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# **MONTENEGRO'S ERA INTEGRATION**

**An update by POLICY ANSWERS**

**Main author:** Edin Jahic

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## Contact Information

POLICY ANSWERS

Malte Schrage-Veltins

Email: [policy-answers@westernbalkans-infohub.eu](mailto:policy-answers@westernbalkans-infohub.eu) and [Malte.Schrage-Veltins@dlr.de](mailto:Malte.Schrage-Veltins@dlr.de)

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## Executive summary

Progress related to European Research Area (ERA) integration was achieved since the establishment of the new ERA along the following aspects:

- The Programme for Innovation 2021-2024 of the Innovation Fund (IF) was established with a total budget of 2 million euros per year. The IF aims at significantly strengthening innovative entrepreneurship, contributing to a more efficient implementation of the Smart Specialisation Strategy (S3), increasing absorption capacities in attracting EU funds and preparing Montenegro in this specific field for European structural and investment funds.
- Montenegro applies international peer review mechanisms in calls for proposals within the Programme for Innovation 2021-2024.
- The budget for research and innovation (R&I) has increased in the period 2015-2018.<sup>1</sup>
- Montenegro has a high share of scientific papers with at least one international co-author (73% of papers).
- Montenegro is the first EU candidate to adopt a S3 and has aligned its policy framework with that of the EU.

Challenges for further ERA integration:

- Monitoring and evaluation should play a central role in improving the effectiveness of national R&I systems, in particular in aligning national and EU instruments.
- Efforts to better coordinate relevant national policies and resources to achieve agreed priorities need to be increased if the maximum advantage is to be taken from a simpler and more impact-oriented EU R&I partnership landscape.
- There are no job vacancies on the EURAXESS portal.
- There are still large disparities in the attractiveness of careers for researchers from EU Member States.
- The share of doctoral students with EU Member States citizenship is non-existent.
- The transfer of research results to the market and closer collaboration between industry and academia need to be promoted.
- Montenegro, as less developed R&I system, has fewer collaboration opportunities, and is therefore less equipped for new partnerships.

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<sup>1</sup> There is no newer data available beyond 2018.

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## List of abbreviations used in this document

AI	Artificial Intelligence
CAGR	Compound Annual Growth Rate
CEI	Central European Initiative
COST	Cooperation in Science and Technology
CSO	Civil Society Organisations
DIH	Digital innovation Hubs
DOAJ	Directory of Open Access Journals
EC	European Commission
EIS	European Innovation Scoreboard
EOSC	European Open Science Cloud
ERA	European Research Area
EU	European Union
EUSAIR	EU Strategy for the Adriatic-Ionian Region
EUSDR	EU Strategy for the Danube Region
FTE	Full-Time Equivalent
HLRS	High-Performance Computing Center Stuttgart
HPC	High-Performance Computing
HPDA	High-Performance Data Analytics
ICA	International Cooperation Agreement
ICEDA	Increasing Civic Engagement in the Digital Agenda
ICT	Information and Communication Technologies
IEC	Innovation and Entrepreneurship Center
IF	Innovation Fund
MONSTAT	Statistical Office of Montenegro
MSCA	Marie Skłodowska-Curie Actions
NCC	National Competence Centre
NOSCI	National Open Science Cloud Initiative
OA	Open Access
R&I	Research and Innovation
S3	Smart Specialisation Strategies
SEEIIST	Southeast Europe International Institute for Sustainable Technology
STP	Science and Technology Park
TAFTIE	European Network of leading national Innovation Agencies
TTO	Technology Transfer Officer



<b>UDG</b>		University of Donja Gorica
<b>UoM</b>		University of Montenegro
<b>WB</b>		Western Balkans

# 1. National measures in support of the Horizon Europe association: achievements and challenges by ERA priority

## 1.1 ERA Priority 1: More effective national research systems

The Innovation Fund (IF) of Montenegro was established by the Government of Montenegro on 11 June 2021 and registered on 14 September 2021<sup>2</sup>. It is supposed to serve as national umbrella institution to ensure the implementation of innovation policy through providing and implementing funds to encourage innovation activity. The IF aims at significantly strengthening innovative entrepreneurship in Montenegro, contributing to a more efficient implementation of the Smart Specialisation Strategy (S3), increasing absorption capacities in attracting EU funds and preparing Montenegro in this specific field for European structural and investment funds. The work of the IF is supervised by the Ministry of Science and Technological Development.

