Regional Cooperation Council

REPORT
ON THE STATE OF APPLICATION OF

DIGITAL ECONOMY SOCIETY INDEX (DESI)

IN WESTERN BALKAN ECONOMIES

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REPORT

ON THE STATE OF APPLICATION OF DIGITAL ECONOMY SOCIETY INDEX (DESI) IN WESTERN BALKAN ECONOMIES

Content

List of Abbreviations

3G	Third-generation technology
4G	Fourth-generation technology
5G	Fifth-generation technology
AEC	Agency for Electronic Communications (North Macedonia)
AIS	Agency for Information Society (Kosovo*)
AKEP	Agency for Electronic Communications and Post (Albania)
AL	Albania
ARKEP	Regulatory Authority of Electronic and Postal Communications (Kosovo*)
BA	Bosnia and Herzegovina
BCE	Broadband Coverage in Europe
BCO	Broadband Competence Office (North Macedonia)
BEREC	Body of European Regulators for Electronic Communications
BHAS	Agency for Statistics of Bosnia and Herzegovina
CDMA	Code-Division Multiple Access
CEFTA	Central European Free Trade Agreement
COCOM	Communication Committee Commission
CRM	European Commission Common Regional Market
DESI	Digital Economy and Society Index
DG CONNECT	Directorate-General for Communications Networks, Content and Technology
DOCSIS	Data Over Cable Service Interface Specifications
DSL	Digital Subscriber Lines
eDAMIS	Electronic Dataflow Administration and Management Information System
EDP	European Data Portal
EEA	European Economic Area
EFTA	European Free Trade Association
eID	Electronic identification
EKIP	Agency for Electronic Communications and Postal Services (Montenegro)
EU	European Union
EU-LFS	European Union – Labour Force Survey

* This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo declaration of independence.

Eurostat	Statistical office of the European Union
FIS	Institute for Statistics of Federation of Bosnia and Herzegovina
FTTP	Fiber to the premises
FWA	Fixed wireless access
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
HSPA	High Speed Packet Access
ICT	Information and Communications Technology
INSTAT	Institute of Statistics (Albania)
ISCED 2011	International Standard Classification of Education
ISCO	International Standard Classification of Occupations
ISP	Internet Service Provider
KAS	Kosovo* Agency of Statistics
LFS	Labour Force Survey
LTE	Long Term Evolution
MAP REA	Multi-annual Action Plan for a Regional Economic Area
Mbps	Megabits per second
ME	Montenegro
MISA	Ministry of Information Society and Administration (North Macedonia)
MK	North Macedonia
MNO	Mobile Network Operator
MONSTAT	Statistical Office of Montenegro
MPA	Ministry of Public Administration, Digital Society and Media (Montenegro)
MQ	Eurostat Model Questionnaire
MKT	Ministry of Transport and Communications of Bosnia and Herzegovina (Bosnia and Herzegovina)
NAIS	National Agency for Information Society (Albania)
NGA	Next Generation Access
NRA	National Regulatory Authority
NSI	National Statistical Institute
NUTS	Nomenclature of territorial units for statistics
OECD	Organisation for Economic Co-operation and Development
RAK	Communications Regulatory Agency (Bosnia and Herzegovina)
RATEL	Republic Agency for Electronic Communications and Postal Service (Serbia)

RCC	Regional Cooperation Council
RS	Serbia
RSIS	Institute for Statistics of Republika Srpska
SIM	Subscriber Identity Module
SMEs	Small and medium-sized enterprises
SORS	Statistical Office of the Republic of Serbia
SSO	State Statistical Office (North Macedonia)
UK	United Kingdom
UMTS	Universal mobile telecommunications system
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNESCO-UIS	UNESCO Institute for Statistics
UNU-EGOV	United Nations University Operating Unit on Policy-Driven Electronic Governance
UOE	UNESCO OECD Eurostat
USA	United States of America
USIM	Universal Subscriber Identity Module
VDSL	Very high bit rate digital subscriber line
VHCN	Very High Capacity Network
WB	Western Balkans
XK*	Kosovo*

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EXECUTIVE SUMMARY

This report was prepared for the Regional Cooperation Council by the United Nations University Operating Unit on Policy-Driven Electronic Governance (UNU-EGOV). The objective is to provide an overview of the state of application of the Digital Economy and Society Index (DESI) methodology in Western Balkans (WB), the availability of datasets for calculating all DESI indicators and identify the responsible institutions for data collection. The aim is to identify gaps and needs and to provide short-term recommendations to harmonise the domestic methodologies with the DESI and European Union (EU) methodologies.

The methodological aspects for data collection, indicator requirements, updates, corrections and normalisations are important elements and are defined in the DESI Methodologies each year. Four aspects of the DESI methodology are relevant for this assignment: indicator requirements, data sources; methodologies used for data collection; and frequency of collection for each indicator.

Findings

The analysis finds that all WB economies, and the responsible authorities, are aware of the importance of data collection and measuring the progress in the context of DESI. In that regard, the analysis finds that the WB economies can provide data for calculation for the majority of DESI indicators.

Currently, Serbia is the most prepared economy in WB able to provide data for all 37 DESI indicators, followed by Montenegro and North Macedonia (34 indicators), Albania (32 indicators), Kosovo* (31 indicators) and Bosnia and Herzegovina (27 indicators). In the context of the methodological alignment, Serbia is also the most prepared among the WB economies, able to provide methodologically aligned data for 36 of 37 DESI indicators followed by North Macedonia (32 indicators), Montenegro and Kosovo* (28 indicators), Albania and Bosnia and Herze-

govina (27 indicators). However, the analysis reveals that data for some indicators remain unavailable in five of the six WB economies and that all six economies have to further align their domestic methodologies with that of the EU acquis on Statistics.

In terms of mandates, all six WB economies have mandated authorities responsible for collection of data for DESI indicators. The Connectivity dimension is monitored by the WB National Regulatory Authorities (NRAs) and Broadband Competence Office (BCO), while National Statistical Institutes (NSIs) have the responsibility to collect data for the Human capital, Use of Internet services and Integration of digital technology. The ministries or agencies responsible for information society and digitisation are mandated to monitor developments in the Digital public service dimension.

However, the main challenge to ensuring data availability for all DESI indicators is the indicators that use data from the Commission ad hoc studies (Study on Broadband Coverage in Europe, Study on Mobile and Fixed Broadband Prices in Europe, European 5G Observatory Reports, eGovernment Benchmark Study and Open Data Maturity Study). This challenge applies to all six WB economies. As most of the WB economies are not included in these studies, the data availability for these indicators remains a challenge. Moreover, domestic data collection and calculations by each of the WB economies for some of these studies is not feasible due to their complexity, specific methodological requirements, and tools for collection (e.g. mystery shopper). To fill the gaps and improve the quality of data collection, the European Commission will need to provide additional technical and financial support to WB economies.

Recommendations

To address the findings of this Report, five general recommendations are made for improving

the level of preparation and data collection in the context of DESI.

1. RCC and the six WB economies should advocate the inclusion of all WB economies in the Study on Broadband Coverage in Europe, Study on Mobile and Fixed Broadband Prices in Europe, European 5G Observatory, eGovernment Benchmark Study and Open Data Maturity Study. If not feasible, the RCC and the six WB economies should advocate Commission to support preparation of the same or similar studies for the WB economies or the economies not included in the European studies.

2. Coordinated by RCC, a regional network for coordination and collaboration between the responsible authorities from the six WB economies should be established. The network will ensure stronger coordination and collaboration between the WB economies and will increase the knowledge-sharing for data collection and calculation for WB using DESI methodology. Where necessary, RCC will strive to provide technical assistance for data collection and calculation using the DESI methodology. Once established, RCC will be able to publish annual DESI reports for the WB based on data or reports obtained from WB economies with an indication of the data sources for each indicator.

3. NRAs and ministries or agencies for information society and digitisation should make all necessary internal preparations required for participation in the studies at the European or regional level. These include the Study on Broadband Coverage in Europe, Study on Mobile and Fixed Broadband Prices in Europe, European 5G Observatory, eGovernment Benchmark Study and Open Data Maturity Study. Until included each of the six WB economies should, where possible, commence the collection of data and calculate the scores using the methodologies applied in these ad hoc studies.

4. Domestically, the institutional capacities of all NSIs, NRAs, ministries or agencies for information society and digitisation need to be further strengthened. This includes increasing the capacities and skills of the existing staff and increasing the number of professionals that will (where necessary) work on the statistical operations, monitoring the global and European trends and changes in methodologies, and capacities to participate in complex studies on European or regional level.

5. Further strengthen the level of internal cooperation and collaboration between all relevant institutions in each of the WB economies. Formal or informal networks, intergovernmental bodies or forums have proven to be beneficial to increase local and international collaboration. Appropriated funding and capacity building should be provided.

In addition to these recommendations, a set of 48 economy-specific recommendations has been provided in the six WB economy reports, Annex 1 of this report.

1. INTRODUCTION

Globally, ICT has become a strategic tool and an enabler for public sector innovation and growth of productivity. Digital technologies enable governments to function both efficiently and effectively, and provide both more customer-oriented public services and public value, but also to radically transform the way the public sector operates.[1,2] The digital transformation brings about both socio-economic opportunities and challenges.[3,4]

To track the progress of the digital performance and digital competitiveness made by the European Union (EU) Member States, the European Commission (Commission) launched the Digital Economy and Society Index (DESI) in 2014. Divided into five dimensions, the DESI measures five key areas: connectivity, human capital, use of internet by individuals, integration of digital technologies by the business sector and digital public services. As candidates or potential candidates for EU membership, the Western Balkan (WB) economies are required to use DESI indicators for measurement of the progress made.

1.1. Background

The integration of WB economies[5] into the EU is an ongoing process supported by the EU's pol-icies for gradual integration. The EU-Western Balkan Summit Declaration in June 2003[6] confirmed the prospect of future EU membership for the WB economies once the European standards and criteria are met (i.e. the Acquis Communautaire). However, only Croatia (in 2013) has subsequently become a member of the EU, and other economies are still in the enlargement process. As of January 2021, Albania, Montenegro, North Macedonia and Serbia are candidates, while Bosnia and Herzegovina and Kosovo* are still potential candidates for EU membership.

Recognising the potential and benefits of the regional cooperation and digital transformation, the WB leaders endorsed the Multi-annual Action Plan for a Regional Economic Area (MAP REA)[7] in 2017, prepared and coordinated by RCC. One of the four components of MAP REA is the digital integration focused on the integration of WB economies into the pan-European digital market. This underlines the importance of the WB Digital Agenda to enhance regional cooperation in digital matters and accelerate integration into the European Digital Single Market. Specific focus areas for regional and EU-WB cooperation include ensuring a modern and robust digital infrastructure, improved regional connectivity, harmonised spectrum policies, coordinated roaming policies, increased cybersecurity and

1 Meyerhoff Nielsen, Morten and Jordanoski, Zoran. 2020. Digital transformation, governance and coordination models: A comparative study of Australia, Denmark and the Republic of Korea. In The 21st Annual International Conference on Digital Government Research (dg.o '20). Association for Computing Machinery, New York, NY, USA, 285–293. Source: https://dl.acm.org/doi/10.1145/3396956.3396987

2 Meyerhoff Nielsen, Morten and Millard, Jeremy (2020). Local context, global benchmarks: Recommendations for an adapted approach using the UN E-Government Development Index as an example. In The 21st Annual International Conference on Digital Government Research (dg.o '20). Association for Computing Machinery, New York, NY, USA, 253–260. Source: https://dl.acm.org/doi/10.1145/3396956.3396969

3 Manda, More Ickson & Backhouse, Judy. (2017). Digital transformation for inclusive growth in South Africa: challenges and opportunities in the 4th industrial revolution. Source: https://www.researchgate.net/publication/318395119_Digital_transformation_for_inclusive_growth_in_South_Africa_challenges_and_opportunities_in_the_4_th_industrial_revolution

4 Ossiannilsson, Ebba & Ioannides, Nicolas. (2017). Towards a Framework and Learning Methodology for Innovative Mobile Learning: A Theoretical Approach. 1-8. Source: https://dl.acm.org/doi/10.1145/3136907.3136929

5 This report examined Albania, Bosnia and Herzegovina, Kosovo*, Montenegro, North Macedonia and Serbia. For easier interpretation, the six economies are referred to as a Western Balkan (WB) economies through the report.

6 EU-Western Balkan Summit Declaration. 2003. Declaration, Thessaloniki, 21 June 2003. 10229/03 (Presse 163). Source: https://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressdata/en/misc/76291.pdf

7 Regional Cooperation Council (RCC). 2017. Consolidated Multi-annual Action Plan for a Regional Economic Area in the Western Balkans Six. 06072017 Version. Sarajevo, 16 March 2017. Source: https://www.rcc.int/download/docs/map_regional_economic_area_06_july_2017_clean_version.pdf/5511a1f61b9f7165f7d539bfd4df5bae.pdf

data protection, digital literacy and use of smart technologies.[8]

The Commission reinforced the enlargement perspective for WB in its Report "A credible enlargement perspective for and enhanced EU engagement with the Western Balkans".[9] Section five of the report is focused on digital agenda and indicates the need for launching a Digital Agenda for the WB. The report also notes that the Commission together with the WB will launch a Digital Agenda for the region and sets out five main areas to be covered by the Digital Agenda, including: lowering the cost of roaming based on a roadmap; deployment of broadband; development of eGovernment, eProcurement, eHealth, and digital skills; capacity building in trust and security, and digitalisation of industries; and adoption, implementation and enforcement of the acquis in the area of digital single market.[10]

As a result of the joint effort by the Commission and WB authorities, the Commission launched the Digital Agenda for the WB in June 2018 intending to support the transition of the region into a digital economy and bring the benefits of the digital transformation, such as faster economic growth, more jobs, and better services. The focus areas include: investing in broadband connectivity; increasing cybersecurity, trust and digitalisation of industry; strengthening the digital economy and society; and, boosting research and innovation.[11] These efforts are to be complemented by enhanced support for the adoption, implementation and enforcement of the acquis in the area of digital single market.

The implementation of the Digital Agenda foresees concrete actions by the EU and the WB economies. The Commission also highlighted the need for increased cooperation and collaboration between the Commission and WB economies, in which the RCC will continue to play a significant role.[12]

Motivated by the MAP REA achievements, the WB leaders endorsed the Common Regional Market (CRM) Action Plan 2021-2024 at the Berlin Process Summit held in November 2020, in Sofia.[13] One of the four target areas includes establishing a regional digital area to integrate the Western Balkans into the pan-European digital market. To achieve the goal, the Action Plan recognises the need for the six WB economies to remove obstacles to e-Commerce, introduce interoperability frameworks and standards for improved data exchange, mutual recognition of electronic identification schemes across the Western Balkans, and upgrade digital infrastructure. For that purpose, the Action Plan defines four priority areas (Digital infrastructure and connectivity, Digital skills and competence, Digital economy in the era of new ICT technologies, and Trust and security), further divided into 21 regional actions. A timetable, supporting organisations and expected results are associated with all regional actions. In order to ensure proper monitoring, RCC is tasked to develop an appropriate monitoring tool, including the establishment of a dynamic scorecard, designed to reflect changes in real-time; track the implementation of measures agreed in the CRM Action Plan; support policy reforms where needed and allow stakeholders, including citizens, to provide input on the effectiveness of steps taken.[14]

Another important aspect of digital transformation and integration is the monitoring and evaluation of the progress. The objective of the monitoring of digital transformation progress is to inform public policy-making as part of sustainable governance.[15]

In order to measure the progress of EU Member States in digital competitiveness, Commission launched DESI in 2014. Consequently, the use of DESI is necessary to measure the progress made by WB economies and reveal the priority action dimensions. To assist the WB economies to measure the progress, the Commission is carrying out a study to monitor the progress made towards compliance with the EU rules and regulations. The DESI indicators are used to allow comparison with the EU Member States. The three Study Reports aimed to "monitor progress made by the WB and Turkey" (2018[16], 2019[17] and 2020[18]) noted gaps in the performance between the EU Member States and WB economies. More significantly, the three studies noted that "complete datasets from the region for all DESI dimensions are currently missing, and therefore integration with the EU DESI can only take place progressively as the relevant WB authorities are able to provide the full datasets, in accordance with the EU acquis on statistics, where applicable."[19]

The obligation for ensuring reliable data aligned with EU rules and methodologies is part of the enlargement process. Specifically, Chapter 18 which specifies that statistics requires the existence of a statistical infrastructure while the acquis covers methodology, classifications, and procedures for data collection in various areas. This alignment is particularly important as the statistics form a significant component of other chapters as it allows screening and monitoring of the progress. According to the Commission October 2020 reports,[20] Albania, Montenegro, North Macedonia, and Serbia are moderately prepared, while Kosovo* has some level of preparation, and Bosnia and Herzegovina is at the early stage of preparations in the area of statistics.

Western Balkan economies have recognised the need to monitor digital transformation and progress towards compliance with the EU acquis for electronic communications and information society. By signing the Conclusions at the Digital Summit in Belgrade, they have committed to work towards setting a commonly agreed baseline and monitoring progress in the main areas of the digital transformation, including through the collection of data to benchmark Western Balkan economies using DESI. Recognising the importance of progress monitoring, the CRM Action Plan defines the need to undertake regional activities to improve availability, analysis and monitoring of high-quality digital economy statistics, building on EU's DESI and ITU's ICT Development Index. Expected results include: progress regarding regional digital competitiveness tracked; priority areas for data collection to calculate DESI indicators identified; and use of data collection for reporting purpose enhanced.

8   Ibid.

9   European Commission. 2018. A credible enlargement perspective for and enhanced EU engagement with the Western Balkans COM (2018) 65 final. Source: https://ec.europa.eu/commission/sites/beta-political/files/communication-credible-enlargement-perspective-western-balkans_en.pdf

10   Ibid.

11   European Commission. 2018. Press release: European Commission launches Digital Agenda for the Western Balkans. Brussels, 25 June 2018. Source: https://ec.europa.eu/commission/presscorner/detail/en/IP_18_4242

12   European Commission. 2018. Commission Staff Working Document: Measures in support of a Digital Agenda for the Western Balkans. Brussels, 22.6.2018. SWD (2018) 360 final. Source: https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/swd_measures_in_support_of_a_digital_agenda_for_the_western_balkans.pdf

13   RCC. 2020. Common Regional Marked. Source: https://www.rcc.int/pages/143/common-regional-market

14   Ibid.

15   Boulanger, Paul-Marie. (2008). Sustainable development indicators: A scientific challenge, a democratic issue. Sapiens. Source: https://journals.openedition.org/sapiens/166

16   European Commission. 2018. Monitor Progress made by the WB and Turkey. Smart 2016/2024. Source: https://op.europa.eu/en/publication-detail/-/publication/2e0e1320-5118-11e9-a8ed-01aa75ed71a1

17   European Commission. 2019. Monitor Progress made by the WB and Turkey. 2019 Follow-up Study Report. Smart 2016/2024. Source: https://op.europa.eu/fr/publication-detail/-/publication/a54e990d-1fb3-11ea-95ab-01aa75e-d71a1/language-en

18   European Commission. 2020. Monitor Progress made by the WB and Turkey. Smart 2016/2024. Source: https://op.europa.eu/en/publication-detail/-/publication/baf459a2-6698-11eb-aeb5-01aa75ed71a1/language-en/format-PDF/source-192754717

19   Ibid, European Commission 2018, 2019 and 2020.

20   European Commission. 2020. Country Reports 2020. Albania 2020 Report SWD(2020) 354 final. Montenegro 2020 Report SWD(2020) 353 final. North Macedonia 2020 Report SWD(2020) 351 final. Serbia 2020 Report SWD(2020) 352 final. Kosovo* 2020 Report SWD(2020) 356 final. Bosnia and Herzegovina 2020 Report SWD(2020) 350 final. Source: https://ec.europa.eu/neighbourhood-enlargement/countries/package_en

1.2. Objectives of the report

The overall objective of the report is to provide an analysis of the application of DESI indicators in the individual WB economies. The report will assist the RCC and the responsible authorities in the WB economies in their process of harmonisation of data collection for all DESI indicators, and thus ensure reliable monitoring and evaluation, aligned to the DESI methodology, of the performance in digital competitiveness in all WB economies.

More specifically, this report aims to establish the foundations of the DESI methodology in the six WB economies. This includes identification and analysis of associated indicators, data sources, methodologies used for data collection, frequency of data collection, and all other relevant statistical operations.

To assess the state of application of DESI indicators in all WB economies, this report maps the available datasets for individual WB economies for all DESI indicators, and reviews domestic methodologies used for data collection in the WB region and assesses their alignment with DESI and other EU methodologies. As part of the assessment, the report analyses the awareness of relevant WB authorities of the importance to align their methodologies and collect the full datasets required for the calculation of DESI. The report also assesses readiness of the relevant WB authorities to align their data collection methods with those of the DESI.

Lastly, this report provides an analysis of the identified gaps, needs and challenges faced by the relevant WB authorities. In doing so, the report provides short-term recommendations to the relevant WB authorities on how to align their methodologies and work to enable the collection, in accordance with the EU rules on statistics, of the full data sets required for the DESI calculation.

1.3. Approach and Methodology

In line with the overall and specific objectives of the report, the core activities were grouped into three phases:

1. Desk review;

2. Stakeholder consultations; and,

3. Gap analysis.

The desk review aimed at identifying the relevant data and methodologies used for each DESI indicator in each of the WB economies. This includes identifying the entity responsible for collecting the data used to calculate DESI indicators. A review of documents relevant to the assignment was also carried out. Documents included relevant EU and domestic WB policies, regulations, guidelines, strategies, reports and other documents relevant for the Information and Communications Technology (ICT) sector in general, and more specifically, the acquis on statistics and application and measurement of DESI indicators. The analysis of the relevant portals, websites, documents was done in the official languages of each of the WB economies, i.e. Albanian (for Albania and Kosovo*), Bosnian (Bosnia and Herzegovina) Croatian (Bosnia and Herzegovina), Macedonian (North Macedonia), Montenegrin (Montenegro), and Serbian (Serbia, Bosnia and Herzegovina and Kosovo*). The overall aim of the review was to gain a deep understanding of the current availability and use of DESI indicators in the WB economies in terms of:

» Current framework for supporting the measurement of DESI indicators.

» Institutional framework, processes and mechanisms in place in all WB economies;

» Identifying main institutions and stakeholders responsible for data collection in each WB economy;

» Identifying any shortcomings and gaps in data collection and methodological misalignments in each WB economy;

» Proposing potential short-term interventions to improve the gaps identified.

Based on the findings of the desk review and identified stakeholders (Annex 2) in the WB economies, the stakeholder consultations phase was divided into two specific activities. The first activity included development and dissemination of an online questionnaire which was sent to all relevant institutions in the WB economies (Annex 3). The aim was to identify and confirm the institutions responsible for data collection in each of the WB economies, the data collected, the degree of alignment with DESI methodology, the frequency of data collection, and other relevant information. All institutions were invited to answer several multiple-choice questions related to each of the DESI indicators.[21] Questions relevant to all 37 DESI indicators were:

» Is your institution responsible for data collection for this indicator?

» Does your institution collect data for this indicator?

» Is your methodology aligned with DESI Methodology?

