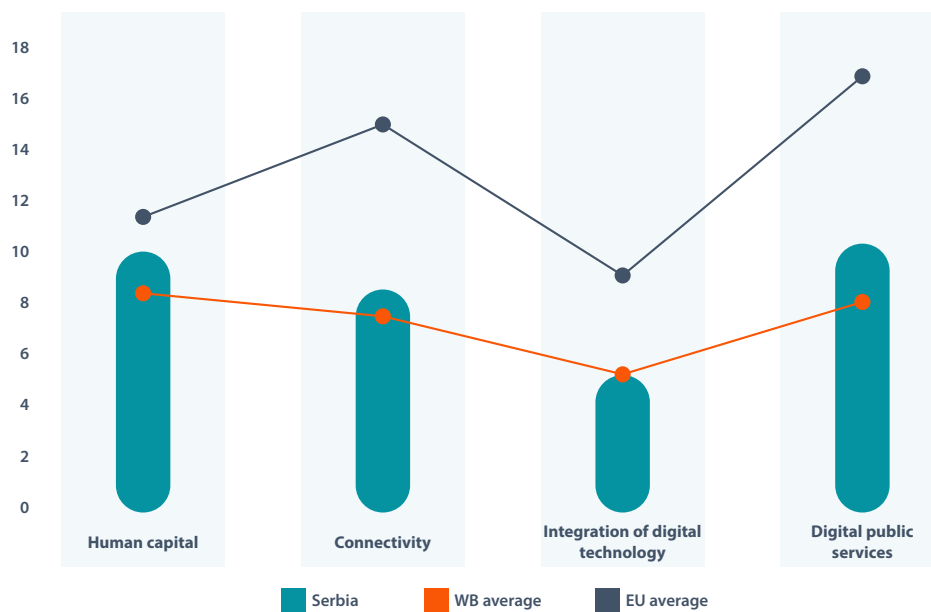
Figure 51 Total WB DESI 2022 (score 0-100), Serbia



Source: WB DESI calculation

Considering WB DESI 2022 dimensions, Serbia shows strong performance in all dimensions with scores above the WB averages.

Figure 52 WB DESI 2022 Dimensions (weighted score 0-100), Serbia



Source: WB DESI calculation

HUMAN CAPITAL

Indicators from 2020 and 2021 that are included in the Human capital dimension for calculating WB DESI for 2021 and 2022 are given in Table 21.

Table 21 Human capital indicators, Serbia

Indicator	Serbia		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
At least basic digital skills % individuals	NA*	41% 2021	35%	54%
Above basic digital skills % individuals	NA*	12% 2021	9%	27%
At least basic digital content creation skills % individuals	NA*	64% 2021	54%	66%
ICT specialists % employees	2.8% 2020	3.3% 2021	2.6%	4.5%
Female ICT specialists % ICT specialists	25% 2020	24% 2021	19%	19%
Enterprises providing ICT training % enterprises	29% 2019	16% 2020	14%	20%
ICT graduates % graduates	6.2% 2019	7.1% 2021	6.2%	3.9%

Source: Eurostat and Statistical Office of Serbia (RZS), EU DESI 2022 (for EU average)

*Data are available for 2019, but due to break in time series caused by methodological changes cannot be used for comparison with 2021

Serbia is one of the best performing WB economies in the Human capital dimension. It is placed at the top among WB economies when it comes to individuals with basic and above basic digital skills. Also, Serbia has the highest share of its population with at least basic digital content creation skills (64% compared to the WB average of 54%). 16% of Serbian enterprises provide ICT training to their employees. While this is slightly higher than the WB average, the share has sharply declined compared to 2019. The share of ICT specialists is above the WB average (3.3% versus 2.6% in the WB region) and there is also a higher share of female ICT specialists compared to WB and EU averages. With regards to the number of ICT graduates, Serbia performs markedly better than the EU average and has seen 15% growth in this area over the last two years.

Digital skills occupy a prominent place in the Serbian Strategy for Development of Digital Skills for the period 2020–2024⁵¹ whose overall objective is to improve the digital knowledge and skills of all citizens, including members of vulnerable social groups, in order to enable monitoring of the development of ICT technologies in all fields and to meet the needs of labour market. Specific objectives envisaged by the Strategy include improvement of digital competences in the education system, improvement of basic and advanced digital skills for all citizens, development of digital skills in relation to the needs of labour market and lifelong learning of ICT professionals. Implementation of the Strategy is envisaged through two action plans, the first Action Plan for the period 2021-2022 and the second Action Plan for the period 2023-2024.