The aim of the fundamental IF programme lines is the encouragement of technological innovations, in order to create the most appropriate programme framework for the needs of Montenegro. The concept is founded on the basic pilot programme lines, with the key mission of providing support to overall development of innovative products and services, from idea to market launch, aligned with S3 priorities and goals of the European Green Deal. Funding is harmonised with the S3 of Montenegro “Smart Specialisation Strategy of Montenegro 2019-2024”, which focuses on the following strategic priorities: Sustainable agriculture and food value chain; energy and sustainable environment; sustainable and health tourism; and information and communication technologies (ICT) as a horizontal priority.

The government, in its session held on 23 September 2021, adopted the Programme for Innovation 2021-2024. The programme also provides information on the IF programme framework of Montenegro, which refers to the following programme lines:

1. Innovation in companies
2. “Proof of concept”
3. “Green jobs”
4. Innovation vouchers
5. Technology Transfer
6. Programme line of collaborative grants for innovations

During 2022, the IF has launched the first support instruments for the innovative community in Montenegro. The amount of 770,000 euros, out of 1 million euros in 2022, will be used to implement the following two programme lines:

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<sup>2</sup> Conclusions of the EU-Montenegro SAA subcommittee innovation, human resources, info society, social policy held on October 5th, 2022, Ministry of Science and Technological Development Montenegro, Dec. 2022

Table 1: Overview of Montenegrin Innovation Fund Programmes

Innovation Fund Programme Name	Amount planned for allocation	Program summary
Innovation Vouchers Programme	100,000 euros	Grants - vouchers for companies in the amount from 5,000 euros to 8,000 euros. Public call announcement in March 2022
Programme of Collaborative Grants for Innovations	670,000 euros	Grants for companies in the amount up to 100,000 euros. Public call announcement in May/June 2022

## Innovation Vouchers Programme

This Programme was designed as a simple, fast, and efficient financial incentive for micro, small and medium-sized enterprises in order to raise the innovation level of their products and improve their competitiveness in the market using specialised services of research and development institutions.

A single voucher can cover a maximum of 80% of the total costs of a service provided by the R&D institution, up to an amount of 8,000 euros, so that the beneficiary of the voucher is obliged to co-finance at least 20% of the total amount of the invoice including VAT. The Innovation Vouchers Programme was launched in April 2022 (Public Call opened from 05 April 2022), considering the total budget amounted to 100,000 euros. At least 70% of the available budget will be allocated to applications in the priority areas of Montenegro's S3, while a maximum of 30% will be allocated to all other areas. So far, 11 applications for innovation vouchers have been received, of which 6 have been approved for up to €40,335<sup>3</sup>. The public call is open until the budget is spent.

## Collaborative Grants Programme

This programme is intended for micro, small and medium-sized enterprises in order to implement innovative projects in cooperation with scientific research institutions and/or other micro, small and medium-sized enterprises with the aim of creating new products, services and technologies with sustainable impact and market potential. The purpose of the public call is to encourage companies to actively and meaningfully cooperate with scientific research institutions and other companies on commercially oriented innovative projects while strengthening the competitiveness of Montenegrin companies and supporting the transfer of innovative ideas from scientific research institutions to the market. Total funding for innovative projects is 670,000 euros for a period of up to two years and amounts to up to 100,000 euros for approved grants. Grants will co-finance up to 80% of the total costs of the project for micro and small enterprises, or up to 70% for medium-sized enterprises. 36 project proposals were submitted until the deadline of this call, which can be considered a very successful outcome.

<sup>3</sup> Conclusions of the EU-Montenegro SAA subcommittee innovation, human resources, info society, social policy held on October 5th, 2022, Ministry of Science and Technological Development Montenegro, Dec. 2022



The submitted proposals are from all priority areas of Montenegro's S3, most of them (16) are from the ICT field. Out of 36 proposals, 22 are partnerships between an SME and a scientific research institution, while 14 proposals are partnerships established between 2 or more SMEs<sup>4</sup>.

A two-stage international evaluation was carried out and a ranking list has been prepared. Upon the finalisation of the negotiation process and in line with the available budget, the IF will select the best ranked project proposals to be recommended for funding by the Investment Committee. The implementation of the approved project proposals was expected to start in January 2023, but at the time of drafting this report (February 2023) the selection has not been finalised.