» What is the frequency of data collection?

For the first three questions, respondents had the opportunity to choose between "yes", "no" and "unsure". The option "unsure" was inserted as a possible alternative in case mandates for data collection were unclear, issues surrounding the definition of indicators, or the respondent's inability to confirm the level of alignment of the domestic methodology with DESI and EU methodologies.

The invited institutions were asked to add links to the methodologies used and datasets collected (if they are publicly available), and to provide additional comments where deemed necessary by the respondent.

The questionnaire was distributed to the following institutions:

» **Albania:**

♦ Agency for Electronic Communications and Post (AKEP);

♦ Institute of Statistics (INSTAT);

♦ Ministry of Infrastructure and Energy; and

♦ National Agency for Information Society (NAIS).

» **Bosnia and Herzegovina:**

♦ Agency for Statistics of Bosnia and Herzegovina (BHAS);

♦ Communications Regulatory Agency (RAK);

♦ Council of Ministers of Bosnia and Herzegovina - Department for Maintenance and Development of e-Business and e-Government; and

♦ Ministry of Transport and Communications (MKT).

» **Kosovo***

♦ Agency for Information Society (AIS).

♦ Kosovo* Agency of Statistics (KAS);

♦ Ministry of Economy;

♦ Ministry of Education; and

♦ Regulatory Authority of Electronic and Postal Communications (ARKEP).

» **Montenegro:**

♦ Agency for Electronic Communications and Postal Services (EKIP).

♦ Ministry of Public Administration, Digital Society and Media; and

♦ Statistical Office of Montenegro (MONSTAT).

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21   With limited resource and the time available for the project, the questionnaire was distributed in English only.

» **North Macedonia:**

♦ Agency for Electronic Communications (AEC);

♦ Broadband Competence Office (BCO);

♦ Ministry of Information Society and Administration (MISA); and

♦ State Statistical Office (SSO).

» **Serbia:**

♦ Office for Information Technologies and eGovernment;

♦ Republic Agency for Electronic Communications and Postal Service (RATEL); and

♦ Statistical Office of the Republic of Serbia (SORS).

As a follow-up, the second activity of the stakeholder consultations phase included individual and group interviews. It was divided into 15 sessions, one per institution. The aim was to validate and complement the findings of the Desk Review and data collected through the questionnaires. Special focus was given to ascertain the level of awareness of the institutions of the importance of DESI index, institutional readiness and capacities to participate in the data collection process for all indicators, and any other challenges which the institutions are facing in this respect.

The gap analysis phase was based on the findings of the desk review and stakeholder consultations phases and mapped the availability of DESI indicators and methodologies in each WB economy and detected any gaps in data or misalignments with the EU methodologies. The objective was to provide an economy-specific assessment of the state of application of DESI indicators, including short-term recommendations to enable and facilitate application of DESI index in all WB economies.

As the most recent DESI results, published in 2020, are based on the data collected and reported annually or bi-annually (i.e. in 2018 and 2019), this assessment focused on the availability of data and application of DESI Methodology in WB economies for the same years (i.e. 2018 and 2019). Where available, an assessment of 2020 data was included to align with the timeliness of data collection and reporting. The matrix used for the findings of assessment is colour-based as shown in Table 1.

🟢	Data available and fully aligned with DESI Methodology
🟡	Data available but not fully aligned with DESI Methodology
🔴	Data not available

Table 1: Evaluation of each DESI Indicator (Authors, 2021)

When assessing the data availability for each indicator, the **green colour** is assigned to all indicators for which data is available and fully aligned with DESI Methodology and/or other relevant EU methodologies. This data is useful for DESI and can be used to compare the performance of the assessed economy with its WB peers and EU Member States.

The **yellow colour** is assigned to all indicators for which some data is available but there is a degree of methodological misalignments with DESI Methodology and/or other relevant EU methodologies identified. The methodologies applied for the data collection associated with these indicators need to be revised in order to be fully aligned with DESI Methodology and/or other EU methodologies.

The **red colour** is assigned to all indicators for which data is not available.

To ascertain whether data is available or not, it must appear in an official database or officially published source databases (e.g. Eurostat, domestic statistics database, annual reports, or other sources). To ascertain the degree of methodological alignment analysis of the domestic methodologies used for data collection and the official methodologies applied for each DESI indicator was carried out.

The final assessment evaluates the readiness of each of the WB economies to provide the methodologically aligned data for all DESI indicators. The readiness assessment is made based on the following scale of data available and fully aligned with DESI Methodology:

» Highly prepared: 76-100%

» Moderately prepared: 51-75%

» Some level of preparation: 26-50%

» Early-stage of preparation: 0-25%

The Digital Economy and Society Index is a composite index that summarises relevant indicators on Europe's digital performance and tracks the evolution of EU Member States in digital competitiveness. It is used by the Commission to monitor the Member States' progress since 2014. Four main types of analysis are possible through DESI:

» General performance assessment: performance assessment of an individual Member State through their general index score and the scores of the main DESI dimensions.

» Zooming-in: to identify the areas where Member State can improve its performance by analysing scores of all DESI sub-dimensions and indicators.

» Follow-up: to monitor and assess the progress over time.

» Comparative analysis: to compare the Member States and cluster them according to their index scores and similar stages of digital development in order to identify the policy areas that need improvement.[23]

2.1. Structure of the DESI

DESI is made up of five dimensions, each of them measuring different aspects of the digital society. All five dimensions reflect the principal policies relevant to the digital economy and society. The structure of DESI is presented in Table 2.

2. DIGITAL ECONOMY AND SOCIETY INDEX

Connectivity	Fixed broadband take-up, fixed broadband coverage, mobile broadband and broadband prices
Human capital	Internet user skills and advanced skills
Use of internet services	Citizens' use of internet services and online transactions
Integration of digital technology	Business digitisation and e-commerce
Digital public services	e-Government

Table 2: Structure of the DESI (Source: DESI Methodological Note 2020)

The five dimensions are further divided into 12 sub-dimensions and 37 indicators. Each of the dimensions, sub-dimensions and indicators have different weight in the final DESI score, which also reflects the current EU's digital policy.

Dimension 1: Connectivity

The existence of modern and robust digital infrastructure is the main precondition for any large scale digital transformation of governments, economy, and society in general. The access and use of a fast and reliable broadband connection are necessary to enable online delivery of the key economic and social services. Affordability is also another important factor for increasing broadband take-up.

All these factors have also proven crucial during the pandemic. The crisis showed the importance of the quality of digital infrastructure as all networks have faced increased demand. Reflecting the EU's digital policy, the connectivity represents 25% of the total weighted score of DESI. It measures up the fixed and mobile broadband coverage, take-up and affordability. The Connectivity dimension is composed of four sub-dimensions, each of them further divided into eight indicators in total, as shown in Table 3.

Sub-dimension	Indicator
1a Fixed broadband take-up	1a1 Overall fixed broadband take-up
	1a2 At least 100 Mbps fixed broadband take-up
1b Fixed broadband coverage	1b1 Fast broadband (NGA) coverage
	1b2 Fixed Very High Capacity Network (VHCN) coverage
1c Mobile broadband	1c1 4G coverage
	1c2 Mobile broadband take-up
	1c3 5G readiness
1d Broadband price index	1d1 Broadband price index

Table 3: Connectivity sub-dimensions and indicators (Source: DESI Methodological Note 2020)

Dimension 2: Human Capital

Human capital and digital skills are also key to any digital society and digital transformation. Two elements are essential. First, the number of ICT specialists and ICT graduates annually that shows the human resources potential of every economy regarding further development of digital society. Second, the digital skills of all citizens and non-ICT professionals enable the take-up of internet use, digital public services and the integration of digital technologies.

The current pandemic showed that the digital skills of non-ICT professionals in public administration (e.g. teachers, health workers, civil servants, etc.) are essential for business continuity respecting the physical distance recommendations, as well as the integration of new technologies (e.g. distance learning, telemedicine, teleworking, etc.). By comparison, the basic and above basic digital and software skills of citizens have enabled easier adaptation of various digital tools for access to information and services online.

Recognised as an essential enabler of a successful digital economy and society in the EU, the Human Capital dimension is weighted at 25% in the total DESI score. It measures up the internet user skills (all individuals aged 16-74) and the advanced skills and development of ICT specialists and graduates. The human capital dimension is composed of two sub-dimensions, each of them further divided into six indicators, as shown in Table 4.

Sub-dimension	Indicator
2a Internet user skills	2a1 At least basic digital skills
	2a2 Above basic digital skills
	2a3 At least basic software skills
2b Advanced skills and development	2b1 ICT specialists
	2b2 Female ICT specialists
	2b3 ICT graduates

Table 4: Human capital sub-dimensions and indicators (Source: DESI Methodological Note 2020)

Dimension 3: Use of internet services

The internet penetration and frequency of use is another key factor for digital society development. The number of people who never used the internet is on a downwards trajectory. The frequency of internet use, activities online and the transactions made are important elements for the measurement of EU Member States progress and also of the actual benefits of the ICT and technology investments made.

The internet use by citizens (defined as all citizens and residents within the EU) is weighted at 15% of the total DESI score. It is composed of three sub-dimensions, each of them further divided into eleven indicators, as presented in Table 5.

Sub-dimension	Indicator
3a Internet use	3a1 People who never used the internet
	3a2 Internet users
3b Activities online	3b1 News
	3b2 Music, videos and games
	3b3 Video on demand
	3b4 Video calls
	3b5 Social networks
	3b6 Doing an online course
3c Transactions	3c1 Banking
	3c2 Shopping
	3c3 Selling online

Table 5: Use of internet services sub-dimensions and indicators (Source: DESI Methodological Note 2020)

Dimension 4: Integration of digital technology

The integration of digital technology in small and medium-sized enterprises (SMEs) (including microenterprises) is an important aspect of digital transformation of the economy. Businesses are constantly adopting new technologies and providing information about their products and services online. Online transactions and selling online cross-border in another EU Member State are also important for the integration and adoption of digital technologies by SMEs.

The current pandemic has nonetheless shown that SMEs ability to adapt by reducing physical interaction has not been as easy as for governments and large enterprises. A large number of SMEs remained closed during restrictions and lockdowns without being able to offer their products and services online. Further research is needed to identify the underlying reasons for the limited capacities of SMEs to adapt to the current pandemic as it will serve as an indicator of their ability to embrace IT and technology in the medium- to long-term.

As one of the important elements of EU's digital policy, Integration of Digital Technology dimension weight 20% in the total DESI score. It is composed of two sub-dimensions, each of them further divided into seven indicators, as shown in Table 6.

Sub-dimension	Indicator
4a Business digitisation	4a1 Electronic information sharing
	4a2 Social media
	4a3 Big data
	4a4 Cloud
4b e-Commerce	4b1 SMEs selling online
	4b2 e-Commerce turnover
	4b3 Selling online cross-border

Table 6: Integration of digital technology sub-dimensions and indicators (Source: DESI Methodological Note 2020)

Dimension 5: Digital public services

Digital transformation of public service production and delivery is an important element of public sector modernisation and digitisation. The availability of key eGovernment has enabled interoperability, one-stop-shop and specialised portals and platforms, well-developed portfolios of online services for citizens and business, and ha increased take-up of online services over the years across the EU. The use of new emerging technologies for service delivery (e.g. AI, Big data, Blockchain, etc.) will also increase the qual-ity, efficiency and effectiveness of government services.

In that regard, the current pandemic shows the benefits of economies with well-established digital infrastructure and functional eGovernment ecosystem. This measurement is important to monitor the change of users' behaviours and authorities and serve as an indicator of the benefits generated by ICT investments. Digital public service dimension is weighted at 15% of the total DESI score It is composed of one sub-dimension, further divided into five indicators, as shown in Table 7.

Sub-dimension	Indicator
	5a1 e-Government users
	5a2 Pre-filled forms
5a e-Government	5a3 Online service completion
	5a4 Digital public services for businesses
	5a5 Open data

Table 7: Digital public services sub-dimensions and indicators (Source: DESI Methodological Note 2020)

2.2. Methodological considerations

The methodological aspects for data collection, indicator requirements, updates, corrections and normalisations are defined in the DESI Methodological Manuals each year. Four aspects of the DESI methodology are relevant for this assignment: indicator requirements; data sources; methodologies used for data collection; and frequency of collection for each indicator.

2.2.1. Indicator Requirements

DESI Methodological Manual 2020 defines that all indicators must comply with the following requirements:

» Must be collected regularly. In order to fulfil the monitoring function, the indicators used in the index must be collected ideally on a yearly basis (or at least with a pre-defined regularity).

» Must be relevant for a policy area of interest. All indicators in the index must be accepted as relevant metrics in their specific policy areas.

» Must not be redundant. The index should not contain redundant indicators, either statistically or in terms of interpretation.[23]

Following these conditions, all WB economies must align their domestic regulations and methodologies in order to ensure the collection of data for all DESI indicators on regular basis.

2.2.2. Data Sources and Methodologies

The issue of data sources and methodologies used for each DESI indicator was detected as one of the most challenging issues for WB authorities. Although strong institutional will and readiness to collect data for all indicators are present, data collection for some indicators remains challenging for all economies. As the aim of this report is to assist the various WB authorities to harmonise their domestic processes and methodologies for data collection, it is important to reveal all data sources for all DESI indicators. Table 8 summarises the sources of all DESI indicators.

Indicator	Source
1a1 Overall fixed broadband take-up	Survey on ICT usage in households and by individuals
1a2 At least 100 Mbps fixed broadband take-up	Communication Committee (COCOM) based on the Survey on ICT usage in households and by individuals
1b1 Fast broadband (NGA) coverage	Study on Broadband Coverage in Europe
1b2 Fixed Very High Capacity Network (VHCN) coverage	Study on Broadband Coverage in Europe
1c1 4G coverage	
1c2 Mobile broadband take-up	COCOM based on the Survey on ICT usage in households and by individuals
1c3 5G readiness	COCOM based on European 5G Observatory
1d1 Broadband price index	Study on Mobile and Fixed Broadband Prices in Europe
2a1 At least basic digital skills	Survey on ICT usage in households and by individuals
2a2 Above basic digital skills	
2a3 At least basic software skills	
2b1 ICT specialists	EU-Labour Force Survey (EU-LFS)
2b2 Female ICT specialists	
2b3 ICT graduates	UNESCO OECD Eurostat (UOE) joint data collection on education
3a1 People who have never used the internet	Survey on ICT usage in households and by individuals
3a2 Internet users	
3b1 News	
3b2 Music, videos and games	
3b3 Video on demand	
3b4 Video calls	
3b5 Social networks	
3b6 Doing an online course	
3c1 Banking	
3c2 Shopping	
3c3 Selling online	
4a1 Electronic information sharing	Survey on ICT Usage in enterprises
4a2 Social media	
4a3 Big data[25]	
4a4 Cloud	
4b1 SMEs selling online	
4b2 e-Commerce turnover	
4b3 Selling online cross-border	

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23 Ibid.

24 Last year of collection or the Big data indicator (4a3) as defined in DESI 2020 Methodology was 2018. Since 2019, Eurostat replaced this indicator with other indicators related to Big data.

Indicator	Source
5a1 e-Government users	Survey on ICT usage in households and by individuals
5a2 Pre-filled forms	
5a3 Online service completion	eGovernment Benchmark
5a4 Digital public services for businesses	
5a5 Open data	Open Data Maturity Study

Table 8: DESI indicators sources (Source: Adjusted by Authors, DESI 2020 Methodological Note, 2021)

All DESI indicators are derived from different statistical operations, each of them using different methodologies. Generally, data sources for DESI indicators can be divided into two categories:

» Data collected by national authorities (28 indicators) and

» Data collected by third parties (9 indicators) through ad hoc studies.

2.2.2.1. Data collected by national authorities

Most of DESI indicators (28) are based on data collected by national authorities. However, not all indicators are derived from a single statistical operation. Rather, the indicators are derived from five separate statistical operations, that is:

a.) ICT usage in households and by individuals survey (16 indicators);

b.) ICT usage in enterprises survey (7 indicators);

c.) Communication Committee (2 indicators);

d.) Labour Force Survey (2 indicators);

e.) UNESCO OECD Eurostat (UOE) joint data collection on education (1 indicator).

a) ICT usage in households and by individuals

Sixteen (16) DESI indicators have their data derived directly from the ICT usage in households and by individuals survey. Data for these indicators are collected annually by the National Statistical Institutes (NSI) and are based on Eurostat's annual Model Questionnaires (MQs) on ICT usage in households and by individuals.[25] The questionnaire is adapted every year based on the evolving situation of technologies and needs.[26]

The survey is conducted using the Eurostat Methodological Manual[27] which provides guidelines and standards for implementation in the EU Member States. Data are collected in the first quarter of the year, generally through telephone or face-to-face interviews. The NSIs reports the data to Eurostat in the fourth quarter of the same year. Before publishing, reported data are verified and compared across economies by Eurostat.

The reporting NSI may be asked to verify and revise their results if any data inconsistencies are found. Usually, the results are published at the end of the reporting year or the beginning of the next.

The full list of indicators derived from the ICT usage in households and by individuals survey is presented in Table 9.

Dimension	Indicator
Connectivity	1a1 Overall fixed broadband take-up
Human Capital	2a1 At least basic digital skills
	2a2 Above basic digital skills
	2a3 At least basic software skills
Use of Internet Services	3a1 People who have never used the internet
	3a2 Internet users
	3b1 News
	3b2 Music, videos and games
	3b3 Video on demand
	3b4 Video calls
	3b5 Social networks
	3b6 Doing an online course
	3c1 Banking
	3c2 Shopping
	3c3 Selling online
Digital Public Services	5a1 e-Government users

Table 9: Indicators derived from the ICT usage in households and by individuals survey (Source: Authors, 2021)

b) ICT usage in enterprises

All seven (7) indicators in the Integration of Digital Technology dimension are extracted from the ICT usage in enterprises survey. Data for these indicators are collected annually by the NSIs or ministries and are based on the annual Eurostat MQs on ICT usage and e-commerce in enterprises.[28] The MQ (modules and questions) changes every year in order to measure the development in the usage of ICT and evolving technology and needs.[29]

The survey is conducted using the Eurostat Methodological Manual[30] which provides guidelines and standards for implementation in the EU Member States. Data are generally collected through online web questionnaires, usually in the first half of the year. The reference periods are determined in the MQ. For some questions, it refers to the current situation during the survey period, while for other it refers to the previous year. Data are reported by national authorities to Eurostat in the fourth quarter of the survey year

and are subject to verification and comparison across economies by Eurostat. Usually, results are published in December of the same year or in January of the following year.

The full list of indicators derived from the ICT usage in enterprises survey is presented in Table 10.

25   European Commission. 2020. Eurostat annual model questionnaires. Source: https://circabc.europa.eu/faces/jsp/extension/wai/navigation/container.jsp?FormPrincipal:_idcl=FormPrincipal:libraryContentList:pager&page=0&FormPrincipal_SUBMIT=1&org.apache.myfaces.trinidad.faces.STATE=DUMMY

26   Eurostat. 2020. Metadata: ICT usage in households and by individuals (isoc_i). Source: https://ec.europa.eu/eurostat/cache/metadata/en/isoc_i_esms.htm

27   European Commission. 2020. Eurostat Methodological Manuals. Source: https://circabc.europa.eu/faces/jsp/extension/wai/navigation/container.jsp

28   Ibid. Eurostat annual model questionnaires.

29   Eurostat. 2020. Metadata: ICT usage in enterprises (isoc_e). Source: https://ec.europa.eu/eurostat/cache/metadata/en/isoc_e_esms.htm#data_rev1593032325661

30   Ibid. European Commission. 2020. Eurostat Methodological Manuals.

Dimension	Indicator
Use of Internet Services	4a1 Electronic information sharing
	4a2 Social media
	4a3 Big data
	4a4 Cloud
	4b1 SMEs selling online
	4b2 e-Commerce turnover
	4b3 Selling online cross-border

Table 10: Indicators derived from the ICT usage in enterprises survey (Source: Authors, 2021)

c) Communication Committee

Two (2) indicators use data from the Communications Committee. Established by Directive 2002/21/EC in 2002 (Framework Directive), COCOM is a committee composed of representatives of EU Member States to assist the Commission in executing its powers. European Economic Area (EEA) countries[32] and EU candidate countries[33] participate in COCOM meetings as observers. The COCOM usually meets five times per year.

One of the roles of COCOM is to collect data for the Digital Agenda Scoreboard[34] for all EU Member States. Data for electronic communica-tions market indicators (except for interconnec-tion charges and roaming prices) are collected from national ministries and regulatory authori-ties by the Directorate-General for Communica-tions Networks, Content and Technology (DG CONNECT) using the COCOM definitions and methodology for Electronic communications market indicators.[35] Data for the EU Member States for both indicators are collected every six months using a spreadsheet questionnaire.

The full list of indicators derived from the CO-COM data collection on broadband is presented in Table 11.

Dimension	Indicator
Connectivity	1a2 At least 100 Mbps fixed broadband take-up
	1c2 Mobile broadband take-up

Table 11: Indicators derived from the COCOM data collection on broadband (Source: Authors, 2021)

The indicator monitoring "at least 100 Mbps fixed broadband take-up" is calculated based on the fixed broadband subscriptions (both residen-tial and business) for different speed categories (data derived from Eurostat and the data re-ported by the National Regulatory Authorities (NRAs) (collected from telecom operators) to the COCOM).[36] It is calculated by multiplying the share of at least 100 Mbps subscriptions with the fixed broadband household penetration.[36]

For "1c2 Mobile broadband take-up" indicator, COCOM uses the following definition for "mo-bile broadband":

"Mobile broadband refers to third generation technologies (3G) and higher speed mobile technologies (i.e. HSPA or LTE), while exclud-ing GSM/GPRS technologies. Retail access should be reported. In the case of UMTS the unit of reference is SIM/USIM cards (includ-ing modem/dongles). For the CDMA standard, the unit of measurement should be the num-ber of User Equipment."[37]

For the purpose of 1c2 indicator calculation, COCOM reports the total number of SIMs for the following categories:

» Number of subscriptions with actual voice usage which made a mobile Internet connec-tion in the last 90 days through a standard mobile subscription.[38]

» Number of subscriptions without actual voice usage to dedicated data services over a mobile network which are purchased sep-arately from voice services as a stand-alone service, i.e. excluding mobile handset users.[39]

» Number of subscriptions with actual voice usage to dedicated data services over a mo-bile network which are purchased separately from voice services as an add-on data pack-age to voice service which require an addi-tional subscription.[40]

d) Labour Force Survey

Two (2) indicators have their data derived from the EU Labour Force Survey (EU-LFS). In the context of the Human Capital dimension, the focus is on ICT specialists employment, and the level of participation of women in the ICT sector has been added. The datasets are constructed using a secondary statistical analysis approach. Both the ICT specialists, and Female ICT special-ists indicators are based on EU-LFS microdata.

The EU-LFS is designed as a continuous quarter-ly survey based on the EU-LFS Methodology.[41] Data for the main indicators are released in line with a pre-defined quarterly release calendar, while annual results are released at the same time as the fourth-quarter data.[42] Data collec-tion is carried out through mainly four modes: personal visits, telephone interviews, web inter-views and self-administered questionnaires. Eu-rostat checks the quality of data and consistency provided by the national authorities.