51 <https://mtt.gov.rs/extfile/sr/718/Strategija%20razvoja%20digitalnih%20vestina%20u%20RS%20za%20period%202020-2024.pdf>

Serbia recently renewed the Strategy for Development of Information Society and Information Security 2021 – 2026⁵² which focuses on improvement of citizens' digital knowledge and skills, strengthening the capacities of public and private sector employees to use new technologies, and improvement of digital infrastructure in education institutions.

Furthermore, Industrial Policy Strategy 2021-2030⁵³ highlights the growing skills gap in Serbia and envisages a transition from a lower-skilled workforce cost leverage to a skills-based advantage since strengthening core skills and developing digital literacy will prove to be crucial in the shift to a skills-based economy in Serbia.

New Serbian National Strategy on Gender Equality (2021-2030)⁵⁴ targets and promotes women's entrepreneurship by prioritising economic empowerment of women. It also emphasises the need for a specific focus on areas where women are under-represented, such as green and circular, renewable energy, digital and knowledge economies.

CONNECTIVITY

Indicators from 2020 and 2021 that are included in the Connectivity dimension for calculating WB DESI for 2021 and 2022 are given in Table 22.

Table 22 Connectivity indicators, Serbia

Indicator	Serbia		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
Overall fixed broadband take-up % households	70% 2020	72% 2021	77%	78%
At least 100 Mbps fixed broadband take-up % households	19% 2020	26% 2021	21%	41%
At least 1 Gbps take-up % households	0.04% 2020	0.04% 2021	0.04%	8%
Fast broadband (NGA) coverage % households	77% 2020	74% 2021	73%	90%
Fixed Very High Capacity Network (VHCN) coverage % households	49% 2020	59% 2021	48%	70%
Fibre to the premises (FTTP) coverage % households	44% 2020	50% 2021	38%	50%
5G spectrum % of total harmonised 5G spectrum	0% 2020	0% 2021	0%	56%
5G coverage % populated areas	0% 2020	0% 2021	0%	66%
Mobile broadband take-up % individuals	95% 2020	96% 2021	82%	87%
Broadband Price Index Score (0-100)	NA	63** 2022	61	73

Source: RATEL, desk research, EU DESI 2022 (for EU average)

**Calculated based on desk research from 2022

52 <https://mtt.gov.rs/extfile/sr/35315/Information%20Society%20and%20InfoSec%20Strategy%202021-2026111.pdf>

53 <https://privreda.gov.rs/sites/default/files/documents/2021-08/Industrial-Policy-Strategy-2021-2030.pdf>

54 <https://www.rodnaravnopravnost.gov.rs/sites/default/files/2022-03/National%20Strategy%20for%20GE%202021-2030.pdf>

Serbia has the highest score in connectivity dimension in the WB region with the above WB average coverage of fast broadband (NGA), VHCN and FTTP networks. Serbia reported a fixed Very High-Capacity Network (VHCN) coverage of 59% of households, well above the WB average of 48%. FTTP coverage increases steadily and now is at 50% of homes passed, which is on the EU average, and notably higher than the WB average. However, this favourable fixed broadband coverage performance is not reflected in the overall fixed broadband uptake, as broadband penetration reached 72% of all households, which is below the WB average of 77%. In number of households having at least 100 Mbps broadband connection Serbia performs better with penetration of 26% (up from 19% in 2020) which is above the WB average of 21%. As in the whole WB region, the take-up of 1Gbps broadband is at a very low level.

When it comes to mobile connectivity, mobile broadband take-up reached the highest share in the WB region of 96% (compared to 82% of average in the WB region). While 4G coverage reached almost 99% of populated areas in 2021, currently there are no official plans about the timing for 5G spectrum allocation.

Considering Broadband Price Index, prices of broadband services are slightly lower compared to the WB average.

The Next Generation Broadband Connectivity for Rural Schools in White Zones project,⁵⁵ under implementation within the context of Western Balkans Investment Framework (WBIF), benefits from 88 million EUR in loans provided by the European Bank for Reconstruction and Development (EBRD) and more than 34 million EUR in grants. This project will enable development infrastructure and interconnection of the two operators' networks and schools in rural (white) zones. Schools will have fibre connectivity (at least 1 Gbps), while neighbouring households will have broadband connectivity of at least 30 Mbps.

Strategy for Development of New Generation Networks 2023,⁵⁶ adopted in 2018, defines measures to ensure broadband infrastructure development in Serbia. The Strategy promotes the use of cloud computing, Internet of Things, as well as a development of 5G technology. The document acknowledges the need of updating the regulatory framework necessary to support the development of 5G in Serbia.

INTEGRATION OF DIGITAL TECHNOLOGY

Indicators from 2020 and 2021 that are included in the Integration of digital technology dimension for calculating WB DESI for 2021 and 2022 are given in Table 23.