Since 2010 Montenegro has been using international peer review mechanisms, with the aim of improving the level of evaluations and reaching out to experienced evaluators in the region and across Europe. This is especially the case for calls for proposals above 20,000 euros, which are submitted in English to allow for international peer review. There is a database of evaluators provided by the governments of several countries to the former Ministry of Science.

The Government of Montenegro adopted the Draft Law on the Budget of Montenegro 2023 in its session held on 14 November 2022. The proposed revenues from the national budget for 2023 for the IF are 2,4 million euros. The amount of 2 million euros will be dedicated to the implementation of the programme lines, while the amount of 400,000 euros will be used for operational costs. The Budget Law is currently waiting to be adopted by the Parliament of Montenegro.

In Montenegro, R&D expenditure grew from 0.3% of GDP in 2011 to 0.5% in 2018 (latest available data)<sup>5</sup>; however, the World Bank<sup>6</sup> reports the figure of 0.36% for 2019. For comparison, R&D intensity in the EU in 2020 was 2.3% of GDP, 0.3 percentage points higher than in 2010. In 2018 (latest available data), the government provided 49.0% of funds; the business sector 37.8%; foreign funding 7.8%; and higher education institutions 5.4%<sup>7</sup>. An analysis of R&D expenditure by source of funds in the EU in 2019 showed that 59.0% of the total expenditure was funded by business enterprises, while 29.4% was financed by government, and a further 9.4% came from foreign funds; higher education institutions accounted for 1.2%, while the non-profit sector accounted for the remaining 1.1%. Montenegro reported an R&D share of employment at 0.24% in 2019 (latest available data), slightly lower than in 2015 (0.25%)<sup>8</sup>. R&D personnel accounted for 1.44 % of total employment in the EU in 2020, up from 1.21% five years earlier.

ERC grants per public R&D expenditures are not available. eCorda does not report on any figures related to Montenegro and the same applies for participation in Marie Skłodowska-Curie Actions (MSCA).

According to the European Innovation Scoreboard (EIS) 2022, Montenegro is an emerging innovator with a performance at 47.5% of the EU average. The performance is below the average of the emerging innovators (50.0%) and is increasing (6.5%-points) at a lower rate than that of the EU (9.9%-points). Montenegro's performance gap to the EU is becoming larger. Innovation performance increased between 2015 and 2017, decreased stronger in 2018, and increased again in 2019, 2021 and 2022.

Structural differences with the EU are:

- Montenegro has a lower income per capita and a slower growing economy. Business services take up a larger share of the economy.
- The absence of top R&D spenders has a negative impact on the innovation climate.

<sup>4</sup> Ibid

<sup>5</sup> Eurostat ([rd\\_e\\_gerdfund](#))

<sup>6</sup> <https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS?locations=ME>

<sup>7</sup> Ibid

<sup>8</sup> Eurostat ([rd\\_p\\_perslf](#))

- Montenegro has a lower share of in-house product innovators with market novelties and a higher share of non-innovators with innovation potential.
- The ease of starting a business as a driver of R&D is below the EU average.
- Information on climate change related indicators is not available.

The new Strategy for Scientific Research Activities (2022-2026), which will define instruments aimed at increasing the number of researchers, is not yet in place. The working group tasked with its development was established on 25 January 2022. One of the priorities will be to strengthen the link between science and economy and to further link scientific R&I activities. There are no other strategies to foster R&I neither strategies related to particular scientific areas (e.g., artificial intelligence).

Data from Scival (Table 1) show that international collaboration is most represented in the publishing of papers.

Table 2: SciVal data on Montenegrin international collaboration

Metric	%	Scholarly Output	Citations	Citations per Publication	Field-Weighted Citation Impact
International collaboration	63.5%	2,984	28,239	9.5	1.13
Only national collaboration	4.1%	121	631	5.2	0.69
Only institutional collaboration	17.7%	529	1,723	3.3	0.57
Single authorship (no collaboration)	14.7%	438	832	1.9	0.36

While the trend is positive for scholarly output (from 532 in 2017 to 672 in 2021), the trend for citations is increasingly negative (from 8,198 in 2017 to 2,336 in 2021). The indicators for citations per paper and views per paper confirm that this data can be explained as an overproduction of papers without significant research value. Scival data reports a negative trend on patent-cited scholarly output from 1 in 2017 to no activities reported for the period 2018-2021.