In the context of both DESI indicators, micro-data is extracted using the Eurostat LFS data ex-traction tool. While data for EU-LFS is collected quarterly, the data for ICT specialists in employ-ment are aggregated on annual basis and being released in spring (usually in April) following the EU-LFS release calendar. Secondary data are val-idated by Eurostat through comparison with pre-

31 Iceland, Liechtenstein and Norway.

32 Albania, Montenegro, North Macedonia, Serbia and Turkey.

33 Digital Scoreboard Key Indicators. Source: https://digital-agenda-data.eu/datasets/digital_agenda_scoreboard_key_indicators/#

34 Communications Committee COCOM. 2018. Digital Agenda Scoreboard 2018 Electronic communications market indicators: Definitions and methodology. Source: https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=57329

35 European Commission. 2020. DESI Methodological Note 2020.

36 Extract from COCOM Methodology. 2021.

37 Ibid.

38 Number of subscriptions with actual voice usage which made an mobile Internet connection in the last 90 days through a standard mobile subscription.

39 All dedicated data subscriptions with a recurring subscription fee are included as "active data subscriptions", regardless of actual use. Pre-paid mobile broadband plans (i.e. all non-recurrent fee subscriptions) require active use in previous 3 months. Subscriptions which only offer "walled garden", or email-only services (or SMS/MMS only) are not considered. Bundled offers (i.e. voice and data access) are excluded.

40 Recurrent fee subscriptions (i.e. contract) are included automatically. Prepayment subscriptions (or any other type of non-recurrent subscription) need to pass the activity criterion (a usage occurred in the last 3 months). Subscriptions which only offer "walled garden" or email-only services (or SMS/MMS only) are not considered. Bundled offers (i.e. voice and data access) for a unique (flat rate) tariff are also counted if a data connection has been made in last 3 months.

41 Eurostat. 2020. EU-Labour Force Survey Methodology. Source: https://ec.europa.eu/eurostat/statistics-explained/index.php/EU_labour_force_survey_-_methodology

42 Eurostat. 2020. Metadata: Employment and unemployment (Labour force survey) (employ). Source: https://ec.euro-pa.eu/eurostat/cache/metadata/EN/employ_esms.htm

vious years and cross-economy analysis. If inconsistencies are noted, the Eurostat LFS division of the economies can be consulted for a detailed explanation. If the data is considered unreliable, data are flagged or not disseminated.[44]

Dimension	Indicator
Human Capital	2b1 ICT specialists
	2b2 Female ICT specialists

Table 12: Indicators derived from the Labour Force Survey (Source: Authors, 2021)

e) UNESCO OECD Eurostat (UOE) joint data collection on Education

One (1) indicator is derived from the UNESCO OECD Eurostat (UOE) joint data collection on education. The main source is the joint UIS (UNESCO Institute of Statistics) / Organisation for Economic Co-operation and Development (OECD) / Eurostat (UOE) questionnaires on education statistics, which constitute the core database on education.[44]

The data collection is administered jointly by UNESCO-UIS, OECD and Eurostat. Additionally, Eurostat collects data for regional enrolments and foreign language learning. The International Standard Classification of Education (ISCED 2011) is the basis for international education statistics. The ISCED 2011 Operational Manual[45] targets national statisticians collecting and reporting data on education and provides guidelines for classifying national education programmes and related qualifications according. The definitions and methodology for the joint UOE data collection are defined in the manual on concepts, defi-

nitions and classifications[46] published every year.

The national data collections are performed annually by the NSIs or the Ministries of Education. The data collections on enrolments, graduates, personnel, etc. in most economies are census data or extracted from administrative registers. Auxiliary indicators from statistics on demography (e.g. population) or the National Accounts (e.g. Gross Domestic Product, Total Public Expenditure) are used to calculate some of the indicators. Data are collected through data collection tables in electronic questionnaires and further reported to a unique e-mail address or by eDAMIS[47] (applicable for EU, EFTA[48] and candidate countries).[49] The results of the UOE data collection on education statistics are disseminated usually in April or May.

Table 13 presents the indicator derived from the UOE joint data collection on education.

The full list of indicators derived from the EU-LFS survey is presented in Table 12.

Dimension	Indicator
Human Capital	2b3 ICT graduates

Table 13: Indicators derived from the UOE joint data collection on Education (Source: Authors, 2021)

2.2.2.2. Data collected by third parties

Eight (8) of the DESI indicators are collected on behalf of the Commission by third parties and are based on ad hoc studies. These indicators are derived from:

a.) Study on Broadband Coverage in Europe (BCE) (3 indicators);

b.) eGovernment Benchmark (3 indicators);

c.) European 5G Observatory (1 indicator);

d.) Study on Mobile and Fixed Broadband Prices in Europe (1 indicator);

e.) Open Data Maturity Study (1 indicator).

a) Study on Broadband Coverage in Europe (BCE)

Three (3) of the DESI indicators derive their data from the Study on Broadband Coverage in Europe (BCE). This is currently carried out for the Commission by IHS Markit Ltd., OMDIA, and Point Topic. It is designed to monitor and assess the EU Member States progress regarding specific broadband coverage objectives defined in the Digital Agenda for Europe.

The project is coordinated by the DG CONNECT. The objectives are to analyse the availability of nine broadband access technologies (DSL, VDSL, VDSL2 Vectoring, cable modem DOCSIS 3.0, cable modem DOCSIS 3.1, FTTP, FWA, LTE and satellite) in a given economy, and at the regional level using NUTS 3 statisti-

cal units[50] as a research basis.[51] The latest 2019 BCE study[52] included 31 economies, out of which EU28[53], Norway and Iceland were assessed by the IHS Markit Ltd., OMDIA, and Point Topic, while the assessment for Switzerland was made by Glasfasernetz Schweiz.

The methodology[54] used for the 2019 edition mirrors the approach used in the 2013-2018 studies. Also, the survey questionnaire uses a similar wording and formulations with the 2012-2018 questionnaires. The collected data reflects the situation at the end of June 2019.

The core of the study focuses on data collected through a survey of broadband network operators and NRAs. In addition, the results are validated and cross-checked with supplemental research performed by a research team, which is also used for filling in any missing information. In the last phase, the survey data and data from the additional research are combined and used to calculate the national coverage for each technology, as well as the combination of coverage and speed coverage categories.

In order to align the reporting with the publication of DESI, the BCE study is scheduled to reflect the situation at the end of June each year. Table 14 presents the indicators derived from the BCE Study.

43   Eurostat. 2020. Metadata: ICT specialists in employment (isoc_skslf). Source: https://ec.europa.eu/eurostat/cache/metadata/en/isoc_skslf_esms.htm

44   Eurostat. 2020. Metadata: Education administrative data from 2013 onwards (ISCED 2011). Source: https://ec.europa.eu/eurostat/cache/metadata/en/educ_uoe_enr_esms.htm

45   UNESCO-UIS, OECD and Eurostat. 2011. International Standard Classification of Education (ISCED) 2011. Source: http://uis.unesco.org/sites/default/files/documents/international-standard-classification-of-education-isced-2011-en.pdf

46   UNESCO-UIS, OECD and Eurostat. 2020. UOE data collection on formal education: Manual on concepts, definitions and classifications. Source: https://circabc.europa.eu/sd/a/5ef9484f-9d84-430d-9e98-0f440d66bdb3/UOE2020%20Manual.pdf

47   Electronic Dataflow Administration and Management Information System

48   Iceland, Liechtenstein, Norway, and Switzerland.

49   Ibid. Eurostat. 2020. Metadata: Education administrative data from 2013 onwards (ISCED 2011).

50   Nomenclature of Units for Territorial Statistics.

51   NUTS 3 level areas are smaller regional units of 150,000 to 800,000 inhabitants. The study included 1,386 NUTS 3 areas in the 31 study economies.

52   European Commission. 2019. Broadband Coverage in Europe. Source: https://op.europa.eu/en/publication-detail/-/publication/077cc151-f0b3-11ea-991b-01aa75ed71a1

53   UK included as a Member State in 2019.

54   Ibid.

Dimension	Indicator
Connectivity	1b1 Fast broadband (NGA) coverage
	1b2 Fixed Very High Capacity Network (VHCN) coverage
	1c1 4G coverage

Table 14: Indicators derived from the Broadband Coverage in Europe Study (Source: Authors, 2021)

b) eGovernment Benchmark

Three (3) DESI indicators use data from the eGovernment Benchmark Study. The eGovernment Benchmark is currently carried out for the Commission by Capgemini, IDC, and Sogeti. As a measurement of eGovernment service delivery, the benchmark was initiated by the Commission in 2003. Currently, the eGovernment Benchmark measures the progress made under the new eGovernment Action Plan 2016-2020[56] and the Tallinn Declaration.[57] The four top-level benchmarks measured are user-centricity, transparency, cross-border/boundary service delivery and deployment of key enablers.[58]

The latest report published in 2020 provided data for 36 economies, including Albania, Mon-

tenegro, North Macedonia, and Serbia from the WB region. It is published biannually and covers the assessment made in the previous two years. However, the measurement is conducted on annual basis. Each life event is measured in a biennial cycle (once every two years) (e.g. the Business start-up is measured in 2012, 2014, 2016 and 2018, while Regular business operations are measured in 2013, 2015, 2017 and 2019).

The 2020 edition was carried out in accordance with the updated eGovernment Benchmark Framework 2012-2019: Method Paper for the benchmarking exercises (comprehensive rules from 2012 to 2019)[59] Table 15 shows the changes in indicators for the series 2012-2015 and after 2016.

Benchmarks:	Indicators 2012-2015:	Indicators from 2016:
User centricity	Online availability	Online availability
	Usability	Usability
	Ease and speed of use	Mobile friendliness[60]
Transparency	Transparency of service delivery	Transparency of service delivery
	Transparency of public organisations	Transparency of public organisations
	Transparency of personal data	Transparency of personal data[61]

Benchmarks:	Indicators 2012-2015:	Indicators from 2016:
Cross-border mobility	Online availability	Online availability
	Usability	Usability
		Cross-border eID
		Cross-border eDocuments
Key Enablers	Authentic sources	Authentic sources
	eID	eID
	eDocuments	eDocuments
	eSafe	Digital post
	Single Sign On (SSO)	

Table 15: Changes in indicators for the series 2012-2015 and after 2016 in the eGovernment Benchmark (Source: eGovernment Benchmark, 2020)

The most used method for data collection is Mystery Shopping. The only exception is the assessment of 'Mobile friendliness' which is being performed using online available tools.[63,64]

In principle, each economy is assessed by two Mystery Shoppers. A Mystery Shopper is a trained individual engaged to observe, experience and measure certain public service offers. They act like an average user, or customer, and follow a detailed, but objective, evaluation

checklist.[65] If inconsistencies are found, a research team conducts a re-evaluation in order to achieve a high level of reliability and quality. In the DESI context for cross-border/boundary mobility, all economies are assessed by two Mystery Shoppers from another economy.

In the context of DESI, three indicators use data from the eGovernment Benchmark as input, as presented in Table 16.

Dimension	Indicator
Digital Public Services	5a2 Pre-filled forms
	5a3 Online service completion
	5a4 Digital public services for businesses

Table 16: Indicators derived from the eGovernment Benchmark Report (Source: Authors, 2021)

The pre-filled forms indicator is a sub-indicator of the eGovernment key enablers benchmark and measures to what extent the personal data previously gathered by the public administration is prefilled in forms presented to the user.

The online service completion indicator, which is measured as a sub-indicator for the eGovernment user-centricity benchmark, measures the extent to which the steps necessary for getting

a public service can be performed completely online.

The digital public services for businesses indicator focuses on business services only and measures the degree to which public services for starting a business or conducting regular business operations are available online and cross-border/boundary.[65]

55   European Commission (2016). The EU eGovernment Action Plan 2016-2020. Accelerating the digital transformation of government. Source: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52016DC0179

56   Council of the EU. 2017. Tallinn Declaration on eGovernment. Source: https://ec.europa.eu/digital-single-market/en/news/ministerial-declaration-egovernment-tallinn-declaration

57   European Commission. 2018. eGovernment Benchmark 2018. Background Report. Source: https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=55487

58   European Commission. 2019. eGovernment Benchmark Framework 2012-2019. Method Paper for the benchmarking exercises. Source: https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=69464

59   Ibid. European Commission. 2018. eGovernment Benchmark 2018. Background Report. Mobile friendliness was also measured in 2014 and 2015 as proof-of-concept indicator. It was not part of the calculation of the User Centricity Benchmark in those years, but presented as separate index.

60   Ibid. In 2016, an additional question was added to the questionnaire for this indicator.

61   Ibid. In 2016, two additional questions were added to the questionnaire for this indicator.

62   Ibid. European Commission. 2018. eGovernment Benchmark 2018. Background Report. Rankwatch Mobile friendly check, available at: https://www.rankwatch.com/tools/mobile-friendly-check.html

63   Ibid. Google Mobile friendly test, available at: https://search.google.com/test/mobile-friendly

64   Ibid.

65   Ibid.

c) European 5G Observatory

One (1) indicator is derived from the 5G Observatory online platform[67] which provides updates on the latest market developments and actions undertaken by the public and private sector in the area of 5G. The iDATE DigiWorld currently manages the 5G Observatory and provides comprehensive reports for the Commission. Currently, quarterly reports are provided for the status of the 5G deployment in Europe and assessment against the 5G Action Plan.[68]

The "5G readiness" indicator is derived from this report and measures the portion of spectrum assigned for 5G purposes in each EU Member State in the 5G pioneer bands and readiness for 5G by end of 2020. The score calculation is based on the portion of the spectrum assigned

in each 5G pioneer band in comparison with the maximum feasible amounts, which are as follows:

» 700 MHz band: 60 MHz (703-733 & 758-788 MHz)[69]

» 3.6 GHz band: 400 MHz (3 400-3 800 MHz)[70]

» 26 GHz band: 1000 MHz within 24 250-27 500 MHz[71]

All three spectrum bands are equally weighted at 33.3% each.

Data for this indicator is based on the 5G Observatory Reports prepared by the iDATE DigWorld and the data reported by the NRAs. iDATE submits the collected data to Commission and CO-COM quarterly. Table 17 presents the indicator derived from the European 5G Observatory.

Dimension	Indicator
Connectivity	1c3 5G readiness

Table 17: Indicators derived from the European 5G Observatory and iDATE DigWorld (Source: Authors, 2021)

d) Study on Mobile and Fixed Broadband Prices in Europe

One (1) DESI indicator is based on data from the Study on Mobile and Fixed Broadband Prices in Europe. The study is currently prepared for the Commission by the empirica Gesellschaft für Kommunikations- und Technologieforschung mbH in cooperation with TÜV Rheinland. The broadband prices are part of the monitoring agenda of the Commission in line with the objectives of the Digital Single Market Strategy.

The study objective is to reveal the level of prices for a standardised offer of fixed, mobile and converged broadband services. The latest study in 2019 provides data on retail prices of fixed and mobile broadband offers for consumers in the EU28[71], Iceland, Norway, Japan and South Korea, as well as three states of the United States of America (USA) - California, Colorado and New York. For the first time, the 2019 Study provided for data collection for both fixed and mobile broadband offers for the same monitoring period (7-29 October 2019).

The methodology[73] used for the study is agreed with the Commission. The methods applied, classifications and baskets definition are aligned with the Guidelines set by the Body of European Regulators for Electronic Communications (BEREC).[74] The study included the five largest Internet Service Providers (ISPs) and the two or three largest Mobile Network Operators (MNOs) in each country. All data was collected from ISP and MNO websites. As the last step, consistent price normalisation procedures were applied to validate the findings and support valid cross-national comparison.

Table 18 presents the indicator derived from the Study on Mobile and Fixed Broadband Prices in Europe.

Dimension	Indicator
Connectivity	1d1 Broadband price index

Table 18: Indicators derived from the Study on Mobile and Fixed Broadband Prices in Europe (Source: Authors, 2021)

e) Open Data Maturity Study

One (1) DESI indicator uses data from the Study on Open Data Maturity and is based on the European Data Portal (EDP). EDP is an initiative of the Commission and is currently implemented with the support of a consortium led by Capgemini Invent, including Intrasoft International, Fraunhofer Fokus, con.terra, Sogeti, 52North, Time.Lex, the Lisbon Council, and the University of Southampton.

Launched in 2015, the EDP is the main point of access for public sector information at the EU level. The objective of EDP is to improve the access to open data, promote high-quality open data publication at all levels and increase its impact. Currently, only Serbia and Montenegro from the WB are included on the portal.

Since 2015, the EDP performs an annual assessment of the maturity level of the EU Member States and EFTA countries.[74] In the latest 2020

edition, the assessment included the United Kingdom (UK)[75] and the "Eastern Partnership" countries.[76] The aim is to understand the level of maturity, progress made over time, identify improvement, and benchmark countries in relation to one another. The study is complemented with an overview of the best practices identified to illustrate progress and ICT enabled innovation.

The latest benchmark report was published in 2020 and was developed in accordance with the Method Paper 2020.[77] Table 19 presents the Open Data Maturity dimensions and dimension-specific metrics used in the assessment in 2020.

66   European 5G Observatory. 2021a. Source: http://5gobservatory.eu/about/what-is-the-european-5g-observatory/
67   European 5G Observatory. 2021b. Quarterly Report 10 (Up to December 2020). Source: http://5gobservatory.eu/wp-content/uploads/2021/01/90013-5G-Observatory-Quarterly-report-10.pdf
68   DESI 2020. Connectivity. For the 700 MHz band, there are many derogations allowing for a delay until 2022; however, the 5G readiness indicator is about factual reporting, not a judgement on legal compliance. Source: https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=67079
69   Ibid. For the 3 400-3 800 MHz band, only licences aligned with the new technical conditions (according to Commission Decision (EU)2019/235)) were considered ready for 5G use.
70   Ibid. For the 26 GHz band, at least a portion of 1000 MHz within the band must be assigned and ready for 5G use by the end of 2020, as required by the European Communications Code. (Until the end of March 2020).
71   EU27 plus UK.

72   European Commission. 2019. Mobile and Fixed Broadband Prices in Europe 2019. On page 39. Source: https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=72471
73   Body of European Regulators for Electronic Communications (BEREC). 2018. European Benchmark of the pricing of bundles – methodology guidelines. (referred to as 2018 BEREC Guidelines). Source: https://berec.europa.eu/eng/document_register/subject_matter/berec/download/0/8255-european-benchmark-of-the-pricing-of-bun_0.pdf
74   European Data Portal. 2020. Open Data Maturity Report 2020. EU Member States (including UK in the latest edition) plus the EFTA countries (Iceland, Liechtenstein, Norway and Switzerland. Source: https://www.europeandataportal.eu/sites/default/files/edp_landscaping_insight_report_n6_2020.pdf
75   Ibid. Following the withdrawal of the country from EU. UK was included in the previous editions as an EU Member State.
76   Ibid. EaP: Azerbaijan, Georgia, Moldova, and Ukraine.
77   European Data Portal. 2020. Measuring open data maturity. Sixth edition, 2020. Source: https://www.europeandataportal.eu/sites/default/files/method-paper_insights-report_n6_2020.pdf

Dimension	Metrics
Open Data Policy	Policy framework
	Governance of open data
	Open data implementation
Open Data Impact	Strategic awareness
	Political impact
	Social impact
	Environmental impact
	Economic impact
Open Data Portal	Portal features
	Portal usage
	Data provision
	Portal sustainability
Open Data Quality	Currency
	Monitoring and measures
	DCAT-AP compliance
	Deployment quality and linked data

Table 19: Open Data Maturity dimensions and dimension-specific metrics[79] (Source: Open Data Maturity Method Paper. 2019)

The assessment process, as described in the Method Paper is composed of several activities performed during the 12 months of a given year:

» Step 1: Refine and update the landscaping methodology and questionnaire;

» Step 2: Coordinate and assist national teams in filling out the landscaping questionnaire;

» Step 3: Analyse and validate the data together with the national teams;

» Step 4: Complement the results with additional desk research;

» Step 5: Publish an in-depth report and country factsheets documenting the results and findings;

» Step 6: Visualise the results on the dashboard of the European Data Portal;

» Step 7: Produce an analytical report and webinars showcasing best practices from countries.

Table 20 presents DESI indicator derived from the Open Data Maturity Report.

Dimension	Indicator
Digital Public Services	5a5 Open data

Table 20: Indicators extracted from the Open Data Maturity Report (Source: Authors, 2021)

2.2.3. Frequency of data collection

The frequency of collection for each indicator is an important element required to be fully aligned with the DESI Methodology. For the biannual indicators, this is particularly important, as the NSIs need to be aligned with the Eurostat time series, Methodological manuals, and MQs (e.g. 2017, 2019, 2021, and all odd years). Table 21 summarises the frequency of data collection and time series for each indicator as defined in the DESI 2020 Methodology.

78   More information about indicators used is presented in the Method paper.

Indicator	Frequency	Years collected 2018	2019	2020
1a1 Overall fixed broadband take-up	annual	✕	✕	✕
1a2 At least 100 Mbps fixed broadband take-up	annual	✕	✕	✕
1b1 Fast broadband (NGA) coverage	annual	✕	✕	✕
1b2 Fixed Very High Capacity Network (VHCN) coverage	annual	✕	✕	✕
1c1 4G coverage	annual	✕	✕	✕
1c2 Mobile broadband take-up	annual	✕	✕	✕
1c3 5G readiness	quarterly		✕	✕
1d1 Broadband price index	annual	✕	✕	✕
2a1 At least basic digital skills	biannual		✕	
2a2 Above basic digital skills	biannual		✕	
2a3 At least basic software skills	biannual		✕	
2b1 ICT specialists	annual	✕	✕	✕
2b2 Female ICT specialists	annual	✕	✕	✕
2b3 ICT graduates	annual	✕	✕	✕
3a1 People who have never used the internet	annual	✕	✕	✕
3a2 Internet users	annual	✕	✕	✕
3b1 News	annual	✕	✕	✕
3b2 Music, videos and games	biannual	✕		✕
3b3 Video on demand	biannual	✕		✕
3b4 Video calls	annual	✕	✕	✕
3b5 Social networks	annual	✕	✕	✕
3b6 Doing an online course	annual	✕	✕	✕
3c1 Banking	annual	✕	✕	✕
3c2 Shopping	annual	✕	✕	✕
3c3 Selling online	annual	✕	✕	✕
4a1 Electronic information sharing	biannual		✕	
4a2 Social media	biannual		✕	
4a3 Big data[80]	biannual	✕		
4a4 Cloud	biannual	✕		✕
4b1 SMEs selling online	annual	✕	✕	✕
4b2 e-Commerce turnover	annual	✕	✕	✕
4b3 Selling online cross-border	biannual		✕	
5a1 e-Government users	annual	✕	✕	✕
5a2 Pre-filled forms	biannual	✕		✕
5a3 Online service completion	biannual	✕		✕
5a4 Digital public services for businesses	biannual	✕		✕
5a5 Open data	annual	✕	✕	✕

Table 21: Frequency for data collection for each indicator (Source: Adjusted by Authors, Eurostat, 2021)

79   Last year of collection or the Big data indicator (4a3) as defined in DESI 2020 Methodology is 2018. Since 2019, Eurostat replaced this indicator with other indicators related to Big data.