Table 23 Integration of digital technology indicators, Serbia

Indicator	Serbia		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
SMEs with at least basic level of digital intensity	NA*	42%	35%	55%
% SMEs		2021		
Electronic information sharing	29%	22%	24%	38%
% enterprises	2019	2021		
Social media	21%	16%	23%	29%
% enterprises	2019	2021		

55 <https://wbif.eu/project/PRJ-SRB-DII-005>

56 https://mtt.gov.rs/extfile/sr/789/2A_Strategija%20razvoja%20mreza%20-%202023.pdf

Indicator	Serbia		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
Big data % enterprises	2% 2020	4% 2021	7%	14%
Cloud % enterprises	NA*	22% 2021	16%	34%
Artificial intelligence % enterprises	NA	1% 2021	3%	8%
ICT for environmental sustainability % enterprises	NA	58% 2022	56%	66%
e-Invoices % enterprises	18% 2018	19% 2020	17%	32%
SMEs selling online % SMEs	27% 2020	26% 2021	21%	19%
e-Commerce turnover % SMEs	9% 2020	4% 2021	6%	12%
Selling online cross-border % SMEs	8% 2019	3% 2021	4%	9%

Source: Eurostat, Statistical Office of Serbia (RZS), RATEL, EU DESI 2022 (for EU average)

*Data for 2020 exist but due to break in time series caused by methodological changes cannot be used for comparison with 2021

Most Serbian enterprises still fail to capitalise on digital technology and the situation is even worse in 2021 since many indicators have lower values compared to 2020. Regarding basic digital technologies, 22% of enterprises had an enterprise resource planning system for electronic information sharing in 2021 (down from 29% in 2019), and 16% used social media (down from 21% in 2019). These figures are notably below the WB averages. The adoption rates for advanced digital technologies are also low: 1% of enterprises reported using AI, 4% big data. Much better situation is with the use of cloud computing, since 22% of enterprises reported to use cloud, which is above the WB average of 16%. 19% of enterprises send e-invoices suitable for automatic processing, which is slightly above the WB average of 17%. Additionally, 58% of enterprises reported that they managed to reduce their environmental footprint through the use of ICT.

In the SMEs segment, almost half of SMEs have at least basic level of digital intensity that is well above the WB average of 35%. 26% of SMEs engage in e-commerce, but only 3% sell online cross border (down from 8% in 2019). This also resulted in lower e-commerce turnover.

During 2020 and 2021 Serbia adopted several important strategic documents and their adequate implementation should enable and accelerate digital transformation in the business segment.

The overall goal of the Industrial Policy Strategy 2021-2030⁵⁷ is to raise competitiveness with a focus on industry-led development. There are five specific objectives and the first one includes improved digitalisation of the industry which will be achieved through promotion of industrial digital transformation, education programmes and advising companies on the implementation of digital solutions in industry, incentive support programmes to industrial digital transformation, increasing accessibility of financial instruments for industrial digitisation and innovation, and ensuring adequate level of digital security.

57 <https://privreda.gov.rs/sites/default/files/documents/2021-08/Industrial-Policy-Strategy-2021-2030.pdf>

The Smart Specialisation Strategy 2020-2027⁵⁸ recognises ICT industry as a priority since it is the fastest growing industry in Serbia and objectives set for ICT focus on supporting new solutions using big data, business analytics, cloud computing, IoT, embedded systems, AI, and blockchain technologies. Particularly important are ICT solutions that ought to be deployed to enhance public administration and strategic decision-making.

Newly adopted Strategy for Development of Information Society and Information Security in Serbia for 2021–2026⁵⁹ puts special focus on digitalisation of services and business operations in public and private sectors.

The Strategy for Development of Artificial Intelligence (2020-2025)⁶⁰ is launched with the general objective to facilitate the use of artificial intelligence in favour of economic growth, employment and improvement of the quality of life. The most notable achievements of the current Action Plan for implementation of the Strategy for Development of AI for 2020-22 are the creation of the Institute for artificial intelligence research and development, introduction of master educational programmes for artificial intelligence at three universities in Serbia and establishment of the public platform for artificial intelligence in the National Data Centre in Kragujevac in December 2021.

e-Invoicing is mandated in Serbia according to the new Law on Electronic Invoicing which prescribes that all companies subject to VAT, including public bodies and representatives of foreign companies, are obliged to exchange invoices electronically as of 1 January 2023.

There are also other initiatives that support digitalisation of enterprises in Serbia. One of them is the Speed2.0 initiative, which is a set of tests developed by the Centre for Digital Transformation on digital immunity, digital competitiveness and artificial intelligence readiness⁶¹ which enables companies to gain insight into the level of their readiness for digital transformation required in the business environment.