## 1.2 ERA Priority 2a: Optimal transnational cooperation and competition

Total domestic spending on research and development amounted to 0.36% of GDP in 2019, i.e., gross expenditures for R&D amounted to 17.98 million euros. In 2019, 2,330 persons were engaged in research and development activities in organisations, institutions and companies in this field, including 1,586 researchers, 495 technicians and 249 supporting staff members. Total full-time equivalent (FTE) was 685, and FTE for researchers was 469 in 2019<sup>9</sup>.

Montenegro has a high share of scientific papers with at least one international co-author (73% of papers). In the period of 2008-2014, Montenegro had 91 papers with international co-authors per million population<sup>10</sup>.

The association agreement on Montenegro's participation in Horizon Europe was signed in December 2021. A number of institutions have already negotiated and signed grant agreements.

<sup>9</sup> Communication on research and development statistics for 2019, Ministry of Education, Science, Culture and Sports Montenegro, 18 May 2021

<sup>10</sup> Montenegro Ministry of Science, Quantitative and qualitative analysis. Mapping economic, innovation and scientific potential in Montenegro (2019)

The participation of the scientific research community in the Cooperation in Science and Technology (COST) programme increased in 2021, and Montenegrin research teams participated in about 110 (still ongoing) actions during the previous year. In May 2022, the COST Committee of Senior Officials confirmed the funding of 70 new COST actions to start in autumn 2022. Research teams from Montenegro also participated as partners in 12 approved COST actions. The implementation of nine EUREKA projects continued in 2021.

In November 2021, Montenegro and the International Atomic Energy Agency adopted the Programme of technical cooperation 2022-2023.

Montenegro is member of the Southeast Europe International Institute for Sustainable Technologies (SEEIIST)<sup>11</sup> for hadron cancer therapy and research in the field of biomedicine using protons and heavier ions.

Montenegro is participating in the Digital Agenda Observatory through the project Increasing Civic Engagement in the Digital Agenda - ICEDA. The project aims to increase the engagement of civil society organisations (CSOs) in the promotion, shaping, and implementation of the Digital Agenda in the Western Balkans. There are currently many digital services offered for citizens by public institutions in the region. These services range from including tax declarations and online payments for utilities to registering a new business. ICEDA aims to boost the adoption of e-services through promotional efforts and by tackling issues that hinder their widespread use. Furthermore, the organisation advocates for new quality services to be introduced from the governments at all levels.

Montenegro is part of the Central European Initiative (CEI) since 2006. The latest available data for 2021<sup>12</sup> shows that Montenegro participated in three different project initiatives: the Technical Cooperation Programme, the Know-how Exchange Programme and the Cooperation Activities programme. Montenegro also participates in the EU Strategy for the Danube Region (EUSDR), the EU Strategy for the Adriatic-Ionian Region (EUSAIR) as well as the Western Balkans Regional R&D Strategy for Innovation. The Open Balkan Initiative has been rebuffed by Montenegro.

As for cooperation agreements with EU Member States, other countries, and other Western Balkan economies, the agreements that have been formally concluded have not generated substantial outcomes in science or practical applications thus far. Existing bilateral agreements are primarily an expression of good and friendly relations between partner countries rather than a requirement for associated scientific communities to collaborate on issues that are common and beneficial. Therefore, this cooperation has largely been based on mutual visits of expert teams and networking, which were helpful but lacked concrete project implementation. Sporadically, some agreements are concretised such as published call for proposals dated within the framework of the Scientific and Technological Cooperation between the Government of Italy and the Government of Montenegro from January 2022. The related Call aims at financing “Joint Research Projects” in priority research areas: agriculture and food sciences, environment, with particular attention to blue growth, natural risk assessment and mitigation and cultural heritage and related technologies.

### **1.3 ERA Priority 2b: Make optimal use of public investments in research infrastructures**

For some time, physicists from Montenegro have participated as individuals in the CERN experimental programme, e.g. in heavy-ion physics via NA49 and ALICE (A Large Ion Collider Experiment) and a small team from the University of Montenegro in Podgorica (UoM) has

<sup>11</sup> <https://seeiist.eu/>

<sup>12</sup> Annual Report of the Secretary General 2021.

participated in the AD-4 (ACE) experiment on the biological effects of antiproton annihilation. CERN signed an agreement with the UoM in 1990, when Montenegro was still part of Yugoslavia. Following Montenegro's independence, the MoU was updated in 2007 to an International Cooperation Agreement (ICA) between the government and CERN in order to strengthen scientific and technical cooperation in high-energy physics. A visit to CERN by the Minister of Science of Montenegro in December 2014 marked the start of a closer collaboration with the Organisation. This includes participation in CERN's educational activities. During a visit by the Montenegro's Prime Minister to CERN in July 2017, a Memorandum of Understanding was signed for Montenegro to become a member of the CMS collaboration<sup>13</sup>.