3. ASSESSMENT OVERVIEW

This chapter provides an overview of the state of application of DESI indicators in the WB and each WB economy. The format for presenting information is consistent for the general overview and across all dimensions.

The general overview presents the assessment findings in terms of the state of application of DESI indicators in the WB region. A comparison of the overall progress of the WB economies is presented in terms of data availability and its alignment with DESI Methodology.

As for the analysis of the dimensions, a colour-based table summarising the results of each WB economy is presented at the beginning. The last two rows summarise the number of indicators for which information is available and its alignment with DESI Methodology. In addition, a summary of the findings for each dimension is presented distinguishing the good examples across the WB economies, identified gaps and shortcomings and any common challenges.

3.1. State of application of DESI Indicators in Western Balkan economies

Generally, WB economies are able to provide data for calculation for most of DESI indicators. Figure 1 presents the percentage of data available per DESI indicators in each WB economy.
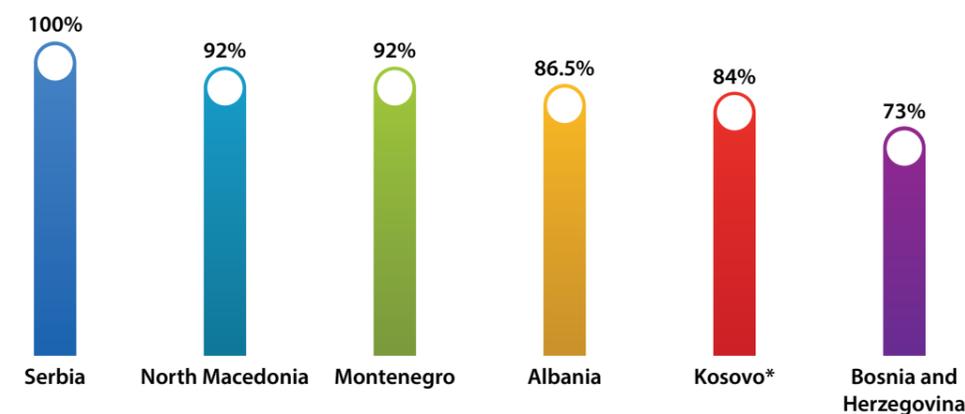

Figure 1: Data available per DESI indicators in each WB economy (Source: Authors, 2021)

Currently, Serbia is the most prepared economy in WB able to provide data for all 37 DESI indicators, followed by Montenegro and North Macedonia (34 indicators), Albania (32 indicators), Kosovo* (31 indicators) and Bosnia and Herzegovina (27 indicators).

It the context of DESI, the alignment of data available with DESI and other methodologies is also essential. Serbia is also a leader among the WB economies able to provide methodologically aligned data for 36 of 37 DESI indicators followed by North Macedonia (32 indicators), Montenegro and Kosovo* (28 indicators), Alba-

nia and Bosnia and Herzegovina (27 indicators). However, the analysis showed that there is still data missing for five of the six WB economies, while all six economies have to make additional methodological alignments as shown in Figure 2.
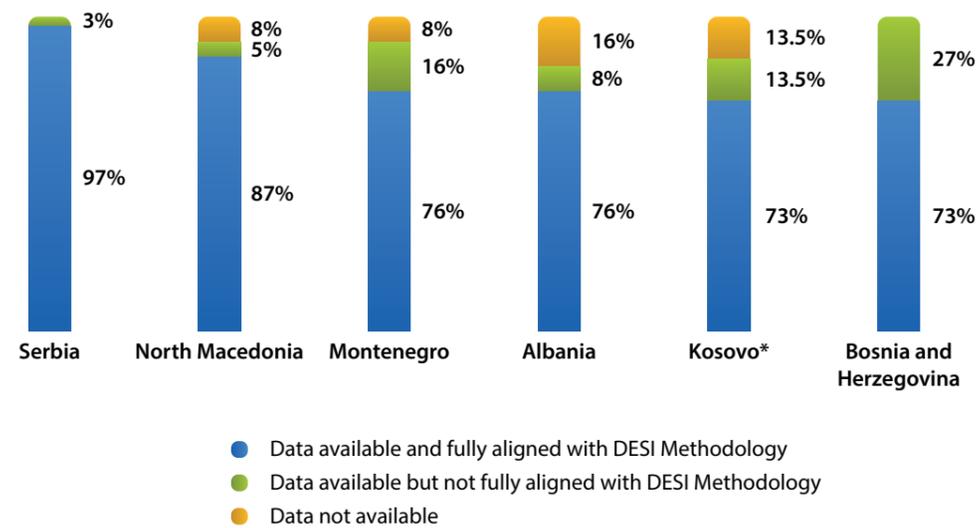
Figure 2: Alignment with DESI Methodology (Source: Authors, 2021)

- ● Data available and fully aligned with DESI Methodology
- ● Data available but not fully aligned with DESI Methodology
- ● Data not available

In general, all six WB economies have a solid foundation for monitoring DESI domestically. Most of the relevant DESI indicators are available with NSIs being responsible for their collection. All NSIs have a high degree of compliance with Eurostat surveys on ICT usage in households and by individuals and ICT usage in enterprises.

The biggest challenge remains with the indicators that use data from the Commission ad hoc studies. A significant number of indicators derived from these ad hoc studies are in the Connectivity (five of eight indicators) and Digital public services (four of five indicators) dimensions.

Although practice in the EU Member States shows that data for these indicators are not collected domestically, the practice from WB demonstrates that for some of these indicators a domestic data collection and calculation is possible in the context of DESI. Namely, the indicators that derive from the BCE Study and the 5G Observatory can be calculated domestically, as shown in Montenegro, North Macedonia and Serbia. As all NRAs are already collecting data on the broadband coverage, calculation of the score is possible if the correct methodology is available in advance and NRAs have reasonable time for internal preparation.

However, a number of indicators derived from the Study on Mobile and Fixed Broadband Prices in Europe, eGovernment Benchmark Report and Open Data Maturity Report require significant resources, skills and knowledge. Domestic data collection and calculations by each of the WB economies is not feasible due to their complexity, specific methodological requirements, and tools for collection (e.g. mystery shopper).

In order to produce high-quality assessments and data in the context of DESI, all six WB economies need to be included in the Commission ad hoc studies or be subject to special regional studies financially and technically supported by the Commission. In both scenarios, the WB authorities should actively participate in these studies to improve their competencies in the medium- to long-term.

3.1.1. Connectivity dimension

Data collection for Connectivity dimension is the shared responsibility of both the NSIs and NRAs. Table 22 provides an overview of data availability and its alignment with DESI Methodology in the Connectivity dimension.

Dimension	Indicator	AL	BA	XK*	ME	MK	RS
CONNECTIVITY	1a1 Overall fixed broadband take-up	●	●	●	●	●	●
	1a2 At least 100 Mbps fixed broadband take-up	●	●	●	●	●	●
	1b1 Fast broadband (NGA) coverage	●	●	●	●	●	●
	1b2 Fixed Very High Capacity Network (VHCN) coverage	●	●	●	●	●	●
	1c1 4G coverage	●	●	●	●	●	●
	1c2 Mobile broadband take-up	●	●	●	●	●	●
	1c3 5G readiness	●	●	●	●	●	●
	1d1 Broadband price index	●	●	●	●	●	●
Indicators for which data is available		8	4	8	7	8	8
Indicators for which data available is aligned with DESI Methodology		5	4	5	7	7	7

Table 22: Connectivity dimension assessment (Source: Authors, 2021)

As seen from the analysis, the NSIs are responsible for data collection of one indicator (1a1 Overall fixed broadband take-up), which derives from the ICT usage in households and by individuals survey. As all NSIs achieved high compliance, data for this indicator is available for all WB economies on Eurostat.

As for the NRAs, the awareness is high of the importance of monitoring in the Connectivity dimension indicators and all of them are in a process towards full alignment of their methodologies with the Digital Agenda scoreboard key indicators, especially for the Broadband take-up and coverage, Broadband speeds and prices and Mobile market. In that regard, no gaps were found in terms of two Connectivity indicators (1a2 At least 100 Mbps fixed broadband take-up and 1c2 Mobile broadband take-up) as the data is collected by the NRAs.

However, challenges and gaps were detected for five indicators as all of them use data from Commission ad hoc studies. Three indicators (1b1 Fast broadband (NGA) coverage; 1b2 Fixed Very High Capacity Network (VHCN) coverage; and 1c1 4G coverage) use data from the BCE Study, one indicator (1c3 5G readiness) from the European 5G Observatory, and one indicator (1d1 Broadband price index) from the Study on Mobile and Fixed Broadband Prices. Unfortunately,

none of the WB economies is included in these studies.

The practice shows that for most of these indicators NRAs have the data collected from the operators and can calculate the score applying the same methodologies used in the Commission ad hoc studies. The example of RATEL in Serbia and joint efforts of AEC and BCO in North Macedonia shows that the data collection and calculation can be carried out for all indicators that derive from the BCE study. However, this requires significant knowledge, skills and resources.

The alignment with the 5G readiness indicator should not cause significant difficulties for NRAs. Since it is a new indicator, all NRAs should use the COCOM and European 5G Observatory methodology and include all three spectrum bands.

Lastly, significant challenges and gaps remain for the Broadband price index. Although Albania, Kosovo*, North Macedonia and Serbia collected data and made the calculations, serious challenges in terms of methodological alignments exist. Due to its specific methodology, the Study on Mobile and Fixed Broadband Prices in Europe provides data collection in a very specific and limited timeframe. The major issue for ensuring full alignment for the four economies lies in the time gap between the publication of the study

methodology and the time needed for internal preparations and data collection. Moreover, constant changes in the methodology provide additional challenges for all NRAs. Even RATEL and BCO, the two most experienced institutions in the WB region for calculation of this indicator, reported that the latest methodological changes made the individual (for each economy) calculation practically impossible due to the delayed availability of the methodology, its complexity and constant changes.

It is recommended for the Commission to make efforts to include all WB economies in these ad hoc studies or to support regional ad hoc studies that will be methodologically aligned with the European studies. As a recognised regional leader, RCC could play important role in coordination of these regional studies. In both scenarios, NRAs need to strengthen their capacities to be able to actively participate in these studies, which would also require additional external support.

3.1.2. Human capital dimension

Data collection for the Human capital dimension is the responsibility of the NSIs in all WB economies. Data for this dimension are extracted from three statistical operations:

» ICT usage in households and by individuals survey (3 indicators)

» Labour Force Survey (2 indicators)

» UNESCO OECD Eurostat (UOE) joint data collection on Education (1 indicator)

Table 23 provides an overview of the data availability and its alignment with DESI Methodology in Human capital dimension.

Dimension	Indicator	AL	BA	XK*	ME	MK	RS
HUMAN CAPITAL	2a1 At least basic digital skills	🟢	🟢	🟢	🟠	🟢	🟢
	2a2 Above basic digital skills	🟢	🟢	🟢	🟠	🟢	🟢
	2a3 At least basic software skills	🟢	🟢	🟢	🟢	🟢	🟢
	2b1 ICT specialists	🟠	🟢	🟢	🟢	🟢	🟢
	2b2 Female ICT specialists	🟠	🟢	🟢	🟢	🟢	🟢
	2b3 ICT graduates	🟢	🔴	🟢	🟠	🟠	🟢

	AL	BA	XK*	ME	MK	RS
Indicators for which data is available	6	5	6	6	6	6
Indicators for which data available is aligned with DESI Methodology	4	5	6	3	5	6

Table 23: Human capital dimension assessment (Source: Authors, 2021)

As for the ICT usage in households and by individuals survey, all NSIs achieved high level of compliance with the ICT usage in enterprises survey. Methodological Manuals and MQs are provided by Eurostat and adjusted every year. Data for each WB economy for all DESI indicators are available on Eurostat and can be used in t.he context of calculation of DESI. Only minor methodological misalignments are detected for Montenegro as two indicators are flagged by Eurostat as low reliability. It is recommended for all NSIs to continue with the high level of compli-ance with Eurostat methodologies and to make all the necessary annual adjustments as provided by Eurostat.

Regarding the LFS, only Montenegro, North Macedonia and Serbia achieved a significant level of compliance with the EU-LFS. The NSIs of the three economies are already transmitting their data to Eurostat. On the other side, Albania, Bosnia and Herzegovina and Kosovo* are not fully aligned with the EU-LFS methodology, and thus do not transmit their data to Eurostat. To fill the gap, Bosnia and Herzegovina collects data for the two indicators by their inclusion in the ICT usage in enterprises survey using the same ISCO-08 classification as used in EU-LFS. Data for the two indicators are also available in the KAS database for Kosovo*, but not transmitted to Eurostat. Also, Albania collects data for the same indicators but from administrative sources.

In order to increase the availability and quality of data, it is recommended for Montenegro, North Macedonia and Serbia to maintain their high level of compliance with EU-LFS and to ensure a high level of quality of data transmitted to Eurostat. Albania, Bosnia and Herzegovina and Kosovo* should speed up the process for alignment with EU-LFS. External support for all economies is recommended due to the complexity and the frequency (quarterly) of the EU-LFS methodology.

Lastly, Albania, Kosovo*, Montenegro, North Macedonia, and Serbia are able to provide data for the ICT graduates indicator that derives from the UNESCO OECD Eurostat (UOE) joint data collection on education. Out of the five economies, data for Montenegro, North Macedonia and Serbia are available on Eurostat. However, as flagged by Eurostat, some methodological misalignments exist as the definition differs for the three economies. In order to resolve this issue, NSIs of the three economies should align their definitions with the UOE methodology. Also, NSIs from Albania and Kosovo* need to start with the data transmission to Eurostat.

As for Bosnia and Herzegovina, data for the ICT graduates is not available in the BHAS database, but it is available in the entities statistical institutes. It is recommended for BHAS to align its domestic methodology on education with the UOE methodology and to start with data transmission to Eurostat. Also, external support for all WB economies will be beneficial to align domestic methodologies and practice on education with the UOE methodology.

3.1.3. Use of internet services dimension

Data collection for the Use of internet services dimension is the responsibility of the NSIs in all WB economies. Data for this dimension are extracted from the ICT usage in households and by individuals survey. Table 24 provides an overview of the data availability and its alignment with DESI Methodology in the Use of internet services dimension.

Dimension	Indicator	AL	BA	XK*	ME	MK	RS
USE OF INTERNET SERVICES	3a1 People who have never used the internet	🟢	🟢	🟢	🟢	🟢	🟢
	3a2 Internet users	🟢	🟢	🟢	🟢	🟢	🟢
	3b1 News	🟢	🟢	🟢	🟢	🟢	🟢
	3b2 Music, videos and games	🟢	🟢	🟢	🟢	🟢	🟢
	3b3 Video on demand	🟢	🟢	🟢	🟢	🟢	🟢
	3b4 Video calls	🟢	🟢	🟢	🟢	🟢	🟢
	3b5 Social networks	🟢	🟢	🟢	🟢	🟢	🟢
	3b6 Doing an online course	🟢	🟢	🟢	🟢	🟢	🟢
	3c1 Banking	🟢	🟢	🟢	🟢	🟢	🟢
	3c2 Shopping	🟢	🟢	🟢	🟢	🟢	🟢
	3c3 Selling online	🟢	🟢	🟢	🟢	🟢	🟢

	AL	BA	XK*	ME	MK	RS
Indicators for which data is available	11	11	11	11	11	11
Indicators for which data available is aligned with DESI Methodology	11	11	11	11	11	11

Table 24: Use of internet services dimension assessment (Source: Authors, 2021)

As noted, all NSIs achieved high level of compliance with the ICT usage in households and by individuals Methodological Manuals and MQs are provided by Eurostat and adjusted every year. Data for each WB economy for all DESI indicators are available on Eurostat and can be used in the context of calculation of DESI. No gaps or methodological misalignments were detected.

It is recommended for all NSIs to continue with the high level of compliance with Eurostat methodologies and to make all the necessary annual adjustments as provided by Eurostat.

3.1.4. Integration of digital technology dimension

Data collection for the Integration of digital technology dimension is the responsibility of the NSIs in all WB economies. Data for this dimension are extracted from the ICT usage in enterprises survey. Table 25 provides an overview of the data availability and its alignment with DESI Methodology in the Integration of digital technology dimension.

Dimension	Indicator	AL	BA	XK*	ME	MK	RS
INTEGRATION OF DIGITAL TECHNOLOGY	4a1 Electronic information sharing	🟢	🟢	🟢	🟠	🟢	🟢
	4a2 Social media	🟢	🟢	🟢	🟢	🟢	🟢
	4a3 Big data	🔴	🔴	🔴	🔴	🔴	🟢
	4a4 Cloud	🟢	🟢	🔴	🟢	🟢	🟢
	4b1 SMEs selling online	🔴	🟢	🟢	🟠	🟢	🟢
	4b2 e-Commerce turnover	🔴	🟢	🟢	🟠	🔴	🟢
	4b3 Selling online cross-border	🔴	🟢	🟢	🟢	🟢	🟢

	AL	BA	XK*	ME	MK	RS
Indicators for which data is available	3	6	5	6	5	7
Indicators for which data available is aligned with DESI Methodology	3	6	5	3	5	7

Table 25: Integration of digital technology dimension assessment (Source: Authors, 2021)

All NSIs achieved high level of compliance with the ICT usage in enterprises survey. Methodological Manuals and MQs are provided by Eurostat and adjusted every year. Data from this survey for Bosnia and Herzegovina, Montenegro, North Macedonia, and Serbia are already transmitted to Eurostat, while Albania and Kosovo* are not transmitting these data yet.

While all WB economies are using the Eurostat methodology and MQ, some quality challenges remain as some of these data are flagged by Eurostat as low reliability, or not published by NSIs due to quality issues. Also, data for some indicators are not available since they were included in the latest survey or will be included in the 2021 survey.

In order to achieve full compliance and provide data for all DESI indicators, it is recommended for all NSIs to continue with their alignment and compliance with Eurostat methodologies and to make all the necessary annual adjustments as provided by Eurostat. NSIs will also need to detect and resolve all quality issues detected by Eurostat. Lastly, NSIs of Albania and Kosovo* should take all necessary efforts to start transmission of the ICT usage in enterprises survey data to Eurostat.

3.1.5. Digital public services dimension

Data collection for the Digital public service dimension is the shared responsibility of both the NSIs and ministries or agencies for information society and digitisation. Table 26 provides an overview of the data availability and its alignment with DESI Methodology in the Digital public service dimension.

Dimension	Indicator	AL	BA	XK*	ME	MK	RS
DIGITAL PUBLIC SERVICES	5a1 e-Government users	🟢	🟢	🟢	🟢	🟢	🟢
	5a2 Pre-filled forms	🟢	🔴	🔴	🟢	🟢	🟢
	5a3 Online service completion	🟢	🔴	🔴	🟢	🟢	🟢
	5a4 Digital public services for businesses	🟢	🔴	🔴	🟢	🟢	🟢
	5a5 Open data	🔴	🔴	🔴	🔴	🔴	🟢

	AL	BA	XK*	ME	MK	RS
Indicators for which data is available	4	1	1	4	4	5
Indicators for which data available is aligned with DESI Methodology	4	1	1	4	4	5

Table 26: Digital public services dimension assessment (Source: Adjusted by Authors, 2021)

As seen from the analysis, the NSIs are responsible for data collection for one indicator (5a e-Government users), which derives from the ICT usage in households and by individuals survey. As all NSIs achieved high compliance, data for this indicator is available for all WB economies in the Eurostat database.

The remaining four indicators fall under the jurisdiction of the ministries or agencies responsible for information society and digitisation. Significant challenges and gaps were detected in this group of four indicators as all of them use data from Commission ad hoc studies, such as eGovernment Benchmark Report (biannual) and Open Data Maturity Report (annual).

As regards the eGovernment Benchmark Report, the latest 2020 edition included only Albania, Montenegro, North Macedonia, and Serbia, thus providing a reliable score for three DESI indicators (5a2 Pre-filled forms; 5a3 Online service completion; and 5a4 Digital public services for businesses). However, although included, challenges remain in the inter-governmental cooperation between the ministries or agencies for information society and digitisation and other involved institutions domestically. To resolve this issue, strengthening the mandate and position of the ministries or agencies for coordination and data collection is necessary.

As for Bosnia and Herzegovina and Kosovo*, data for these indicators are not available as both have limited capacities and skills to conduct similar studies. For full alignment, inclusion of Bosnia and Herzegovina and Kosovo* in the eGovernment Benchmark Report for the next edition it is recommended or supporting similar study on a regional level to fill the gap till both economies are included in the European study. Also, the issue of strengthening the mandate and position of the ministries or agencies for information society and digitisation for coordination and data collection is required.

Concerning the Open Data, it is beneficial to note that data for all WB economies are available from world indexes measuring the Open data maturity. These data are also used to measure the progress of WB economies with the EU Member States. However, the score of these indexes cannot be used in the context of DESI since their methodologies are not aligned with the Open Data Maturity Report. As none of the WB economies was included in the latest Open Data Maturity Report 2020 edition, data is not available in the context of DESI.

As Montenegro and Serbia become part of the EDP, they are expected to be included in the editions of the Open Data Maturity Report. All other economies are recommended to take all necessary efforts to become part of EDP, and

thus ensure inclusion in the next editions of the Open Data Maturity Report. Alternatively, all WB economies need to be supported by providing a similar study on a regional level to fill the gap till all are included in the European study. In the meantime, Albania, Bosnia and Herzegovina, Kosovo* Montenegro and North Macedonia should follow the example of Serbia where RATEL used the same methodology to calculate the score for Serbia. Although possible, this option is not recommended due to limited institutional capacities, skills and possibilities for methodological misalignments.

CONCLUSION

This report examines the application of DESI indicators in the six individual WB economies.

Regionally, the six WB economies are able to provide data for 80% of all DESI 2020 indicators. For 8% of the DESI indicators, further methodological alignment is required. Data for 12% of the indicators for 2020 and earlier are not available.

The analysis revealed the areas in which WB economies achieved high level of compliance with DESI and other EU relevant methodologies including:

» Survey on ICT usage in households and by individuals, and

» Survey on ICT usage in enterprises.

Challenges for some economies still exist as domestic methodologies are not fully aligned with the Eurostat methodologies for:

» EU-Labour Force Survey (EU-LFS), and

» UNESCO OECD Eurostat (UOE) joint data collection on education.

Common problems and challenges in the six WB economies include the Commission ad hoc studies:

» Study on Broadband Coverage in Europe

» Study on Mobile and Fixed Broadband Prices in Europe

» European 5G Observatory

» eGovernment Benchmark

» Open Data Maturity Study

The assessment overview applied the matrix colour-based system which allowed closer comparison of each economy readiness to provide methodologically aligned data for each indicator. Further details are included in six individual reports, one per economy. Each of the individual reports provides a detailed analysis of the data availability and its methodological alignments for each DESI indicator. Based on the findings, each WB economy report contains five general recommendations:

1. RCC and the six WB economies should advocate the inclusion of all WB economies in the European studies on broadband coverage, mobile and fixed broadband prices, 5g observatory, eGovernment benchmark and open data maturity studies.