DIGITAL PUBLIC SERVICES

Indicators from 2020 and 2021 that are included in the Digital public services dimension for calculating WB DESI for 2021 and 2022 are given in Table 24.

Table 24 Digital public services indicators, Serbia

Indicator	Serbia		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
e-Government users % internet users	39% 2020	40% 2021	35%	65%
Pre-filled forms Score 0-100	NA*	79 2021	63	65
Digital public services for citizens Score 0-100	NA*	43 2021	43	75

58 https://pametnaspecijalizacija.mpn.gov.rs/wp-content/uploads/2021/06/Strategija-pametne-specijalizacije_EN_WEB.pdf

59 <https://mtt.gov.rs/extfile/sr/35315/Information%20Society%20and%20InfoSec%20Strategy%202021-2026111.pdf>

60 <https://www.srbija.gov.rs/tekst/en/149169/strategy-for-the-development-of-artificial-intelligence-in-the-republic-of-serbia-for-the-period-2020-2025.php>

61 <https://cdt.org.rs/programi>

Indicator	Serbia		WB DESI 2022	EU DESI 2022
	DESI 2021	DESI 2022		
Digital public services for businesses Score 0-100	NA*	68 2021	59	82
Open data % maximum score	NA*	57% 2021	42%	81%

Source: Eurostat, E-Government benchmark, RATEL, EU DESI 2022 (for EU average)

*Data for 2020 exist but due to methodological changes will not be used for comparison with 2021

Serbia ranks first amongst the WB economies in the Digital public services dimension. E-government services are used by 40% of Serbian internet users, well above the WB average of 35%. Serbia performs very well on pre-filled forms (79), and on providing online services for both citizens and businesses (scoring 43 and 68, compared to WB averages of 43 and 59, respectively). Serbia scores above the WB average on open data, too.

Serbia modernised its online **e-Uprava** portal for digital services in 2020. Over a million active users on e-Uprava can use more than 900 available electronic services of various public authorities. The e-Government Development Programme and accompanying Action Plan 2020–2022 outline plans for further development of e-government infrastructures and services. Namely, the programme aims to have 80% of digital services available through the e-Uprava portal, allowing for fully transactional services which can be completed fully on line. The programme takes a multi-layered approach to development of digital government, and its specific objectives include improving the government infrastructure for data interoperability and legal certainty for users, increasing the accessibility of digital government, and promoting the use of open data.

The availability of open data on the government **Open Data Portal** has increased to 2,060 in 2022,⁶² and the number of institutions publishing data on the portal increased to 110 in the same period. The criteria for open data publication, annotation and organisation to facilitate its reuse are defined and datasets are provided in machine-readable formats. Users can use the open data portal to interact with the publishing institutions if they have questions on a particular dataset.

62 <https://data.gov.rs/sr/dashboard/>

CONCLUSION

Identifying digital as a key priority, providing political support and putting in place a clear strategy, strong policies and targeted investments are essential components to accelerate digital transformation and put the WB region on fast track to achieve digital goals.

DESI is a suitable indicator to be used by the WB region to measure the progress in digital competitiveness and to compare digital performance among WB economies and the region's average performance with that of the EU. Individual DESI indicators show key areas where the performance and competitiveness of each WB economy could improve in relation to the performance of other WB economies and the WB region and EU.

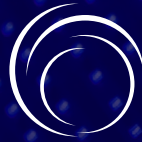
WB region has already clearly stated its ambition to use DESI to monitor progress in the main areas of digital transformation and to compare digital performance of WB economies within the WB region and with the EU.

The first step in this process is to ensure a reliable and continuous data collection process. All WB economies have already mandated authorities responsible for data collection process for calculating DESI indicators.

The main gaps in the available data have been identified for indicators that relate to the integration of digital technologies in enterprises collected through Eurostat. Other very important data limitation arises from the ad-hoc studies of the European Commission, since most studies do not include the WB region and data contained in the studies are not available through the WB institutions. Even EU studies which include WB region, do not include all WB economies (such as the e-Government benchmark study or the Open Data Maturity Report).

To fill the gaps in available data, separate market research and desk research processes need to be established for the WB region in order to collect all data necessary for WB DESI calculation.

Another important aspect in the process is synchronisation of data collection process with the latest EU DESI methodology. The EU methodology for calculating DESI, including the composition of DESI indicators, changes on an annual basis to reflect the latest technological and policy developments in the EU. To enable DESI comparison between the WB region and the EU, the methodology for WB DESI calculation needs to be based on the latest EU methodology. In this regard, it would be extremely useful to exchange information with the European Commission on the indicative timeframe for the publication of annual DESI methodology and the planned changes in the composition of individual DESI indicators.



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