Podgorica was selected to participate in the lighthouse research infrastructure project "EU Climate and Smart Cities Mission by 2030", along with 100 cities from 27 EU Member States and as one of 12 cities from countries associated to the Horizon Europe programme.

The University of Donja Gorica (UDG) and EuroCC Montenegro (national competence center for supercomputers) participate in the EuroCC project<sup>14</sup> realised under Horizon 2020 through the EuroHPC Joint Undertaking [JU]<sup>15</sup>. Within the EuroCC project, UDG and other partners from participating countries are establishing a single National Competence Centre (NCC) in the area of high-performance computing (HPC). The NCC coordinates activities in all HPC-related fields at national level and serve as a contact point for industry, science, HPC experts, and the general public. The EuroCC activities – with 33 member and associated countries on board – is coordinated by the High-Performance Computing Center Stuttgart (HLRS). The project aims at elevating the participating countries to a common high level in the fields of HPC, high-performance data analytics (HPDA) and artificial intelligence (AI). To achieve this objective, the EuroCC project will establish National Competence Centres (NCCs) in the participating countries, which will be responsible for surveying and documenting the core HPC, HPDA, and AI activities and competencies in their respective countries. Ultimately, the goal is to make HPC available to different users from science, industry, public administration, and society.

## 1.4 ERA Priority 3: An open labour market for researchers

In 2018, around 16% of doctoral students in Montenegro were foreign citizens, most of them coming from the WB region. The lack of strategy for an attractive labour market for researchers shows that more could be done to enhance Montenegro's performance towards this priority. However, mechanisms have been put in place for Montenegro to improve its performance. Private universities have head-hunting strategies to attract high quality researchers from abroad. The UoM is among the 401 best ranked universities<sup>16</sup> (2021 young universities ranking), on position 1201+ in the world university rankings 2022, and has received the HR Excellence Logo in January 2020. These achievements demonstrate Montenegro's potential to develop a more open labour market.

The UoM, the UDG and the University Mediterranean (UM) have adopted an Internationalisation Strategy 2021-2026.<sup>17</sup> The strategy of the UM is focused on the following areas: international mobility, higher education and scientific research; openness of institutions towards the international environment; high quality international scientific research and development cooperation; promotion of intercultural competences. Members of the working team of the project called "Fostering Internationalisation at Montenegrin HEIs through Efficient Strategic Planning (IESP) 2", which is financed through the Erasmus+ capacity building programme in

<sup>13</sup> <https://home.web.cern.ch/science/experiments/alice>

<sup>14</sup> <https://eurocc.udg.edu.me/about/#>

<sup>15</sup> [https://eurohpc-ju.europa.eu/index\\_en](https://eurohpc-ju.europa.eu/index_en)

<sup>16</sup> <https://www.timeshighereducation.com/world-university-rankings/university-montenegro>

<sup>17</sup> <http://www.iesp.ucg.ac.me/page.php?id=23>

higher education, have participated in the development of the internationalisation strategy. EU partner institutions in the project are the University of Ljubljana (Slovenia), the University of Cadiz (Spain) and the University of the Côte d'Azur in Nice (France).

The strategy of the UDG is focused on three priority areas: student and staff mobility, quality international scientific research, and internationalisation at home, with clearly defined objectives expected to be met during the implementation of the strategy, together with the action plan following the strategy. Drafting of this document has been supported by the project IESP: Fostering Internationalisation at Montenegrin HEIs through Efficient Strategic Planning co-funded by the Erasmus+ Programme of the European Union aimed at improving international competitiveness and visibility of Montenegrin HEIs through providing an optimum model for strengthening capacities for various aspects of internationalisation, including an internationalisation strategy with action plans, supporting documentation for internationalisation, internationalisation of research and innovation, international mobility of staff and students, international networking and quality assessment of internationalisation<sup>18</sup>.