2. Coordinated by RCC, a regional network for coordination and collaboration between the responsible authorities from the six WB economies should be established. Where necessary, RCC will endeavour to provide technical assistance for data collection and calculation using DESI methodology.

3. NRAs and ministries or agencies for information society and digitisation should make all necessary internal preparations required for participation in the studies at the European or regional WB level.

4. Institutional capacities of all NSIs, NRAs, ministries or agencies for information society and digitisation need to be further strengthened.

5. Strengthening the level of cooperation and collaboration domestically, and between all relevant institutions in each of the WB economies.

The details of the five recommendations and the underpinning 48 economy-specific recommendations, made for improving the level of preparation and data collection in the context of DESI are outlined in the individual reports in Annex 1 of this report.

ANNEX

ANNEX 1: ECONOMY REPORTS
(alphabetically ordered)

ALBANIA

1. Background

Since June 2014 Albania has been a candidate for EU membership. Acknowledging the progress made by Albania, the Commission issued the first recommendation to the European Council in April 2018 to open accession negotiations with Albania. In March 2020, the Council endorsed the General Affairs Council's decision to open accession negotiations with Albania. The draft negotiation framework presented by the Commission in July 2020 is to be approved by the Council.

As part of the enlargement process, the Commission publishes annual assessment reports of the state of play in each candidate country accompanied by recommendations and guidance on the reform priorities for the candidate. In its October 2020 Report, the Commission noted that Albania is moderately prepared in the area of information society and audio-visual media (i.e. Chapter 10), recommending accelerating the continued adoption of the required amendments to the Law on Electronic Communications in order to align with the new European Electronic Communications Code, and approve the action plan for the digital agenda; finalise and adopt the national cybersecurity strategy; and draft a digital skills strategy. The Commission also noted that Albania needs to improve the collection of statistical data on digital performance and digital competitiveness to monitor the progress on electronic communications and information society.[80] In the area of Statistics (Chapter 18),

the Commission noted that Albania is moderately prepared with the Law on Official Statistics already aligned with the European Code of Practice and that most of the classification schemes being aligned with EU standards. According to the Commission, the Institute of Statistics (INSTAT) annual budget and staffing are insufficient for full implementation of the EU acquis in the field of statistics.[81]

2. Institutional framework

The progress on electronic communications and information society is monitored by three institutions:

- » Institute of Statistics (INSTAT)
- » Electronic and Postal Communications Authority of Albania (AKEP)
- » National Agency for Information Society (NAIS)

No gaps or overlaps are identified in terms of jurisdiction as all DESI indicators have been assigned to responsible institution for monitoring and data collection.

2.1. Institute of Statistics

As the statistical office of Albania, INSTAT is responsible for monitoring and data collection for 27 DESI indicators. The progress on electronic communications and information society by INSTAT is monitored through four main statistical operations:

- » ICT usage in households and by individuals survey
- » ICT usage in enterprises survey

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80 European Commission. 2020. Country Reports 2020. Available at: https://ec.europa.eu/neighbourhood-enlargement/countries/package_en

81 Ibid.

» Labour Force Survey (LFS)

» Administrative data on education

INSTAT has achieved high level of compliance with the Methodological Manuals and Model Questionnaires (MQs) for ICT usage in households and by individuals and ICT usage in enterprises surveys. However, only data for ICT usage in households and by individuals survey is transmitted and available in the Eurostat database. INSTAT does not transmit its data from the ICT usage in enterprises survey to Eurostat due to internal technical challenges.

In terms of LFS, INSTAT reported that while in the process to ensure full compliance, data for the ICT professionals indicators, as defined in DESI, are available but only as an extraction from the administrative registers. As for the ICT graduates, data for this indicator exists in the INSTAT database. However, as it is not fully aligned with the EU-LFS and UNESCO OECD Eurostat (UOE) data collection on education, INSTAT is not in a position to transmit these data to Eurostat.

INSTAT reported that there are no challenges or obstacles to comply with the established practice and to improve data collection in the context of DESI for Albania or in accordance with the Eurostat methodologies and MQs.

2.2. Electronic and Postal Communications Authority of Albania

The national regulator, the Electronic and Postal Communications Authority of Albania, is responsible for monitoring and data collection for seven DESI indicators, all of them in the Connectivity dimension. AKEP also collects data for 1a1 indicator, but the data used for DESI calculation is the one collected by INSTAT and reported to Eurostat. No overlaps between AKEP and INSTAT are identified as the DESI methodology clearly defines which data is used for DESI calculation for each indicator. AKEP publishes quarterly and annual reports on market developments in the electronic communications and postal markets.

With respect to the Connectivity dimension, AKEP has achieved high level of compliance with the process of data collection and methodological alignment for four DESI indicators. Concerning the Commission's ad hoc studies, in which Albania is currently not included, AKEP expressed readiness to participate in these or similar studies on European or regional level or to continue to calculate the score for these indicators if the methodology is available in advance and there is reasonable time for internal preparation.

No significant challenges were reported by AKEP in terms of data collection and calculations in relation to the DESI and Connectivity dimension.

2.3. National Agency for Information Society

National Agency for Information Society is mandated to monitor and collect data for four DESI indicators in the Digital public services dimension. It publishes annual reports about its work and the information society development. NAIS has already participated in the latest eGovernment Benchmark Study 2020 and already ensures the collection of data for three of the four DESI indicators for Albania.

Regarding the Open data indicator, unfortunately, Albania is neither part of the European Data Portal (EDP) nor of the Open Data Maturity Report 2020. As NAIS monitors these indicators, it should increase its readiness to participate in the EDP Study on the European or the WB regional level, or to calculate the score for this indicator using the same EDP Methodology.

No significant challenges were reported by NAIS in terms of monitoring the Digital public service dimension.

3. Digital Economy and Society Index

On the availability of statistical data on digital performance and digital competitiveness in the context of DESI, Albania is **moderately prepared** with data for 73% of DESI indicators being available and aligned to the DESI Method-

ology. Data for 13.5% of the indicators are available, but further methodological alignments are necessary. Data for 13.5% of indicators are still not available.

Data is available and fully aligned with DESI Methodology	🟢	27 Indicators (73%)
Data is available but not fully aligned with DESI Methodology	🟡	5 Indicators (13.5%)
Data is not available	🔴	5 Indicators (13.5%)

Table 1: Albania: Summary of DESI indicators (Source: Authors, 2021)

3.1. Connectivity

Data collection and monitoring the development of Digital public services dimension is the responsibility of INSTAT (one indicator) and AKEP (seven indicators).

Full alignment with DESI Methodology is achieved for five of eight indicators. Data for four indicators (1a2, 1c1, 1c2 and 1c3) are collected by AKEP and are fully aligned with DESI definitions and methodology. Data for one indicator (1a1) is collected by INSTAT and is already published in Eurostat database.

Partial alignment is achieved for three indicators. Namely, data for two indicators (1b1 and 1b2) that derives from the Study on Broadband Coverage in Europe is collected by AKEP as Albania is not included in this Study. AKEP will need to

align its methodologies and definitions with the methodology used for the Study and in DESI in order to calculate the score for these indicators in the context of DESI.

Data for Broadband price index (1d1) indicator is also available as the AKEP is measuring this index but using ITU Methodology.[83] Since data for this indicator also derives from the Study on Mobile and Fixed Broadband Prices in Europe as a Commission ad hoc report in which Albania is not included, AKEP makes calculations for the fixed prices only.

To fully align with DESI, AKEP expressed readiness to participate in all ad hoc studies (on European or regional level) or to calculate the score for these indicators if the methodologies are available in advance and there is reasonable time for internal preparation.

Indicator	Responsible institution	Data available
1a1 Overall fixed broadband take-up	INSTAT	🟢 2018/2019
1a2 At least 100 Mbps fixed broadband take-up	AKEP	🟢 2019
1b1 Fast broadband (NGA) coverage	AKEP	🟡 2019
1b2 Fixed Very High Capacity Network (VHCN) coverage	AKEP	🟡 2019
1c1 4G coverage	AKEP	🟢 2019
1c2 Mobile broadband take-up	AKEP	🟢 2019
1c3 5G readiness	AKEP	🟢 2019
1d1 Broadband price index	AKEP	🟡 2019

Table 2: Albania: Connectivity indicators assessment (Source: Adjusted by Authors, AKEP, INSTAT, Eurostat, 2021)

3.2. Human Capital

Data collection for Human Capital dimension is the responsibility of INSTAT (six indicators).

Full alignment with DESI Methodology is achieved for four of six indicators. Data for three indicators (2a1, 2a2 and 2a3) that derives from the ICT usage in households and by individuals survey is

82   International Telecommunications Union (ITU). 2019. Measuring digital development ICT Price Trends 2019

available on Eurostat for the last reported year (2019). Although not available in the Eurostat database, data for the ICT graduates indicator (2b3) is available in the INSTAT database.

Partial alignment is achieved for two indicators (2b1 and 2b2). INSTAT reported that data for

these indicators are extracted from administrative sources and not from the LFS. As the domestic LFS is not aligned with the EU-LFS, data for these indicators is not available on Eurostat.

Indicator	Responsible institution	Data available	
2a1 At least basic digital skills	INSTAT	🟢	2019
2a2 Above basic digital skills	INSTAT	🟢	2019
2a3 At least basic software skills	INSTAT	🟢	2019
2b1 ICT specialists	INSTAT	🟠	2019
2b2 Female ICT specialists	INSTAT	🟠	2019
2b3 ICT graduates	INSTAT	🟢	2018

Table 3: Albania: Human capital indicators assessment (Source: Adjusted by Authors, INSTAT, Eurostat, 2021)

3.3. Use of Internet services

Data collection for the Use of internet services dimension is the responsibility of INSTAT (eleven indicators). Domestic methodology and questionnaire are aligned with the Eurostat Methodological Manual and MQs for ICT usage in households and by individuals survey and are adjusted every year.

Full alignment with DESI Methodology is achieved for all eleven indicators. Data for all indicators for the last reported year (2019) are transmitted and are available in the Eurostat database and can be used in the context of DESI calculation for Albania.

Indicator	Responsible institution	Data available	
3a1 People who have never used the internet	INSTAT	🟢	2018/2019
3a2 Internet users	INSTAT	🟢	2018/2019
3b1 News	INSTAT	🟢	2019
3b2 Music, videos and games	INSTAT	🟢	2018
3b3 Video on demand	INSTAT	🟢	2018
3b4 Video calls	INSTAT	🟢	2018/2019
3b5 Social networks	INSTAT	🟢	2018/2019
3b6 Doing an online course	INSTAT	🟢	2019
3c1 Banking	INSTAT	🟢	2018/2019
3c2 Shopping	INSTAT	🟢	2018/2019
3c3 Selling online	INSTAT	🟢	2018/2019

Table 4: Albania: Use of Internet services indicators assessment (Source: Adjusted by Authors, INSTAT, Eurostat, 2021)

3.4. Integration of digital technology

Data collection for the Integration of digital technology dimension is the responsibility of INSTAT (seven indicators). Domestic methodology and questionnaire are aligned with the Eurostat Methodological manual and MQs for ICT usage in enterprises survey and are adjusted accordingly every year.

Full alignment with DESI Methodology is achieved for three of seven indicators. Data for these indicators (4a1, 4a2 and 4a4) for the last reported years (2018, 2019 and 2020) are available in the INSTAT statistical database but are not transmitted to Eurostat.

Data is not available for four indicators. Data for the Big data indicator (4a3) as defined in DESI 2020 Methodology is not available, but it was collected by INSTAT for the first time in 2020 survey and will be published in 2021. Data for three of these indicators (4b1, 4b2 and 4b3) are also collected by INSTAT for the last reported year (2019) but are not published due to quality assurance challenges. Data for 4b3 indicator is not collected in the 2020 survey as according to Eurostat definition this is a biannual indicator, hence next cycle is to be collected in 2021.

Indicator	Responsible institution	Data available	
4a1 Electronic information sharing	INSTAT	🟢	2019
4a2 Social media	INSTAT	🟢	2019
4a3 Big data	INSTAT	🔴	
4a4 Cloud	INSTAT	🟢	2020
4b1 SMEs selling online	INSTAT	🔴	
4b2 e-Commerce turnover	INSTAT	🔴	
4b3 Selling online cross-border	INSTAT	🔴	

Table 5: Albania: Integration of digital technology indicators assessment (Source: Adjusted by Authors, INSTAT, 2021)

3.5. Digital Public Services

Data collection and monitoring the development of Digital public services dimension is the responsibility of INSTAT (one indicator) and NAIS (four indicators).

Full alignment with DESI Methodology is achieved for four of five indicators. Data for one indicator (5a1), for the last reported year (2019), is collected by INSTAT and derives from the ICT usage in households and by individuals survey. Data for this indicator for the last year (2019) is transmitted and is available in the Eurostat database.

Data for three indicators (5a2, 5a3 and 5a4) are fully aligned with the DESI Methodology as deriving from the biannual eGovernment Bench-

mark Report. As Albania was included in the latest 2020 Report data for these indicators are available and can be used in the context of DESI calculation for Albania.

Lastly, data for the Open data indicator (5a5) is not available, as Albania is not part of the European Data Portal (EDP) and was therefore not included in the Open Data Maturity Report 2020.

As NAIS collects data for measurement in the eGovernment and open data maturity, it should ensure institutional readiness for participation in these or similar ad hoc studies on European or regional WB level, or to calculate the 5a5 indicator using the same methodology.

Indicator	Responsible institution	Data available	
5a1 e-Government users	INSTAT	🟢	2019
5a2 Pre-filled forms	NAIS	🟢	2020
5a3 Online service completion	NAIS	🟢	2020
5a4 Digital public services for businesses	NAIS	🟢	2020
5a5 Open data	NAIS	🔴	

Table 6: Albania: Digital public services indicators assessment (Source: Adjusted by Authors, INSTAT, Eurostat, eGovernment Benchmark 2020, 2021)

4. Recommendations

Following the findings of this Report, a set of nine specific recommendations across three organisations for improving the level of preparation and data collection in the context of DESI is made below.

Recommendations for the Institute of Statistics

1. INSTAT should maintain the current high level of compliance with the Eurostat surveys for ICT usage in households and by individuals. In order to do so, INSTAT must adapt its annual methodologies and MQs to Eurostat.

2. INSTAT should improve compliance with the Eurostat survey on ICT usage in enterprises and adapt its annual methodologies and MQs to Eurostat. INSTAT should also start transmitting this data to Eurostat.

3. INSTAT should harmonise its methodologies with the EU-LFS. To fill the gap, INSTAT should find an alternative way to collect data for ICT specialists in employment in the context of DESI.

4. INSTAT should improve compliance with the UOE data collection on education and start transmitting this data to Eurostat.

Recommendations for the Electronic and Postal Communications Authority of Albania

5. AKEP should continue to monitor development in the Connectivity dimension, especially development in the Broadband take-up and Mobile market as defined in the Digital Agenda Scoreboard key indicators.[83] In the context of DESI, AKEP also needs to monitor the potential changes in the indicators and methodologies.

6. AKEP should align its methodologies and calculate the score in the context of DESI for the indicators that use data from the Commissions ad hoc studies as AKEP already collects data for these indicators.

7. With respect to the Commissions ad hoc studies, AKEP should undertake internal preparations for participation in these studies on a European or regional level.

Recommendations for the National Agency for Information Society

8. NAIS should continue with its active participation in the eGovernment Benchmark Study to ensure monitoring of Digital Public Service dimension for Albania.

9. NAIS should make all necessary efforts for the inclusion of Albania in EDP and Open Data Maturity Reports. If not included, NAIS should calculate this indicator for Albania using the same methodology.

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83 Digital Scoreboard Key Indicators: https://digital-agenda-data.eu/datasets/digital_agenda_scoreboard_key_indicators/#

BOSNIA AND HERZEGOVINA

1. Background

Bosnia and Herzegovina is a potential candidate for EU membership having its application submitted in February 2016. Following the European Council decision, the Commission adopted the Opinion in May 2019 identifying 14 key priorities in terms of opening EU accession negotiations. The Council endorsed the Opinion with the key priorities in December 2019 as a comprehensive roadmap.

As part of the enlargement process, the Commission publishes annual assessment reports of the state of play in each candidate country accompanied by recommendations and guidance on the reform priorities for the candidate. In its October 2020 Report, the Commission noted that Bosnia and Herzegovina is at an early stage of preparation in the area of information society and audio-visual media (Chapter 10), recommending adoption of a law on electronic communications and electronic media in line with the EU acquis; complete phase two of the digital switchover and adopt a framework strategy for access to broadband network; and adopt a law on electronic identity and trust services for electronic transactions with a single supervisory body for the whole economy in line with the EU acquis. In the area of Statistics (Chapter 18), the Commission noted that Bosnia and Herzegovina is at an early stage of preparations with the Law on Statistics of Bosnia and Herzegovina, and that remains to be aligned with the principles of the European Statistics Code of Practice. According to the Commission, the coordination of the national statistical system between the Agency for Statistics of Bosnia and Herzegovina (BHAS) and other producers needs to be strengthened, especially with the Entities' offices.

2. Institutional framework

The progress on electronic communications and information society is monitored by three institutions:

» Agency for Statistics of Bosnia and Herzegovina (BHAS)

» Bosnia and Herzegovina Communications Regulatory Agency (RAK)

» Ministry of Transport and Communications of Bosnia and Herzegovina (MKT)

No gaps or overlaps are identified in terms of jurisdiction as all DESI indicators have been assigned to responsible institution for monitoring and data collection.

2.1. Agency for Statistics of Bosnia and Herzegovina

The Agency for Statistics of Bosnia and Herzegovina performs international representation and cooperation with organisations and other bodies and fulfils international obligations of Bosnia and Herzegovina in terms of statistics; collects, processes and distributes statistical data of Bosnia and Herzegovina in accordance with internationally accepted standards. As the statistical agency of Bosnia and Herzegovina, BHAS is responsible for data collection for 27 DESI indicators. In order to do so, BHAS closely cooperates with the Institute for Statistics of Federation of Bosnia and Herzegovina (FIS), and the Institute for Statistics of Republika Srpska (RSIS). The progress on electronic communications and information society by BHAS is monitored through four statistical operations:

» ICT usage in households and by individuals survey

» ICT usage in enterprises survey

» Labour Force Survey (LFS)

» Administrative data on education

BHAS has achieved high level of compliance with the Methodological Manuals and Model Questionnaires (MQs) for ICT usage in households and by individuals and ICT usage in enterprises surveys. Data for both surveys are transmitted and are available in Eurostat database and can be used in the context of DESI calculation for Bosnia and Herzegovina.

In terms of LFS, BHAS reported that the process for harmonisation with the EU-LFS is not finished, and thus data for Bosnia and Herzegovina are not transmitted to Eurostat. To fill the gap, BHAS included the DESI indicators for ICT professionals in employment in the ICT usage in enterprises survey.

Concerning the UNESCO OECD Eurostat (UOE) joint collection data on Education, BHAS informed that this data is available in the entities education administrative databases only, but not collected on economy level. BHAS is still in the process of aligning with the UOE methodology.

In terms of challenges, BHAS noted that institutional capacities need to be strengthened in order to maintain harmonisation and alignment with Eurostat methodologies and practice, as well as implementation of new tools for data collection (e.g. web questionnaires).

2.2. Bosnia and Herzegovina Communications Regulatory Agency

The national regulator, the Bosnia and Herzegovina Communications Regulatory Agency, is responsible for monitoring and data collection for seven DESI indicators, all of them in the Connectivity dimension. RAK also collects data for 1a1 indicator, but the data used for DESI calculation is the one collected by BHAS and reported to Eurostat. No overlaps between RAK and BHAS are identified as the DESI methodology clearly defines which data is used for DESI calculation for each indicator. RAK publishes annual reports on market developments in electronic communications.

With respect to the Connectivity dimension, RAK has achieved high level of compliance with the process of data collection and methodological alignment for three DESI indicators. Concerning the Commissions ad hoc studies, in which Bosnia and Herzegovina is currently not included, RAK expressed readiness to participate in these or similar studies on the European or regional level. Currently, RAK is not in a position to collect data for these indicators due to its limited resources, capacities and methodological difficulties.

2.3. Ministry of Transport and Communications

According to the Information Society Development Policy of Bosnia and Herzegovina 2017-2021, MKT is mandated to coordinate and monitor development of information society and thus collect data for four DESI indicators.

Unfortunately, Bosnia and Herzegovina was not included in the eGovernment Benchmark Report 2020 and the Open Data Maturity Report 2020. As MKT is obliged to monitor development of information society, it expresses readiness to participate in both studies on the European or regional level. However, due to its limited capacities, MKT is not in a position to collect data for these indicators.

3. Digital Economy and Society Index

On the availability of statistical data on digital performance and digital competitiveness in the context of DESI, Bosnia and Herzegovina is **moderately prepared** with data for 73% of DESI indicators being available and aligned to the DESI Methodology. However, data for 27% of indicators are still not available.

Data is available and fully aligned with DESI Methodology	🟢	27 Indicators (73%)
vData is not available	🔴	10 Indicators (27%)

Table 1: Bosnia and Herzegovina: Summary of DESI indicators (Source: Authors, 2021)

3.1. Connectivity

Data collection and monitoring the development of Connectivity dimension is the responsibility of BHAS (one indicator) and RAK (seven indicators).

Full alignment with DESI Methodology is achieved for four of eight indicators. Data for three of these indicators (1a2, 1c1, and 1c2) are collected by RAK and are fully aligned with DESI definitions and methodology. Data for 1a1 indicator is collected by BHAS and is already published in the Eurostat database.

Data for 5G readiness indicator (1c3) is not available as the process for review and adoption of

new regulations for 2020-2022 has not been finished yet. The inclusion of three spectrum bands will set a base for the calculation of 5G readiness indicator.

Data for four indicators (1b1, 1b2, 1c3 and 1d1) are not available as neither Bosnia and Herzegovina is included in the Commission ad hoc studies nor RAK collects data for these indicators. As all of them derive from the Commission ad hoc studies, RAK expressed readiness to participate in these studies (on a European or regional level). Currently, RAK is not in a position to collect data for these indicators due to its limited resources, capacities and methodological difficulties.

Indicator	Responsible institution	Data available	
1a1 Overall fixed broadband take-up	BHAS	🟢	2018-2020
1a2 At least 100 Mbps fixed broadband take-up	RAK	🟢	2019
1b1 Fast broadband (NGA) coverage	RAK	🔴	
1b2 Fixed Very High Capacity Network (VHCN) coverage	RAK	🔴	
1c1 4G coverage	RAK	🟢	2019
1c2 Mobile broadband take-up	RAK	🟢	2019
1c3 5G readiness	RAK	🔴	
1d1 Broadband price index	RAK	🔴	

Table 2: Bosnia and Herzegovina: Connectivity indicators assessment (Source: Adjusted by Authors, RAK, Eurostat, 2021)

3.2. Human Capital

Data collection for Human Capital dimension is the responsibility of BHAS (six indicators).

Full alignment with DESI Methodology is achieved for five of six indicators. Data for three indicators (2a1, 2a2 and 2a3) derive from the ICT usage in households and by individuals survey and are available on Eurostat for the last reported year (2019).

Data for two indicators (2b1 and 2b2) are also available but are not collected through the LFS. To fill the gap, BHAS collects data for these indicators through the ICT usage in the household survey using the International Standard Classification of Occupations (ISCO) classification (ISCO-08) on which occupations will be treated as ICT specialists.

Data for the ICT Graduates indicator (2b3) is not available neither in the BHAS database nor

the Eurostat. As administrative data, it is available only at the entity level. The data could be available at the BHAS request to the entity statistical institutions, which will take further action to collect data from administrative sources.

Indicator	Responsible institution	Data available
2a1 At least basic digital skills	BHAS	🟢 2019
2a2 Above basic digital skills	BHAS	🟢 2019
2a3 At least basic software skills	BHAS	🟢 2019
2b1 ICT specialists	BHAS	🟢 2018, 2019, 2020
2b2 Female ICT specialists	BHAS	🟢 2018, 2019, 2020
2b3 ICT graduates	BHAS	🔴

Table 3: Bosnia and Herzegovina: Human capital indicators assessment (Source: Adjusted by Authors, BHAS, Eurostat, 2021)

3.3. Use of Internet services

Data collection for the Use of internet services dimension is the responsibility of BHAS (eleven indicators). The domestic methodology and questionnaire are aligned with the Eurostat Methodological manual and MQs for ICT usage in households and by individuals survey and are adjusted every year.

Full alignment with DESI Methodology is achieved for all eleven indicators. Data for all indicators for the last reported year (2020) are transmitted and available in the Eurostat database and can be used in the context of DESI calculation for Bosnia and Herzegovina.

Indicator	Responsible institution	Data available
3a1 People who have never used the internet	BHAS	🟢 2018-2020
3a2 Internet users	BHAS	🟢 2018-2020
3b1 News	BHAS	🟢 2019/2020
3b2 Music, videos and games	BHAS	🟢 2018/2020
3b3 Video on demand	BHAS	🟢 2018-2020
3b4 Video calls	BHAS	🟢 2018-2020
3b5 Social networks	BHAS	🟢 2018-2020
3b6 Doing an online course	BHAS	🟢 2019/2020
3c1 Banking	BHAS	🟢 2018-2020
3c2 Shopping	BHAS	🟢 2018-2020
3c3 Selling online	BHAS	🟢 2018-2020

Table 4: Bosnia and Herzegovina: Use of Internet services indicators assessment (Source: Adjusted by Authors, BHAS, Eurostat, 2021)

3.4. Integration of digital technology

Data collection for the Integration of digital technology dimension is the responsibility of BHAS (seven indicators). The domestic methodology and questionnaire are aligned with the Eurostat Methodological manual and MQs for ICT usage in enterprises survey and are adjusted accordingly every year.

Full alignment with DESI Methodology is achieved for six of seven indicators. Data for these indicators for the last reported years (2018, 2019 and 2020) are transmitted and available in the Eurostat database and can be used for DESI calculation for Bosnia and Herzegovina.

Concerning DESI 2020 Methodology, data for Big data indicator (4a3) is missing for Bosnia and Herzegovina in the Eurostat database due to its discontinuation in 2019. As this indicator is replaced by multiple alternative indicators for Big data, it is expected that DESI 2021 Methodology will replace it with one or more alternative indicators. In the context of Bosnia and Herzegovina, this cannot be seen as a major issue since BHAS continuously aligns the domestic methodology and questionnaire with the Eurostat Methodological Manual and MQ.

Indicator	Responsible institution	Data available
4a1 Electronic information sharing	BHAS	🟢 2018
4a2 Social media	BHAS	🟢 2018
4a3 Big data	BHAS	🔴
4a4 Cloud	BHAS	🟢 2018/2020
4b1 SMEs selling online	BHAS	🟢 2018-2020
4b2 e-Commerce turnover	BHAS	🟢 2018-2020
4b3 Selling online cross-border	BHAS	🟢 2019

Table 5: Bosnia and Herzegovina: Integration of Digital Technology assessment (Source: Adjusted by Authors, BHAS, Eurostat, 2021)

3.5. Digital Public Services

Data collection and monitoring the development of Digital public services dimension is the responsibility of BHAS (one indicator) and MKT (four indicators).

Full alignment with DESI Methodology is achieved for one of five indicators. Data for one indicator (5a1), for the last reported year (2020), is collected by BHAS and derives from the ICT usage in households and by individuals survey. Data for this indicator for the last year (2020) is transmitted and is available in the Eurostat database.

Data for other four indicators (5a2, 5a3, 5a4 and 5a5) are not available as Bosnia and Herzegovina was not included in the last 2020 eGovernment Benchmark Report and Open Data Maturity Report 2020. Since MKT is mandated to monitor four DESI indicators in the Digital public services dimension, MKT expressed readiness to participate in the study at the European or regional level. Currently, due to its limited capacities, MKT is not in a position to collect data for these indicators.

Indicator	Responsible institution	Data available
5a1 e-Government users	BHAS	🟢 2018-2020
5a2 Pre-filled forms	MKT	🔴
5a3 Online service completion	MKT	🔴
5a4 Digital public services for businesses	MKT	🔴
5a5 Open data	MKT	🔴

Table 6: Bosnia and Herzegovina: Digital public services indicators assessment (Source: Adjusted by Authors, BHAS, Eurostat, 2021)

4. Recommendations:

Following the findings of this Report, a set of nine specific recommendations across three organisations for improving the level of preparation and data collection in the context of DESI is made below.

Recommendations for Agency for Statistics of Bosnia and Herzegovina

1. BHAS should maintain the current high level of compliance with both Eurostat surveys for ICT usage in households and by individuals and ICT usage in enterprises. In order to do so, BHAS needs to adapt its annual methodologies and MQs to Eurostat.

2. BHAS should harmonise its methodologies with the EU-LFS for the Advanced skills and development dimension. To address this gap, BHAS should continue its data collection for ICT specialists in employment through the ICT usage in enterprises survey.

3. BHAS should start collecting data for education using the UOE methodology for data collection on education.

4. BHAS should increase coordination and collaboration with the Entities' statistical offices (FIS and RSIS).

Recommendations for Bosnia and Herzegovina Communications Regulatory Agency

5. RAK should continue to monitor development in the Connectivity dimension, particularly development in the Broadband take-up and Mobile market as defined in the Digital Agenda Scoreboard key indicators.[84] In the context of DESI, RAK should monitor changes in relevant EU indicators and methodologies and adjust accordingly.

6. RAK should start its data collection for the Broadband coverage and prices indicators as defined in the Digital Agenda Scoreboard key indicators.[85] In order to do so, it is recommended that RAK explores all possibilities for strengthening its capacities to collect data for these indicators.

7. RAK should undertake internal preparations for participation in the Commissions ad hoc studies or at the WB regional level. RAK should provide data to the third parties carrying out these studies at the beginning and verify the results at the end of the process.

Recommendations for the Ministry of Transport and Communications

8. MKT should make all necessary efforts to include Bosnia and Herzegovina in the eGovernment Benchmark Studies and EDP.

9. MKT should undertake internal preparations for participation in ad hoc studies on the European or WB regional level. MKT should provide data to the third parties carrying out these studies at the beginning and verify the results at the end of the process.

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84 Digital Scoreboard Key Indicators: https://digital-agenda-data.eu/datasets/digital_agenda_scoreboard_key_indica-tors/#

85 Ibid.

KOSOVO*

1. Background

Kosovo* is a potential candidate for EU membership, and the EU-Kosovo* Stabilisation and Association Agreement entered into force in April 2016.

As part of the enlargement process, the Commission publishes annual assessment reports of the state of play in each candidate country accompanied by recommendations and guidance on the reform priorities for the candidate. In its October 2020 Report, the Commission noted that Kosovo* has some level of preparation in the area of information society and audio-visual media (Chapter 10), recommending that telecoms and media regulators are given adequate resources to fulfil their mandates independently; implement number portability to ensure effective use of numbering resources and fostering competition; and free the first digital dividend / liberate frequencies. In the area of Statistics (Chapter 18), the Commission noted that Kosovo* has some level of preparation with improving the methodology for data collection following Eurostat recommendations and with the ratification of the amended Law on Statistics. The statistical infrastructure is mostly in line with the European Statistics Code of Practice.

2. Institutional framework

The progress on electronic communications and information society is monitored by three institutions:

» Kosovo* Agency of Statistics (KAS)

» Regulatory Authority of Electronic and Postal Communications (ARKEP)

» Agency for Information Society (AIS)

No gaps or overlaps are identified in terms of jurisdiction as all DESI indicators have been assigned to responsible institution for monitoring and data collection.

2.1. Kosovo* Agency of Statistics

As the statistical agency of Kosovo*, KAS is responsible for data collection for 27 DESI indicators. The progress on electronic communications and information society by KAS is monitored through four statistical operations:

» ICT usage in households and by individuals survey

» ICT usage in enterprises survey

» Labour Force Survey (LFS)

» Administrative data on education

KAS has achieved high level of compliance with the Methodological Manuals and Model Questionnaires (MQs) for ICT usage in households and by individuals and ICT usage in enterprises surveys. However, only data for the ICT usage in households and by individuals survey is transmitted and available in the Eurostat database. KAS does not transmit its data from the ICT usage in enterprises survey to Eurostat due to internal technical challenges.

In terms of LFS, KAS reported that although in process for full compliance, data for the ICT professionals indicators, as defined in DESI, are available for 2018 and 2019. However, KAS is not transmitting these data to Eurostat yet.

Lastly, no data is transmitted from administrative registers to UNESCO OECD Eurostat (UOE) database. In terms of the ICT graduates indicator, as defined in DESI, KAS collects data for the ICT graduates in public and private universities.

KAS reported that there are no challenges or obstacles to comply with the established practice and to improve the data collection in the context of DESI for Kosovo* or in accordance with the Eurostat methodologies and MQs.

2.2. Regulatory Authority of Electronic and Postal Communications

The national regulator, the Regulatory Authority of Electronic and Postal Communications, is re-

sponsible for monitoring and data collection for seven DESI indicators, all of them in the Connectivity dimension. ARKEP also collects data for 1a1 indicator, but the data used for DESI calculation is the one collected by KAS and reported to Eurostat. No overlaps between ARKEP and KAS are identified as the DESI methodology clearly defines which data is used for DESI calculation for each indicator. ARKEP publishes annual reports on market developments in the electronic communications and postal markets.

With respect to the Connectivity dimension, ARKEP has achieved high level of compliance with the process of data collection and methodological alignment for four DESI indicators. Concerning indicators that derive from the Commissions ad hoc studies, in which Kosovo* is currently not included, ARKEP has data for all indicators. However, further methodological alignments are necessary in order to produce a methodologically aligned score in the context of DESI. Moreover, ARKEP expressed readiness to participate in these or similar studies on European or regional WB level, or to continue to calculate the score for these indicators if the methodology is available in advance and there is reasonable time for internal preparation.

Except for the Broadband price index methodology and the associated complexity, ARKEP reported that there are no challenges or obstacles to comply with the established practice and to collect data for Kosovo* in the context of DESI.

2.3. Agency for Information Society

The Agency for Information Society is mandated to monitor and collect data for four DESI indicators in the Digital public services dimension.

Unfortunately, Kosovo* was not included in the eGovernment Benchmark Report 2020 and the Open Data Maturity Report 2020. As AIS is responsible to monitor these indicators, it should ensure institutional readiness for participation in these or similar ad hoc studies on the European or regional WB level.

3. Digital Economy and Society Index

On the availability of statistical data on digital performance and digital competitiveness in the context of DESI, Kosovo* is **highly prepared** with data for 76% of DESI indicators being available and aligned to the DESI Methodology. Data for 8% of the indicators are available, but further methodological alignments are necessary. Data for 16% of indicators are still not available.

Data available and fully aligned with DESI Methodology	🟢	28 Indicators (76%)
Data available but not fully aligned with DESI Methodology	🟡	3 Indicators (8%)
Data not available	🔴	6 Indicators (16%)

Table 1: Kosovo: Summary of DESI indicators (Source: Authors, 2021)*

3.1. Connectivity

Data collection and monitoring the development of Connectivity dimension is the responsibility of KAS (one indicator) and ARKEP (seven indicators).

Full alignment with the DESI Methodology is achieved for five of eight indicators. Data for four indicators (1a2, 1c1, 1c2 and 1c3) are collected by ARKEP and are fully aligned with the DESI definitions and methodology. Data for one

indicator (1a1) is collected by KAS and is already published in the Eurostat database.

Partial alignment is achieved for three indicators. Data for two of these indicators (1b1 and 1b2) derived from the Study on Broadband Coverage in Europe are collected by ARKEP as Kosovo* is not included in the Commission's Report. ARKEP will need to align its methodologies and definitions with the methodology used for the Study and in the DESI in order to calculate the score of these indicators for Kosovo*.

Data for the Broadband price index (1d1) indicator is also available as the ARKEP is measuring this index but using ITU Methodology.[87] Data for this indicator is derived from the Study on Mobile and Fixed Broadband Prices in Europe as a Commission ad hoc study in which Kosovo* is not included, and ARKEP makes calculations for the fixed prices only.

To full align with DESI, ARKEP expressed its readiness to participate in all ad hoc studies (on European or regional WB level) or to calculate the score for these indicators if the methodologies are available in advance and there is reasonable time for internal preparation.

Indicator	Responsible institution	Data available	
1a1 Overall fixed broadband take-up	KAS	🟢	2018-2020
1a2 At least 100 Mbps fixed broadband take-up	ARKEP	🟢	2019
1b1 Fast broadband (NGA) coverage	ARKEP	🟡	2019
1b2 Fixed Very High Capacity Network (VHCN) coverage	ARKEP	🟡	2019
1c1 4G coverage	ARKEP	🟢	2019
1c2 Mobile broadband take-up	ARKEP	🟢	2019
1c3 5G readiness	ARKEP	🟢	2019
1d1 Broadband price index	ARKEP	🟡	2019

Table 2: Kosovo: Connectivity indicators assessment (Source: Adjusted by Authors, ARKEP, KAS, Eurostat, 2021)*

3.2. Human Capital

Data collection for the Human Capital services dimension is the responsibility of KAS (six indicators).

Full alignment with the DESI Methodology is achieved for all six indicators. Data for three indicators (2a1, 2a2 and 2a3) derive from the ICT usage in households and by individuals survey

and are available on Eurostat for the last reported year (2019). Data for two indicators (1b1 and 1b2) are collected by KAS and are available in the KAS database, but not transmitted to Eurostat.

Data for the ICT Graduates (2b3) indicator, as defined in the UOE joint methodology, is also available as KAS have data for ICT graduates from public and private universities only. Data for this indicator is not transmitted to Eurostat.

Indicator	Responsible institution	Data available	
2a1 At least basic digital skills	KAS	🟢	2019
2a2 Above basic digital skills	KAS	🟢	2019
2a3 At least basic software skills	KAS	🟢	2019
2b1 ICT specialists	KAS	🟢	2018/2019
2b2 Female ICT specialists	KAS	🟢	2018/2019
2b3 ICT graduates	KAS	🟢	2020

Table 3: Kosovo: Human capital indicators assessment (Source: Adjusted by Authors, KAS, Eurostat, 2021)*

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86   International Telecommunications Union (ITU). 2019. Measuring digital development ICT Price Trends 2019

3.3. Use of Internet services

Data collection for the Use of internet services dimension is the responsibility of KAS (eleven indicators). The domestic methodology and questionnaire are aligned with the Eurostat Methodological Manual and MQs for ICT usage in households and by individuals survey and are adjusted every year.

Full alignment with the DESI Methodology is achieved for all eleven indicators. Data for all indicators, for the last reported year (2020), is transmitted to and available in the Eurostat database, and can be used in the context of DESI calculation for Kosovo*.

Indicator	Responsible institution	Data available
3a1 People who have never used the internet	KAS	🟢 2018-2020
3a2 Internet users	KAS	🟢 2018-2020
3b1 News	KAS	🟢 2019/2020
3b2 Music, videos and games	KAS	🟢 2018/2020
3b3 Video on demand	KAS	🟢 2018/2020
3b4 Video calls	KAS	🟢 2018-2020
3b5 Social networks	KAS	🟢 2018-2020
3b6 Doing an online course	KAS	🟢 2019/2020
3c1 Banking	KAS	🟢 2018-2020
3c2 Shopping	KAS	🟢 2018-2020
3c3 Selling online	KAS	🟢 2018-2020

Table 4: Kosovo: Use of Internet services indicators assessment (Source: Adjusted by Authors, KAS, Eurostat, 2021)*

3.4. Integration of digital technology

Data collection for the Integration of digital technology dimension is the responsibility of KAS (seven indicators). The domestic methodology and questionnaire are aligned with the Eurostat Methodological Manual and MQs for ICT usage in enterprises survey and are adjusted accordingly every year.

Full alignment with the DESI Methodology is achieved for five of seven indicators. Data for five indicators (4a1, 4a2, 4b1, 4b2 and 4b3), for the last reported years (2018 and 2019), are available in the KAS statistical database but are not transmitted to Eurostat due to internal technical issues.

Data for the Big data (4a3) and Cloud (4a4) indicators, as defined in DESI Methodology, are not collected by KAS.

Indicator	Responsible institution	Data available
4a1 Electronic information sharing	KAS	🟢 2018/2019
4a2 Social media	KAS	🟢 2018/2019
4a3 Big data	KAS	🔴
4a4 Cloud	KAS	🔴
4b1 SMEs selling online	KAS	🟢 2018/2019
4b2 e-Commerce turnover	KAS	🟢 2018/2019
4b3 Selling online cross-border	KAS	🟢 2018/2019

Table 5: Kosovo: Integration of digital technology indicators assessment (Source: Adjusted by Authors, KAS, 2021)*

3.5. Digital Public Services

Data collection and monitoring of the development of the Digital public services dimension is the responsibility of KAS (one indicator) and AIS (four indicators).

Full alignment with DESI Methodology is achieved for one of five indicators. Data for this indicator (5a1), for the last reported year (2020), is collected by KAS and derives from the ICT usage in households and by individuals survey. Data for this indicator for the last year (2020) is transmitted and is available in Eurostat database.

Data for three indicators (5a2, 5a3 and 5a4) is not available as Kosovo* was not included in the last 2020 eGovernment Benchmark Report. Data for the Open data indicator (5a5) is also not available as Kosovo* is not part of the European Data Portal (EDP) and was therefore not included in the Open Data Maturity Report 2020.

As AIS collects data for the measurement of eGovernment and open data maturity, it should ensure its institutional readiness for participation in these or similar ad hoc studies on European or regional WB level, or to calculate the 5a5 indicator using the same methodology.

Indicator	Responsible institution	Data available
5a1 e-Government users	KAS	🟢 2018-2020
5a2 Pre-filled forms	AIS	🔴
5a3 Online service completion	AIS	🔴
5a4 Digital public services for businesses	AIS	🔴
5a5 Open data	AIS	🔴

Table 6: Kosovo: Digital public services indicators assessment (Source: Adjusted by Authors, KAS, Eurostat, eGovernment Benchmark 2020, 2021)*

4. Recommendations

Following the findings of this Report, a set of nine specific recommendations across three organisations for improving the level of preparation and data collection in the context of DESI is made below.

Recommendations for the Kosovo* Agency of Statistics

1. KAS should maintain its current high level of compliance with the Eurostat surveys for ICT usage in households and by individuals. In order to do so, KAS* needs to adapt its annual methodologies and MQs to Eurostat.

2. KAS should improve compliance with the Eurostat survey on ICT usage in enterprises and adapt its annual methodologies and MQs to Eurostat. KAS should also start with the transmission of these data to Eurostat.

3. KAS should harmonise its methodologies with the EU-LFS. To address the gap, KAS should continue with data collection for ICT specialists in employment.

4. KAS should start collecting data for education using the UOE methodology for data collection on education. Before full compliance with UOE, KAS should ensure inclusion of the ICT graduates from all universities in Kosovo* (public and private) in its administrative database to be able to provide data in the context of DESI.

Recommendations for the Regulatory Authority of Electronic and Postal Communications

5. ARKEP should continue to monitor development in the Connectivity dimension, particularly development in the Broadband take-up and Mobile market as defined in the Digital Agenda Scoreboard key indicators.[87] In the context of DESI, ARKEP should monitor and align with changes in the indicators and methodologies.

6. ARKEP should align its methodologies and calculate the score in the context of DESI for the indicators that use data from the Commissions ad hoc studies, and ARKEP should apply these approaches to the data already being collected for these indicators.

7. ARKEP should undertake internal preparations for participation in the Commissions ad hoc studies, on a European or regional WB level.

Recommendations for the Agency for Information Society

8. AIS should make all necessary efforts to include Kosovo* in the eGovernment Benchmark Studies and EDP.

9. AIS should undertake internal preparations for participation in ad hoc studies on the

European or regional WB level. It should be prepared to provide data to the third parties caring out these studies at the beginning and to verify the results at the end of the process.

MONTENEGRO

1. Background

Since December 2010 Montenegro has been a candidate for EU membership. The accession negotiations started on 29 June 2012. Of the 33 chapters of the EU acquis, 30 are currently opened, with three being provisionally closed.

As part of the enlargement process, the Commission publishes annual assessment reports of the state of play in each candidate country accompanied by recommendations and guidance on the reform priorities for the candidate. In its October 2020 Report, the Commission noted that Montenegro is moderately prepared in the area of information society and audio-visual media (Chapter 10), recommending establishing a track record to demonstrate an administrative capacity to enforce the EU acquis for electronic communications, information society services and audio-visual media services, including as regards regulatory independence. In the area of Statistics (Chapter 18), the Commission noted that Montenegro is also moderately prepared and recommends strengthening the human and financial resources of the Statistical Office of Montenegro (MONSTAT).

2. Institutional framework

The progress on electronic communications and information society is monitored by three institutions:

» Statistical Office of Montenegro (MONSTAT)

» Agency for Electronic Communications and Postal Services of Montenegro (EKIP)

» Ministry of Public Administration, Digital Society and Media (MPA)

No gaps or overlaps are identified in terms of jurisdiction as all DESI indicators have been assigned to responsible institution for monitoring and data collection.

2.1. Statistical Office of Montenegro

As the statistical office of Montenegro, MONSTAT is responsible for monitoring and data collection for 27 DESI indicators. The progress on electronic communications and information society by MONSTAT is monitored through four statistical operations:

» ICT usage in households and by individuals survey

» ICT usage in enterprises survey

» Labour Force Survey (LFS)

» Administrative data on education

MONSTAT has achieved high level of compliance with the Methodological Manuals and Model Questionnaires (MQs) for ICT usage in households and by individuals and ICT usage in enterprises surveys. Data for both surveys are transmitted and are available in the Eurostat database and can be used in the context of DESI calculation for Montenegro.

In terms of LFS and UNESCO OECD Eurostat (UOE) joint collection data on education, MONSTAT has aligned its methodologies with EU-LFS and UOE. Data for Montenegro is published on Eurostat and can be also used in the context of DESI calculation.

MONSTAT reported that there are no challenges or obstacles to comply with the established practice for collecting data for Montenegro according to Eurostat methodologies and MQs.