Language remains a barrier for European researchers to move to Montenegro, and universities are planning a strategy to internationalise their programmes and offer more courses in English language. No co-funding grants targeting foreign researchers and students to study and work in Montenegro are currently available. However, in 2019, the former Ministry of Science launched an annual open call for grants for visiting lecturers and researchers at universities in Montenegro. The objective of this initiative was to enhance the skills of domestic researchers. To date eight projects have been approved for visiting lecturers, further results on this call were hampered due to COVID-19 restrictions in 2020-2021.

Since 2010, three out of four universities in Montenegro have signed declarations of endorsement of the European Charter and Code for Researchers.<sup>19</sup> Nevertheless, job offerings are rarely published on the EURAXESS job portal<sup>20</sup>, and university websites and journals remain the main source for job vacancies. However, with the HR Excellence Logo for the UoM in 2020, the publishing of the job offerings on EURAXESS has become obligatory. The former Ministry of Science has made some efforts by establishing annual open calls with grants for visiting lecturers and researchers at universities in Montenegro. The aim is to enhance the skills of domestic researchers in conducting research together with foreign scientists<sup>21</sup>.

## 1.5 ERA Priority 4: Gender equality and gender mainstreaming in research

The EC Montenegro Report 2022<sup>22</sup> notes that the shortcomings identified by the evaluation of the 2017-2021 action plan for achieving gender equality remain largely unaddressed.

In July 2021, the government adopted the 2021-2025 National Strategy for Gender Equality, its action plan for 2021-2022 and the final Report on the Implementation of the 2017-2021 Action Plan for Achieving Gender Equality. The strategy introduced some important novelties that could contribute towards improving women's rights and gender equality in Montenegro. These suggestions from specialised NGOs for improved gender mainstreaming of public policies, an increase in the election quota for underrepresented genders, and the establishment of an alimony fund. However, the issue of gender-based violence and domestic violence has not been addressed in the strategy. The legislative framework regarding gender equality has limited

<sup>18</sup> [https://www.iesp.ucg.ac.me/uploaded/files/strategija\\_jan21Ver2.pdf](https://www.iesp.ucg.ac.me/uploaded/files/strategija_jan21Ver2.pdf)

<sup>19</sup> <https://www.euraxess.me/jobs/charter>

<sup>20</sup> <https://www.euraxess.me/>

<sup>21</sup> [https://www.euprava.me/usluge/detalji\\_usluge?generatedServiceId=968](https://www.euprava.me/usluge/detalji_usluge?generatedServiceId=968)

<sup>22</sup> [https://neighbourhood-enlargement.ec.europa.eu/montenegro-report-2022\\_en](https://neighbourhood-enlargement.ec.europa.eu/montenegro-report-2022_en)

impact as a result of insufficient political will to prioritise this issue in the overall government's accountability mechanisms.

Difficulties remain, notably in relation to female labour market participation and vocational training. Women also remain underrepresented in political and economic decision-making. They make up only a quarter of the total management in the public administration, often due to explicit or implicit biases present in hiring, training and promotion practices. There has been an increase in smear campaigns, hate speech and use of gender-based violence against women in politics and public life. Moreover, women have been disproportionately affected by the COVID-19 pandemic.

According to the Statistical Office of Montenegro (MONSTAT) release "Specialists, masters and doctors of science 2021"<sup>23</sup>, the doctor of science degree was obtained in 2021 by 14 persons. Out of this number, 64.3% (9) were females and 35.7% (5) males.

In 2016, Montenegro established the Gender Equality Index<sup>24</sup> with the aim to measure gender equality on a scale from 1 (complete inequality) to 100 (complete equality) across six areas: knowledge, work, money, health, time and power. This was calculated for the first time in early 2020 yielding a value of 55 (out of 100 points), which places Montenegro on a lower rank than the EU28 (including Great Britain) average (67.4).<sup>25</sup> Montenegro currently lacks concrete measures to support women in top-level positions in research, technology and innovation. Indeed, women's participation in Grade A positions in the higher education sector dropped down to 31 in 2018<sup>26</sup>. However, the government supports the advancement of women in Montenegro through the Action Plan for Achieving Gender Equality (see above).<sup>27</sup> The strategic goal for this is to increase employment of women and eliminate all forms of discrimination of women in labour.

According to the She Figures 2021 report, Montenegro demonstrated a positive compound annual growth rate (CAGR) in publications with a gender dimension for 2015-2019, with a growth rate of 16.8% and a 3.6% overall proportion. In comparison to the EU27 Member States and Associated Countries, the proportion of publications with a gender dimension ranged between 0.79% Ukraine and 4.3% Bosnia and Herzegovina, while the growth rate ranged between 4.9% Iceland and 17.7% Ukraine<sup>28</sup>.

According to She Figures 2021, the proportion of female PhD graduates in Montenegro has gradually decreased, approaching gender parity. Data show that women represented 67% of doctoral graduates in 2010 in comparison to 53.9% in 2018. The 2018 data indicate that women represented 48.1% of doctoral graduates at European level (EU27 average), compared to 47.5% in 2010. This indicates that gender equality has almost been accomplished in terms of male and female graduates regardless of their field of study. Furthermore, there has been gradual advancement in gender equality over time.

<sup>23</sup> <https://www.monstat.org/uploads/files/obrazovanje/visoko/specijalisti%20magistri/2021/Specialisti%20%20magistri%20i%20doktori%20nauka%202021.%20godina%20ENG.pdf>

<sup>24</sup> <http://www.gov.me/en/search/165092/Montenegro-establishes-the-Index-of-Gender-Equality.html>

<sup>25</sup>

<https://www.me.undp.org/content/montenegro/en/home/presscenter/pressreleases/2020/GEI2019.html>

<sup>26</sup> Data collected by the University of Montenegro, University Donja Gorica and University Mediterranean.

<sup>27</sup> Action Plan for Achieving Gender Equality 2017-2021 (Published in 2017) Page 55-66

<sup>28</sup> <https://op.europa.eu/en/web/eu-law-and-publications/publication-detail/-/publication/67d5a207-4da1-11ec-91ac-01aa75ed71a1>

## 1.6 ERA Priority 5a: Optimal circulation, access to and transfer of scientific knowledge including knowledge circulation

There have not been any specific policy measures influencing the start-up ecosystem in Montenegro recently. Concerning financial support instruments (grants and loans) offered by the government, there has been a gap in financing the initial seed phase of innovative projects, which is where the emergence and development of innovative start-ups usually take place. In addition, the absence of both an IF as well as a public “guarantee fund” for loans to risky but promising business projects during the stage of rapid growth hinders the positive development of start-ups in Montenegro. However, in mid-2021, the Government of Montenegro passed a decision to establish an IF of Montenegro, which will foster the innovation policy through the provision and implementation of funds to encourage innovation (for more details on the IF see ERA Priority 1: More effective national research systems).

Although innovation infrastructures in Montenegro are not highly developed, the existing ones are very active and contribute significantly to the growth of the innovation ecosystem. The Science and Technology Park (STP) Montenegro<sup>29</sup> was established through a partnership between the Government of Montenegro, the Ministry of Science and the UoM. The objective was to establish a place where innovative and creative individuals and projects with active collaboration from key stakeholders in the entrepreneurial process from both science and economy sectors. The STP Montenegro aims to establish a technological development center of Montenegro. Through its various programmes and activities, it will provide adequate support to the promotion of the innovation-entrepreneurial ecosystem in Montenegro, and thus contribute to faster economic development.

Montenegro can apply under S3E for the call SOUTH3E - DEEP TECH IN SOUTH EUROPE<sup>30</sup> for researchers, start-ups, scale-ups or SMEs from a Southern European country who have a Deep Tech idea and want to bridge the gap from lab to market.

With the call for innovative deep tech projects, applicants get the chance to accelerate their ideas to boost the social and economic growth in Southern Europe. S3 will select research teams, growth stage start-ups, scaling start-ups and SMEs to support them in their lab to market-journey to improve the connectedness and efficiency of the Southern European entrepreneurship ecosystems. There are three different funding lines:

### S3Estart (researchers, tech transfer offices)

S3E Start aims at research teams with deep tech projects working on a scientific discovery or meaningful engineering innovation in any stage of development, that want to explore the path from the lab to the market. S3E Start is also intended for technology transfer officers seeking to learn a thoroughly tested methodology to foster science-based entrepreneurship and technology commercialisation. It offers 25 available spots for research teams and 20 for Technology Transfer Officers (TTOs) to participate in an 18-week hands-on training programme on science-based entrepreneurship.