2.2. Agency for Electronic Communications and Postal Services of Montenegro

The national regulator, the Agency for Electronic Communications and Postal Services of Montenegro, is responsible for monitoring and data collection for seven DESI indicators, all of them in the Connectivity dimension. EKIP also collects data for 1a1 indicator, but the data used for DESI calculation is the one collected by MONSTAT and reported to Eurostat. No overlaps between

EKIP and MONSTAT are identified as the DESI methodology clearly defines which data is used for DESI calculation for each indicator. EKIP publishes annual reports on market developments in the electronic communications and postal markets.

With respect to the Connectivity dimension, EKIP has achieved high level of compliance with the process of data collection and methodological alignment for six DESI indicators. Concerning the Commissions ad hoc studies, in which Montenegro is currently not included, EKIP expressed readiness to participate in these or similar studies on European or regional WB level, or to continue to calculate the score for these indicators, if the methodology is available in advance and there is reasonable time for internal preparation.

Except for the Broadband price index methodology and the associated complexity, EKIP reported that there are no challenges or obstacles to comply with the established practice for collecting data for Montenegro in the context of DESI.

2.3. Ministry of Public Administration, Digital Society and Media

The Ministry of Public Administration, Digital Society and Media is mandated to monitor and collect data for four DESI indicators in the Digital public services dimension. MPA participated in the eGovernment Benchmark Study 2016, 2018 and 2020 and already ensures collection of data for three of the four DESI indicators for Montenegro.

With respect to the fourth Open data indicator, Montenegro is expected to be included in the future editions of the Open Data Maturity Report as part of the European Data Portal (EDP). Montenegro will therefore be included in the EDP Maturity Report 2021 which in turn ensures data collection for the Open data indicator.

MPA reported some institutional challenges and difficulties in terms of limited human capacities and lack of intergovernmental cooperation with other government agencies that provide eServices.

3. Digital Economy and Society Index

On the availability of statistical data on digital performance and digital competitiveness in the context of DESI, Montenegro is **highly prepared** with data for 76% of DESI indicators being available and aligned to the DESI Methodology. Data for 16% of the indicators are available, but further methodological alignments are necessary. Data for 8% of indicators are still not available.

Data is available and fully aligned with DESI Methodology	🟢	28 Indicators (76%)
Data is available but not fully aligned with DESI Methodology	🟡	6 Indicators (16%)
Data is not available	🔴	3 Indicators (8%)

Table 1: Montenegro: Summary of DESI indicators (Source: Authors, 2021)

3.1. Connectivity

Data collection and monitoring of the development of the Connectivity dimension is the responsibility of MONSTAT (one indicator) and EKIP (seven indicators).

Full alignment with the DESI Methodology is achieved for seven of eight indicators. Data for six indicators (1a2, 1b1, 1b2, 1c1, 1c2 and 1c3) are collected by EKIP and are fully aligned with the DESI definitions and methodology. Data for one indicator (1a1) is collected by MONSTAT and is already published in the Eurostat database.

Data for the Broadband price index (1d1) indicator is not available as the EKIP is not measuring this index. Data for this indicator derives from the Study on Mobile and Fixed Broadband Prices in Europe, a Commission ad hoc study in which Montenegro is currently not included. EKIP express its readiness to participate in all ad hoc studies (on European or regional WB level).

Indicator	Responsible institution	Data available	
1a1 Overall fixed broadband take-up	MONSTAT	🟢	2018-2020
1a2 At least 100 Mbps fixed broadband take-up	EKIP	🟢	2019
1b1 Fast broadband (NGA) coverage	EKIP	🟢	2019
1b2 Fixed Very High Capacity Network (VHCN) coverage	EKIP	🟢	2019
1c1 4G coverage	EKIP	🟢	2019
1c2 Mobile broadband take-up	EKIP	🟢	2019
1c3 5G readiness	EKIP	🟢	2019
1d1 Broadband price index	EKIP	🔴	

Table 2: Montenegro: Connectivity indicators assessment (Source: Adjusted by Authors, EKIP, Eurostat, 2021)

3.2. Human Capital

Data collection for the Human Capital dimension is the responsibility of MONSTAT (six indicators).

Full alignment with the DESI Methodology is achieved for three of six indicators. Data for three indicators (2a3, 2b1 and 2b2) that derives from the ICT usage in households and by individuals survey and the LFS, and are available on Eurostat. Data for the other two indicators (2a1 and 2a2) that derives from the ICT usage in households and by individuals survey are currently missing in the Eurostat database, but also are flagged by Eurostat as being of low reliability. Although data for these indicators exist in the MONSTAT database, data for these indicators are flagged as partially aligned to DESI.

Partial alignment is achieved for the ICT graduates indicator (2b3). Data for this indicator is reported and published for Montenegro for 2018 in the Eurostat database, but is flagged as differing in definition to that applied by Eurostat.

Indicator	Responsible institution	Data available	
2a1 At least basic digital skills	MONSTAT	🟡	2019[89]
2a2 Above basic digital skills	MONSTAT	🟡	2019[90]
2a3 At least basic software skills	MONSTAT	🟢	2019
2b1 ICT specialists	MONSTAT	🟢	2018[91]/2019[92]
2b2 Female ICT specialists	MONSTAT	🟢	2019[93]
2b3 ICT graduates	MONSTAT	🟡	2018[94]

Table 3: Montenegro: Human capital indicators assessment (Source: Adjusted by Authors, MONSTAT, Eurostat, 2021)

3.3. Use of Internet services

Data collection for the Use of internet services dimension is the responsibility of MONSTAT (eleven indicators). The domestic methodology and questionnaire are aligned with the Eurostat Methodological Manual and MQs for ICT usage

88   Low reliability (flagged by Eurostat)
89   Low reliability (flagged by Eurostat)
90   Eurostat estimate
91   Low reliability (flagged by Eurostat)
92   Low reliability (flagged by Eurostat)
93   Definition differs (flagged by Eurostat)

in households and by individuals survey and are adjusted every year.

Full alignment with the DESI Methodology is achieved for all eleven indicators. Data for all indicators, for the last reported year (2020), are transmitted and are available in the Eurostat database and can be used in the context of the DESI calculation for Montenegro.

Indicator	Responsible institution	Data available
3a1 People who have never used the internet	MONSTAT	🟢 2018-2020
3a2 Internet users	MONSTAT	🟢 2018-2020
3b1 News	MONSTAT	🟢 2019/2020
3b2 Music, videos and games	MONSTAT	🟢 2018/2020
3b3 Video on demand	MONSTAT	🟢 20182020
3b4 Video calls	MONSTAT	🟢 2018-2020
3b5 Social networks	MONSTAT	🟢 2018-2020
3b6 Doing an online course	MONSTAT	🟢 2019/2020
3c1 Banking	MONSTAT	🟢 2018-2020
3c2 Shopping	MONSTAT	🟢 2018-2020
3c3 Selling online	MONSTAT	🟢 2018-2020

Table 4: Montenegro: Use of Internet services indicators assessment (Source: Adjusted by Authors, MONSTAT, Eurostat, 2021)

3.4. Integration of digital technology

Data collection for the Integration of digital technology dimension is the responsibility of MONSTAT (seven indicators). The domestic methodology and questionnaire are aligned with the Eurostat Methodological Manual and MQs for ICT usage in enterprises survey and is adjusted accordingly every year.

Full alignment with the DESI Methodology is achieved for three of seven indicators. Data for three indicators (4a2, 4a4 and 4b3), for the last reported years (2018, 2019 and 2020), are transmitted and are available in the Eurostat database.

Data for three indicators (4a1, 4b1 and 4b2) are marked as partially aligned since data for these indicators are available in the MONSTAT database but are flagged by Eurostat as low reliable.

Concerning the 2020 DESI Methodology, data for the Big data indicator (4a3) is missing for Montenegro in the Eurostat database due to its discontinuation in 2019. As this indicator is replaced by multiple alternative indicators for Big data, it is expected that the DESI 2021 Methodology will replace it with one or more alternative indicators. In the context of Montenegro, this cannot be seen as a major issue as MONSTAT continuously aligns the domestic methodology and questionnaire with the Eurostat Methodological Manual and MQs.

Indicator	Responsible institution	Data available
4a1 Electronic information sharing	MONSTAT	🟠 2019[95]
4a2 Social media	MONSTAT	🟢 2019
4a3 Big data	MONSTAT	🔴
4a4 Cloud	MONSTAT	🟢 2018/2020
4b1 SMEs selling online	MONSTAT	🟠 2018,2019,2020[96]
4b2 e-Commerce turnover	MONSTAT	🟠 2018,2019[97],2020[98]
4b3 Selling online cross-border	MONSTAT	🟢 2019

Table 5: Montenegro: Integration of digital technology indicators assessment (Source: Adjusted by Authors, MONSTAT, Eurostat, 2021)

3.5. Digital Public Services

Data collection and monitoring of the development of the Digital public services dimension is the responsibility of MONSTAT (one indicator) and MPA (four indicators).

Full alignment with the DESI Methodology is achieved for four indicators. Data for one indicator (5a1), for the last reported year (2020), is collected by MONSTAT and derives from the ICT usage in households and by individuals survey. Data for this indicator for the last year (2020) is transmitted and is available in the Eurostat database.

Data for three indicators (5a2, 5a3 and 5a4) are also fully aligned with the DESI Methodology as

deriving from the biannual eGovernment Benchmark Report. As Montenegro was included in the last three editions (2016, 2018 and 2020), MPA actively participated in these studies. As a result, data for the three indicators are available and can be used for DESI calculation for Montenegro.

Data for the Open data indicator (5a5) is not available. As Montenegro is already part of the EDP, it is expected that Montenegro is also included in the Open Data Maturity Report in future editions, thus ensuring reliable data necessary for the calculation of DESI for Montenegro.

Indicator	Responsible institution	Data available
5a1 e-Government users	MONSTAT	🟢 2018-2020
5a2 Pre-filled forms	MPA	🟢 2016-2020
5a3 Online service completion	MPA	🟢 2016-2020
5a4 Digital public services for businesses	MPA	🟢 2016-2020
5a5 Open data	MPA	🔴

Table 6: Montenegro: Integration of digital technology indicators assessment (Source: Adjusted by Authors, MONSTAT, Eurostat, eGovernment Benchmark 2020, 2021)

4. Recommendations

Following the findings of the Report, a set of seven specific recommendations across three

organisations for improving the level of preparation and data collection in the context of DESI is made below.

94   Low reliability (flagged by Eurostat)
95   Low reliability (flagged by Eurostat)
96   Low reliability (flagged by Eurostat)
97   Low reliability (flagged by Eurostat)

Recommendations for the Statistical Office of Montenegro

1. MONSTAT should maintain the current high level of compliance with both Eurostat surveys for ICT usage in households and by individuals and ICT usage in enterprises. In order to do so, MONSTAT needs to adapt its annual methodologies and MQs to Eurostat.

2. MONSTAT should resolve the quality issues flagged by Eurostat for the ICT usage in enterprises survey.

3. MONSTAT should continue to align with the EU-LFS and UOE joint data collection on education, especially for indicators related to the ICT professionals in employment and ICT graduates.

Recommendations for the Electronic Communications and Postal Services of Montenegro

4. EKIP should continue to monitor development in the Connectivity dimension, especially development in the Broadband take-up and Mobile market as defined in the Digital Agenda Scoreboard key indicators.[98] In the context of DESI, EKIP should monitor and align with the changes in the indicators and methodologies, particularly the methodologies used in the Commissions ad hoc studies.

5. EKIP needs to adopt a domestic methodology for measuring the Broadband price index indicator which is currently missing. EKIP must use the same methodologies used in the Commissions ad hoc studies, at least until Montenegro is included in these studies on the European or regional WB level.

Recommendations for the Ministry of Public Administration, Digital Society and Media

6. MPA should continue with its active participation in the eGovernment Benchmark

Study to ensure monitoring of the Digital Public Service dimension for Montenegro.

7. MPA should ensure that Montenegro, as part of the EDP, will be included in the Open Data Maturity Report 2021. If not, the MPA should calculate this indicator for Montenegro using the same methodology.

NORTH MACEDONIA

1. Background

Since December 2005 North Macedonia has been a candidate for EU membership. Since October 2009 the Commission has been continuously recommending opening accession negotiations with North Macedonia. In March 2020, the European Council endorsed the General Affairs Council's decision to open accession negotiations with North Macedonia. The draft negotiation framework presented by the Commission in July 2020 is yet to be approved by the Council.

As part of the enlargement process, the Commission publishes annual assessment reports of the state of play in each candidate country accompanied by recommendations and guidance on the reform priorities for the candidate. In its October 2020 Report, the Commission noted that North Macedonia is moderately prepared in the area of information society and audio-visual media (Chapter 10) recognising the achievement of established national Broadband Competence Office (BCO) and enhanced eGovernment services. The Commission recommended North Macedonia to finalise the long-term ICT strategy. In the area of Statistics (Chapter 18), the Commission noted that North Macedonia is moderately prepared, noting improvements in all statistical areas and further aligning of sectoral statistics with EU standards. The Commission recommended that North Macedonia ensures adequate staffing and sufficient financial resources for the State Statistical Office (SSO).

2. Institutional framework

The progress on electronic communications and information society is monitored by four institutions:

» State Statistical Office (SSO)

» Agency for Electronic Communications (AEC)

» Broadband Competence Office (BCO)

» Ministry of Information Society and Administration (MISA)

No gaps or overlaps are identified in terms of jurisdiction as all DESI indicators have been assigned to responsible institution for monitoring and data collection.

2.1. State Statistical Office

As the statistical office of North Macedonia, SSO is responsible for monitoring and data collection for 27 DESI indicators. The progress on electronic communications and information society by SSO is monitored through four main statistical operations:

» ICT usage in households and by individuals survey

» ICT usage in enterprises survey

» Labour Force Survey (LFS)

» Administrative data on education

SSO has achieved high level of compliance with the Methodological Manuals and Model Questionnaires (MQs) for ICT usage in households and by individuals and ICT usage in enterprises surveys. Data for both surveys are transmitted and are available in the Eurostat database and can be used in the context of DESI calculation for North Macedonia.

In terms of LFS and UNESCO OECD Eurostat (UOE) joint collection data on education, SSO has aligned its methodologies with EU-LFS and UOE. Data for North Macedonia is published on Eurostat and can be also used in the context of DESI calculation.

SSO reported that there are no challenges or obstacles to comply with the established practice for collecting data for North Macedonia according to Eurostat methodologies and MQs.

98 Digital Scoreboard Key Indicators: https://digital-agenda-data.eu/datasets/digital_agenda_scoreboard_key_indicators/#

2.2. Agency for Electronic Communications

The national regulator, the Agency for Electronic Communications, is responsible for monitoring and data collection for seven DESI indicators, all of them in the Connectivity dimension. AEC also collects data for 1a1 indicator, but the data used for DESI calculation is the one collected by SSO and reported to Eurostat. No overlaps between AEC and SSO are identified as the DESI methodology clearly defines which data is used for DESI calculation for each indicator. AEC publishes quarterly and annual reports on market developments in electronic communications.

At the end of 2020, AEC implemented a system to support implementation of National Operational Broadband Plan (NOBP), which enables mapping of constructed and planned broadband fixed and wireless networks of commercial network operators, as well as mapping of concluded subscriber contracts by speed and technology. Operators have an obligation to update the data in this system quarterly.

With respect to the Connectivity dimension, AEC closely cooperates with BCO in terms of monitoring and assessment of the broadband development in North Macedonia. In this regard, AEC and BCO have achieved high level of compliance in the process of data collection and methodological alignment for the seven DESI indicators.

2.3. Broadband Competence Office

The Broadband Competence Office is established as an expert and advisory body to support investment in broadband networks in North Macedonia in accordance with the Law on Electronic Communications. BCO is mandated to monitor the broadband development in the economy in the context of DESI indicators, as well as to report on the implementation of strategic documents and plans for broadband development.

BCO provides a calculation for the DESI Connectivity indicators for North Macedonia on a semi-annual basis, which is based on the data collected by the AEC. In February 2020, BCO adopted a Methodology for the calculation of all five DESI dimensions for North Macedonia.[99] BCO considers itself the responsible institution for calculation of the Connectivity dimension, recognising the need for intergovernmental collaboration involving all relevant institutions - SSO, AEC, and MISA. So far, three semi-annual reports have been published for North Macedonia's calculation of all the indicators in the Connectivity dimension.[100,101,102]

The biggest challenges reported by the BCO are the Broadband Price Index indicator and the latest methodological changes. BCO expressed readiness to participate in the Commission ad hoc or similar regional WB studies or to continue to calculate the score for the Connectivity dimension if the methodologies are available in advance and there is reasonable time for internal preparation.

2.4. Ministry of Information Society and Administration

The Ministry of Information Society and Administration is mandated to develop policies and monitor development of information society in North Macedonia. MISA is also mandated to monitor four DESI indicators in the Digital public services dimension. It has already participated in the latest 2020 eGovernment Benchmark Study and already ensures the collection of data for three of the four DESI indicators for North Macedonia.

Regarding the Open data indicator, unfortunately, North Macedonia is neither part of the European Data Portal (EDP) nor of the Open Data Maturity Report 2020. As MISA monitors these indicators, it expressed readiness to participate in the EDP Study on a European or regional level or to calculate the score for this indicator using the same methodology.

3. Digital Economy and Society Index

On the availability of statistical data on digital performance and digital competitiveness in the context of DESI, North Macedonia is **highly prepared** with data for 87% of DESI indicators being available and aligned to the DESI Methodology. Data for 5% of the indicators are available, but further methodological alignments are necessary. Data for 8% of indicators are still not available.

Data available and fully aligned with DESI Methodology	🟢	32 Indicators (87%)
Data available but not fully aligned with DESI Methodology	🟠	2 Indicators (5%)
Data not available	🔴	3 Indicators (8%)

Table 1: North Macedonia: Summary of DESI indicators (Source: Authors, 2021)

3.1. Connectivity

Data collection and monitoring of the development of the Connectivity dimension is the responsibility of SSO (one indicator) and AEC and BCO (seven indicators).

Full alignment with the DESI Methodology is achieved for seven of eight indicators. Data for three DESI indicators (1a2, 1c2 and 1c3) are collected and calculated by AEC and are fully aligned with DESI definitions and methodology. Data for one indicator (1a1) are collected by SSO and are already published in the Eurostat database.

Data and score for three indicators (1b1, 1b2 and 1c1) that derives from the Study on Broadband Coverage in Europe are collected by AEC and calculated by BCO as North Macedonia is not currently included in this Study. AEC and BCO use the same methodology for collecting and calculation these indicators. Data for all seven indicators can be used for DESI calculation for North Macedonia.

Partial alignment is achieved for one indicator (1d1), also calculated by BCO. Although data and calculations are available, further methodological alignment is necessary in order to provide data that can be used in the context of DESI calculation for North Macedonia. Moreover, the latest changes in the Study on Mobile and Fixed Broadband Prices in Europe methodology causes significant challenges for BCO, mostly due to the changes in the methodology and the time gap between publishing the methodology and time needed for internal preparations to ensure alignment with the adjusted methodological framework. As North Macedonia is not included in this study, BCO expressed readiness to participate in all ad hoc studies on European or regional WB level, or jointly with AEC to calculate the score for these indicators if the methodologies are available in advance and there is reasonable time for internal preparation.

99   Broadband Competence Office (MK). 2020a. Methodology for calculation of all five DESI dimensions for North Macedonia. Available at the following link.

100   Broadband Competence Office (MK). 2020b. First Report on the development of broadband in North Macedonia. Available at the following link.

101   Broadband Competence Office (MK). 2020c. Second Report on the development of broadband in North Macedonia. Available at the following link.

102   Broadband Competence Office (MK). 2021. Third Report on the development of broadband in North Macedonia. Available at the following link.

Indicator	Responsible institution	Data available
1a1 Overall fixed broadband take-up	SSO	🟢 2018/2019
1a2 At least 100 Mbps fixed broadband take-up	AEC/BCO	🟢 2019/2020
1b1 Fast broadband (NGA) coverage	AEC/BCO	🟢 2019/2020
1b2 Fixed Very High Capacity Network (VHCN) coverage	AEC/BCO	🟢 2019/2020
1c1 4G coverage	AEC/BCO	🟢 2019/2020
1c2 Mobile broadband take-up	AEC/BCO	🟢 2019/2020
1c3 5G readiness	AEC /BCO	🟢 2019/2020
1d1 Broadband price index	AEC/BCO	🟠 2019

Table 2: North Macedonia: Connectivity indicators assessment (Source: Adjusted by Authors, AEC, BCO, Eurostat, 2021)

3.2. Human Capital

Data collection for the Human Capital dimension is the responsibility of SSO (six indicators).

Full alignment with the DESI Methodology is achieved for four of six indicators. Data for the three indicators (2a1, 2a2 and 2a3) that derive from the ICT usage in households and by individuals survey are available on Eurostat for the last reported year (2019). SSO also reported compliance for the two indicators (2b1 and 2b2)

based on data from the LFS. Data for both indicators are available on Eurostat but the indicator 2b2 is marked as Eurostat estimate.

Partial alignment is achieved for the ICT Graduates indicator (2b3) monitored by SSO. Data for this indicator is transmitted to the Eurostat database and is published for North Macedonia for 2018, but is flagged by Eurostat as utilising a different definition. The score for this indicator is also flagged as partially aligned with respect to DESI.

Indicator	Responsible institution	Data available
2a1 At least basic digital skills	SSO	🟢 2019
2a2 Above basic digital skills	SSO	🟢 2019
2a3 At least basic software skills	SSO	🟢 2019
2b1 ICT specialists	SSO	🟢 2018/2019
2b2 Female ICT specialists	SSO	🟢 2018[104]/2019[105]
2b3 ICT graduates	SSO	🟠 2018[106]

Table 3: North Macedonia: Human capital indicators assessment (Source: Adjusted by Authors, SSO, Eurostat, 2021)

3.3. Use of Internet services

Data collection for the Use of internet services dimension is the responsibility of SSO (eleven indicators). The domestic methodology and questionnaire are aligned with the Eurostat Methodological Manual and MQs for ICT usage in households and by individuals survey and are adjusted every year.

Full alignment with DESI Methodology is achieved for all eleven indicators. Data for all indicators for the last reported year (2019) are transmitted and are available in the Eurostat database and can be used in the context of DESI calculation for North Macedonia.

103   Eurostat estimate
104   Eurostat estimate
105   Definition differs (Flagged by Eurostat)

Indicator	Responsible institution	Data available
3a1 People who have never used the internet	SSO	🟢 2018/2019
3a2 Internet users	SSO	🟢 2018/2019
3b1 News	SSO	🟢 2019
3b2 Music, videos and games	SSO	🟢 2018
3b3 Video on demand	SSO	🟢 2018
3b4 Video calls	SSO	🟢 2018/2019
3b5 Social networks	SSO	🟢 2018/2019
3b6 Doing an online course	SSO	🟢 2019
3c1 Banking	SSO	🟢 2018/2019
3c2 Shopping	SSO	🟢 2018/2019
3c3 Selling online	SSO	🟢 2018/2019

Table 4: North Macedonia: Use of Internet services indicators assessment (Source: Adjusted by Authors, SSO, Eurostat, 2021)

3.4. Integration of digital technology

Data collection for the Integration of digital technology dimension is the responsibility of SSO (seven indicators). The domestic methodology and questionnaire are aligned with the Eurostat Methodological Manual and MQs for ICT usage in enterprises survey and are adjusted accordingly every year.

Full alignment with DESI Methodology is achieved for five of seven indicators. Data for two indicators (4a4 and 4b1) for 2020 are transmitted and are available in the Eurostat database and can be used for DESI calculation for North Macedonia. Data for three indicators (4a1, 4a2 and 4d3) are not available on Eurostat but are available in the SSO database for 2019 (as biannual indicators).

Data for one indicator (4b2) is not available in the SSO database and Eurostat but is also marked as partially aligned with the DESI Methodology and is flagged by Eurostat as being of low reliability.

Concerning the 2020 DESI Methodology, data for the Big data indicator (4a3) is also missing for North Macedonia in the Eurostat database due to its discontinuation in 2019. As this indicator is replaced by multiple alternative indicators for Big data, it is expected that the DESI 2021 Methodology will replace it with one or more alternative indicators. In the context of North Macedonia, this cannot be seen as a major issue since SSO continuously aligns the domestic methodology and questionnaire with the Eurostat Methodological Manual and MQs.

Indicator	Responsible institution	Data available
4a1 Electronic information sharing	SSO	🟢 2019
4a2 Social media	SSO	🟢 2019
4a3 Big data	SSO	🔴
4a4 Cloud	SSO	🟢 2020
4b1 SMEs selling online	SSO	🟢 2020
4b2 e-Commerce turnover	SSO	🔴
4b3 Selling online cross-border	SSO	🟢 2019

Table 5: North Macedonia: Integration of digital technology indicators assessment (Source: Adjusted by Authors, SSO, Eurostat, 2021)

3.5. Digital Public Services

Data collection and monitoring of the development of the Digital public services dimension is the responsibility of SSO (one indicator) and MISA (four indicators).

Full alignment with DESI Methodology is achieved for four of five indicators. Data for one indicator (5a1), for the last reported year (2019), is collected by SSO and derives from the ICT usage in households and by individuals survey. Data for this indicator for the last year (2019) is transmitted and is available in the Eurostat database.

Data for three indicators (5a2, 5a3 and 5a4) are fully aligned with the DESI Methodology as deriving from the biannual eGovernment Benchmark Report. As North Macedonia was included in the latest 2020 Report, MISA actively participated in this study. As a result, data for the three indicators are available and can be used in the context of DESI calculation for North Macedonia.

Lastly, data for the Open data indicator (5a5) is currently not available as North Macedonia is not part of the EDP and was not included in the Open Data Maturity Report 2020. While MISA monitors open data developments, it has not provided data in the context of DESI. In this regard, MISA reported that it will make efforts to include North Macedonia in the EDP and future Open Data Maturity Reports.

Indicator	Responsible institution	Data available
5a1 e-Government users	SSO	🟢 2018/2019
5a2 Pre-filled forms	MISA	🟢 2020
5a3 Online service completion	MISA	🟢 2020
5a4 Digital public services for businesses	MISA	🟢 2020
5a5 Open data	MISA	🔴

Table 6: North Macedonia: Digital public services indicators assessment (Source: Adjusted by Authors, SSO, Eurostat, eGovernment Benchmark 2020, 2021)

4. Recommendations

Following the findings of this Report, a set of eight specific recommendations across four organisations for improving the level of preparation and data collection in the context of DESI is made below.

Recommendations for the State Statistical Office

1. SSO should continue to maintain the current high level of compliance with the Eurostat survey on ICT usage in households and by individuals. In order to do so, SSO needs to adapt its annual methodologies and MQs to Eurostat.

2. SSO should improve compliance with the Eurostat survey on ICT usage in enterprises and adapt its annual methodologies and MQs to Eurostat.

3. SSO should continue with its alignment with the EU-LFS and UOE joint data collection on education, especially for indicators related to the ICT professionals in employment and ICT graduates.

Recommendations for the Agency for Electronic Communications

4. AEC should continue to monitor and collect data for indicators in the Connectivity dimension. In the context of the DESI, AEC should monitor changes in the relevant EU indicators and methodologies and adjust accordingly.

Recommendations for the Broadband Competence Office

5. BCO should continue with the coordination and calculation of DESI indicators in the Connectivity dimension. BCO should monitor future DESI and indicators methodological changes and ensure these are reflected in the domestic methodology for DESI calculation.

6. BCO should use the latest methodology to calculate the Broadband price index indicator. Due to the complexity of the methodology, BCO may consider using external expert services to calculate this indicator, at least until North Macedonia is included in these studies on the European or regional level.

Recommendations for the Ministry of Information Society and Administration

7. MISA should continue with its active participation in the eGovernment Benchmark Study to ensure monitoring of the Digital Public Service dimension for North Macedonia.

8. MISA should make all necessary efforts for the inclusion of North Macedonia in EDP and inclusion in the Open Data Maturity Reports. If not included, MISA should collect the appropriate data and calculate this indicator for North Macedonia using the same methodology.

SERBIA

1. Background

Since March 2012 Serbia has been a candidate for EU membership. The accession negotiations started on 21 January 2014. Currently, 18 Chapters of the EU acquis are opened, out of which two are provisionally closed.

As part of the enlargement process, the Commission publishes annual assessment reports of the state of play in each candidate country accompanied by recommendations and guidance on the reform priorities for the candidate. In its October 2020 Report, the Commission noted that Serbia is moderately prepared in the area of information society and audio-visual media (Chapter 10) recognising the achievements in the areas of Digital Single Market, eGovernment and information society. The Commission recommended further alignment of the electronic communications legislation with the updated EU regulatory framework, including the new European Electronic Communications Code. To be in compliance with the EU acquis and boost their capacity to work proactively, the Commission also recommended full financial and operational independence be implemented for the regulators for electronic communications and postal services and electronic media. In the area of Statistics (Chapter 18), the Commission noted that Serbia is moderately prepared, noting that the legal framework for statistical infrastructure is largely in line with the European Statistics Code of Practice. The Commission recommended the adoption of the new statistical law to increase the independence of the Statistical Office (SORS).

2. Institutional framework

The progress on electronic communications and information society is monitored by three institutions:

- » Statistical Office (SORS)
- » Regulatory Agency for Electronic Communications and Postal Services (RATEL)
- » Office for IT and eGovernment

No gaps or overlaps are identified in terms of jurisdiction as all DESI indicators have been assigned to responsible institution for monitoring and data collection.

2.1. Statistical Office

As the statistical office of Serbia, SORS is responsible for data collection for 27 DESI indicators. The progress on electronic communications and information society by SORS is monitored through four main statistical operations:

- » ICT usage in households and by individuals survey
- » ICT usage in enterprises survey
- » Labour Force Survey (LFS)
- » Administrative data on education

SORS has achieved high level of compliance with the Methodological Manuals and Model Questionnaires (MQs) for ICT usage in households and by individuals and ICT usage in enterprises surveys. Data for both surveys are transmitted and are available in the Eurostat database and can be used in the context of DESI calculation for Serbia.

In terms of LFS and UNESCO OECD Eurostat (UOE) joint collection data on education, SORS has aligned its methodologies with EU-LFS and UOE. Data for Serbia is published on Eurostat and can be also used in the context of DESI calculation.

SORS reported that there are no challenges or obstacles to comply with the established practice for collecting data for Serbia according to Eurostat methodologies and MQs.

2.2. Regulatory Agency for Electronic Communications and Postal Services

The national regulator, the Regulatory Agency for Electronic Communications and Postal Services, is responsible for data collection for seven

DESI indicators, all of them in the Connectivity dimension. RATEL also collects data for 1a1 indicator, but the data used for DESI calculation is the one collected by SORS and reported to Eurostat. No overlaps between RATEL and SORS are identified as the DESI methodology clearly defines which data is used for DESI calculation for each indicator. RATEL publishes annual reports on market developments in the electronic communications and postal markets. Notably, RATEL has proactively collected data for all indicators in the five dimensions and calculated the DESI score for Serbia in its annual reports since 2017.

With respect to the Connectivity dimension, RATEL has achieved high level of compliance with the process of data collection and methodological alignment for six DESI indicators. Concerning the Commissions ad hoc studies in which Serbia is not included, RATEL has already proven its capacities and skills to collect data and calculate the score for Serbia using the same methodologies. RATEL expressed readiness to participate in these or similar studies on the European or regional level or to continue to calculate the score for these indicators if the methodology is available in advance and there is reasonable time for internal preparation.

Except for the Broadband price index methodology and its complexity, RATEL reported that there are no challenges or obstacles to comply with the established practice for collecting data for Serbia in the context of DESI.

2.3. Office for IT and eGovernment

The Office for IT and eGovernment is mandated to monitor and collect data for four DESI indicators in the Digital public services dimension. Serbia has already been included in the eGovernment Benchmark Study 2016, 2018 and 2020 and already ensures the collection of data for three of the four DESI indicators for Serbia.

With respect to the fourth Open data indicator, Serbia is expected to be included in the future editions of the Open Data Maturity Report as part of the European Data Portal (EDP). Serbia will therefore be included in the EDP Maturity Report thereby ensuring data collection for the Open data indicator. It should be noted that the 2019 data for this indicator was published in the latest RATEL annual report.

3. Digital Economy and Society Index

On the availability of statistical data on digital performance and digital competitiveness in the context of DESI, Serbia is **highly prepared** as data for all DESI indicators are available. Data and methodologies for 97% of DESI indicators are fully aligned with the DESI Methodology. Data for 3% of the indicators are available, but further methodological alignments are necessary.

Data available and fully aligned with DESI Methodology	🟢	36 Indicators (97%)
Data available but not fully aligned with DESI Methodology	🟠	1 Indicator (3%)

Table 1: Serbia: Summary of DESI indicators (Source: Authors, 2021)

3.1. Connectivity

Data collection and monitoring of the development of the Digital public services dimension is the responsibility of SORS (one indicator) and RATEL (seven indicators).

Full alignment with the DESI Methodology is achieved for seven of eight indicators. Data for

three DESI indicators (1a2, 1c2 and 1c3) are collected by RATEL and are fully aligned with the DESI definitions and methodology. Data for one indicator (1a1) is collected by SORS and is already published in the Eurostat database.

Data and score for three indicators (1b1, 1b2 and 1c1) that use data from the Study on Broadband Coverage in Europe are collected and calculated

by RATEL as Serbia is not currently included in this Study. RATEL uses the same methodology for collecting and calculation these indicators. Data for all seven indicators can be used for DESI calculation for Serbia.

Partial alignment is achieved for the Broadband price index (1d1). Data for this indicator is available, and RATEL is measuring this index by using external services and methodology from the previous year. The time gap between publishing the official Study and the methodology, compared to the time needed to adjust the domestic methodology and make all necessary preparations, causes significant issues for RATEL which leads to misalignment in the methodology.

Indicator	Responsible institution	Data available
1a1 Overall fixed broadband take-up	SORS	🟢 2018-2020
1a2 At least 100 Mbps fixed broadband take-up	RATEL	🟢 2019
1b1 Fast broadband (NGA) coverage	RATEL	🟢 2019
1b2 Fixed Very High Capacity Network (VHCN) coverage	RATEL	🟢 2019
1c1 4G coverage	RATEL	🟢 2019
1c2 Mobile broadband take-up	RATEL	🟢 2019
1c3 5G readiness	RATEL	🟢 2019
1d1 Broadband price index	RATEL	🟠 2019

Table 2: Serbia: Connectivity indicators assessment (Source: Adjusted by Authors, RATEL, SORS, Eurostat, 2021)

3.2. Human Capital

Data collection for the Human Capital dimension is the responsibility of SORS (six indicators). Full alignment with the DESI Methodology is achieved for all six indicators.

Data for three indicators (2a1, 2a2 and 2a3) derive from the ICT usage in households and by individuals survey are available on Eurostat for the last reported year (2019). SORS also reported a high level of compliance for the two indicators (2b1 and 2b2) based on data from LFS. Data for both indicators are available on Eurostat but indicated as Eurostat estimates. However, data for both indicators are also published in the RATEL annual market reports and are based on SORS data, which in turn applies the relevant DESI Methodology.

The ICT Graduates indicator (2b3) is monitored and reported by SORS. Data for this indicator is available for Serbia for 2018 in the Eurostat database, but it is also available in the RATEL annual market report for 2019.

Indicator	Responsible institution	Data available
2a1 At least basic digital skills	SORS	🟢 2019
2a2 Above basic digital skills	SORS	🟢 2019
2a3 At least basic software skills	SORS	🟢 2019
2b1 ICT specialists	SORS	🟢 2018/2019[107]
2b2 Female ICT specialists	SORS	🟢 2018[108]/2019[109]
2b3 ICT graduates	SORS	🟢 2018/2019[110]

Table 3: Serbia: Human capital indicators assessment (Source: Adjusted by Authors, SORS, Eurostat, 2021)

3.3. Use of Internet services

Data collection for the Use of internet services dimension is the responsibility of SORS (eleven indicators). The domestic methodology and questionnaire are aligned with the Eurostat Methodological Manual and MQs for ICT usage in households and by individuals survey and are adjusted every year.

Full alignment with DESI Methodology is achieved for all eleven indicators. Data for all indicators for the last reported year (2020) are transmitted and are available in the Eurostat database and can be used in the context of DESI calculation for Serbia.

Indicator	Responsible institution	Data available
3a1 People who have never used the internet	SORS	🟢 2018-2020
3a2 Internet users	SORS	🟢 2018-2020
3b1 News	SORS	🟢 2019/2020
3b2 Music, videos and games	SORS	🟢 2018/2020
3b3 Video on demand	SORS	🟢 2018/2020
3b4 Video calls	SORS	🟢 2018-2020
3b5 Social networks	SORS	🟢 2018-2020
3b6 Doing an online course	SORS	🟢 2019/2020
3c1 Banking	SORS	🟢 2018-2020
3c2 Shopping	SORS	🟢 2018-2020
3c3 Selling online	SORS	🟢 2018-2020

Table 4: Serbia: Use of internet services indicators assessment (Source: Adjusted by Authors, SORS, Eurostat, 2021)

3.4. Integration of digital technology

Data collection for the Integration of digital technology dimension is the responsibility of SORS (seven indicators). The domestic methodology and questionnaire are aligned with the Eurostat Methodological Manual and MQs for ICT usage in enterprises survey and is adjusted accordingly every year.

106   Eurostat estimate
107   Eurostat estimate
108   Eurostat estimate
109   Data provided by RATEL

Full alignment with DESI Methodology is achieved for all seven indicators. Data for six indicators for the last reported years (2018, 2019 and 2020) are transmitted and are available in the Eurostat database, and can be used for DESI calculation for Serbia.

Concerning the 2020 DESI Methodology, data for the Big data indicator (4a3) is missing for Serbia in the Eurostat database due to its discontinuation in 2019. As this indicator is replaced by multiple alternative indicators for Big data, it is expected that the DESI 2021 Methodology will replace it with one or more alternative indicators. In the context of Serbia, this cannot be seen as a major issue since SORS continuously aligns the domestic methodology and questionnaire with the Eurostat Methodological Manual and MQ. However, to fill this gap, data for this indicator is provided in the RATEL annual market reports.

Indicator	Responsible institution	Data available
4a1 Electronic information sharing	SORS	● 2019
4a2 Social media	SORS	● 2019
4a3 Big data	SORS	● 2019[111]
4a4 Cloud	SORS	● 2018/2020
4b1 SMEs selling online	SORS	● 2019/2020
4b2 e-Commerce turnover	SORS	● 2019/2020
4b3 Selling online cross-border	SORS	● 2019

Table 5: Serbia: Integration of digital technology indicators assessment (Source: Adjusted by Authors, SORS, RATEL, Eurostat, 2021)

3.5. Digital Public Services

Data collection and monitoring of the development of the Digital public services dimension is the responsibility of SORS (one indicator) and the Office for IT and eGovernment (four indicators).

Full alignment with the DESI Methodology is achieved for all five indicators. Data for one indicator (5a1), for the last reported year (2020), is collected by SORS and derives from the ICT usage in households and by individuals survey. Data for this indicator for the last year (2020) is transmitted and is available in the Eurostat database.

Data for three indicators (5a2, 5a3 and 5a4) are also fully aligned with the DESI Methodology as deriving from the biannual eGovernment Benchmark Report. As Serbia was included in the last three editions (2016, 2018 and 2020), data for the three indicators are available and can be used for DESI calculation for Serbia.

Lastly, data for the Open data indicator (5a5) is available as RATEL collects the relevant data and does the calculation in accordance with the Open Data Maturity Report 2020 methodology. As Serbia is already part of the EDP, it is expected that Serbia is also included in the Open Data Maturity Report in future editions, thus ensuring reliable data necessary for the calculation of DESI for Serbia.

Indicator	Responsible institution	Data available
5a1 e-Government users	SORS	● 2018-2020
5a2 Pre-filled forms	Office for IT	● 2016-2020
5a3 Online service completion	Office for IT	● 2016-2020
5a4 Digital public services for businesses	Office for IT	● 2016-2020
5a5 Open data	Office for IT	● 2019[112]

Table 6: Serbia: Digital public services indicators assessment (Source: Adjusted by Authors, SORS, RATEL, Eurostat, eGovernment Benchmark 2020, 2021)

4. Recommendations[111]

Following the findings of this Report, a set of six specific recommendations across three organisations for improving the level of preparation and data collection in the context of DESI is made below.

Recommendations for the Statistical Office

1. SORS should maintain the current high level of compliance with both Eurostat surveys for ICT usage in households and by individuals and ICT usage in enterprises. In order to do so, SORS needs to adapt its annual methodologies and MQs with Eurostat.

2. SORS should continue with its alignment with the EU-LFS and UOE joint data collection on education, especially for indicators related to the ICT professionals in employment and ICT graduates.

Recommendations for the Regulatory Agency for Electronic Communications and Postal Services

3. RATEL should continue to monitor development in the Connectivity dimension, especially development in the Broadband take-up and coverage, Broadband speeds and prices and Mobile market as defined in the Digital Agenda scoreboard key indicators.[112] In the context of DESI, RATEL also needs to mon-itor and apply the changes in the EU indicators and methodologies.

4. RATEL should align its methodology for the calculation of the Broadband price index indicator. In order to do so, RATEL may consider using external expert services to calculate this indicator, at least until Serbia is included in the same or similar study on the European or WB regional level.

Recommendations for the Office for IT and eGovernment:

5. The Office for IT and eGovernment should actively participate in the eGovernment Benchmark Study to ensure monitoring of the Digital Public Service dimension for Serbia.

6. The Office for IT and eGovernment should ensure that Serbia, as part of the EDP, will be included in the Open Data Maturity Report 2021. If not, the Office should calculate this indicator for Serbia using the same methodology.

110   Data provided by RATEL

111   Data provided by RATEL

112   https://digital-agenda-data.eu/datasets/digital_agenda_scoreboard_key_indicators/indicators#discontinued-indicators

ANNEX 2: STAKEHOLDER CONSULTATIONS PHASE

WB Economies	Name	Institution	Contact	Quest. sent	Reminder	Quest. received	Interview
Albania	Elsa Dhuli	Institute of Statistics (INSTAT)	edhuli@instat.gov.al	06.01.2021	12.01.2021	13.01.2021	28.01.2021
	Gazmir Mani	Electronic and Postal Communications Authority of Albania (AKEP)	Gazmir.mani@akep.al	06.01.2021	12.01.2021	13.01.2021	29.01.2021
	Jona Haderi	National Agency for Information Society (NAIS)	jona.haderi@akshi.gov.al	06.01.2021	12.01.2021 22.01.2021	26.01.2021	04.02.2021
Bosnia and Herzegovina	Sevala Korajcevic	Agency for Statistics of Bosnia and Herzegovina (BHAS)	sevala.korajcevic@bhas.gov.ba	06.01.2021	12.01.2021	14.01.2021	25.01.2020
	Natasa Kuzmanovic	Bosnia and Herzegovina Communications Regulatory Agency (RAK)	info@rak.ba nkuzmanovic@rak.ba	06.01.2021	12.01.2021	15.01.2021	29.01.2021
	Ivana Saric	Department for Maintenance and Development of e-Business and e-Government	ivana.saric@vijeceministara.gov.ba	06.01.2021	12.01.2021 22.01.2021	Forwarded to the Ministry of Transport and Communications	
	Danko Lupi	Ministry of Transport and Communications (MKT)	danko.lupi@mkt.gov.ba	22.01.2021		03.02.2020	03.02.2020
Kosovo*	Ibrahim Rrustemi	Kosovo* Agency of Statistics (KAS)	Ibrahim.Rrustemi@rks-gov.net	06.01.2021	12.01.2021	15.01.2021	02.02.2021
	Kujtim Gashi	Agency for Information Society (AIS)	Kujtim.gashi@rks-gov.net	06.01.2021	12.01.2021	19.01.2021	No response Invitation: 22.01.2020 Reminder: 28.01.2021
	Arijan Qorolli	Regulatory Authority of Electronic and Postal Communications (ARKEP)	arijan.qorolli@arkep-rks.org	06.01.2021	12.01.2021	13.01.2021	29.01.2021

WB Economies	Name	Institution	Contact	Quest. sent	Reminder	Quest. received	Interview
Montenegro	Ernad Kolic	Statistical Office of Montenegro (MONSTAT)	Ernad.Kolic@monstat.org	06.01.2021	12.01.2021	15.01.2021	26.01.2021
	Ivona Maric	Electronic Communications and Postal Services of Montenegro (EKIP)	Ivona.maric@ekip.me	06.01.2021	15.01.2021	15.01.2021	22.01.2021
	Milica Vucinic	Ministry of Public Administration, Digital Society and Media (MPA)	milica.vucinic@mju.gov.me arhiva@mju.gov.me	06.01.2021	12.01.2021	14.01.2021	22.01.2021
North Macedonia	Aida Jakupi	State Statistical Office (SSO)	aida.jakupi@stat.gov.mk info@stat.gov.mk	06.01.2021		12.01.2021	02.02.2021
	Petar Tasev	Agency for Electronic Communications (AEC)	contact@aec.mk petar.tasev@aec.mk	14.01.2021	20.01.2021	22.01.2021	No Questions sent in writing: 01.02.2021
	Slavica Nasteska	Broadband competitive Office (BCO)	slavica.nasteska@bco.mioa.gov.mk	06.01.2021		13.01.2021	03.02.2021
	Rozalinda Stojova Solza Kovachevska	Ministry of Information Society and Administration (MISA)	rozalinda.stojova@mioa.gov.mk solza.kovachevska@mioa.gov.mk	06.01.2021		15.01.2021	27.01.2021
Serbia	Vladimir Shutich Uros Rajcevic	Statistical Office (SORS)	vladimir.sutic@stat.gov.rs uros.rajcevic@stat.gov.rs	06.01.2021	12.01.2021	14.01.2021	25.01.2020
	Zorica M. Panic	Regulatory Agency for Electronic Communications and Postal Services (RATEL)	zorica.m.panic@ratel.rs ratel@ratel.rs	06.01.2021	12.01.2021	15.01.2021	27.01.2021
		The Office for IT and eGovernment	kancelarija@ite.gov.rs	06.01.2021	12.01.2021 22.01.2021	No	No Invitation: 03.02.2021

ANNEX 3: QUESTIONNAIRE

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