### S3Echarge (start-ups)

Start-ups in their growth phase are invited to submit their deep tech project ideas solving an unmet (or ill met) need impacting at least one of the SDGs. In return, S3E will support them in developing a solid investment-ready business plan to facilitate their access to non-dilutable<sup>31</sup>

<sup>29</sup> <https://www.ntpark.me/en/about-us/>

<sup>30</sup> <https://south3e.eu/program/>

<sup>31</sup> Non-dilutive financing means that they receive money for the business without giving away any ownership of the company itself.

and dilutable funding and connect them to ‘innovation leaders’ and ‘strong innovators’ ecosystems. It offers 30 available spots for growth start-ups who will be part of a Mentoring and Networking programme on Deep Tech.

### S3Ereverse (corporate or public entity or scale-up/SMEs)

Corporations and public organisations are invited to submit a deep tech challenge aiming at solving an unmet (or ill met) need that impacts at least one of the SDGs (as challengers). In the second stage, scale-ups and SMEs may be able to respond to the selected challenges with their innovative deep tech solutions (as solvers). The programme offers 15 corporate challenges for 60 available spots for scale ups participating in an Open Innovation Programme on Deep Tech.

The Innovation and Entrepreneurship Center (IEC) Tehnopolis<sup>32</sup> has been founded by the Government of Montenegro in 2016 when it officially started operating. It is the most important centre for the development of start-up companies and entrepreneurship in Montenegro. As one of the key actors in the creation and reshaping of the Montenegrin innovation ecosystem, Tehnopolis offers various infrastructural and supportive measures to facilitate the establishment of new companies and the development of businesses based on new, innovative ideas and technologies. The Ministry of Economic Development is in charge of supervising the centre. Tehnopolis was established in collaboration with the following partners: Ministry of Agriculture, Forestry and Water Management, the Investment and Development Fund, and the Municipality of Nikšić. Currently, Tehnopolis has 10 tenants. Its innovation infrastructure consists of the Biotechnology Laboratory, the Data Centre and the TechLab.

Mtel Digital Factory<sup>33</sup>, established in 2017 as a private entity, is a centre for technology entrepreneurship development and innovation, seeking to promote early-stage start-ups that develop innovative products and have the potential to make a positive impact on the environment and society. It is the first hub in Montenegro listed in the Digital Innovation Hubs (DIH) catalogue which was set up to provide a comprehensive picture of DIHs in the EU across varying competences, structures and service offerings. Mtel Digital Factory is cooperating with several important stakeholders such as the Chamber of Commerce of Montenegro, UDG, BEST Student Association, AIESEC, Association of Managers of Montenegro, UDG’s Faculty of Electrical Engineering, etc.

Digitalizuj.Me<sup>34</sup> is a digital community seeking to help citizens and organisations in Montenegro to understand and take advantage of new opportunities for social and business change in the digital environment. It is a non-governmental organisation that successfully implemented many innovative projects in cooperation with organisations such as the UNDP Office in Montenegro, East West Management Institute, Coca-Cola Hellenic, Telekom, Telenor Montenegro, and others.

Incubator BSC Bar<sup>35</sup> was founded in 2007 within the project funded by the Ministry of Foreign Affairs of the Netherlands and conducted by the Dutch NGO SPARK with the main goal of supporting the promotion of entrepreneurship in Montenegro. Currently, BSC Bar hosts 20 tenants.

Beta Bar is the first co-working space in Montenegro offering spaces for international collaboration, access to mentors for business development and opportunities to connect with the Bar community. Besides providing a workspace, Nova Ivica, the parent company of Beta Bar, offers consulting services focused on brand development and promotion, using the potential of social media, IT strategy management and other areas of expertise. It also offers various

<sup>32</sup> <https://www.tehnopolis.me/online/en/about-tehnopolis/>

<sup>33</sup> <http://digitalnafabrika.mtel.me>

<sup>34</sup> <https://digitalizuj.me>

<sup>35</sup> <https://www.bscbar.org/en>



workshops that bring business ideas to life. In addition to the above-mentioned innovation infrastructures, Montenegro's Chamber of Economy, Union of employers, Association of Managers, the American Chamber of Commerce, and the Montenegro Business Alliance all provide general business development support to companies.

The available data shows that business enterprises invest only a limited amount in R&D, thereby restricting their ability to develop new products and processes and of absorbing foreign technologies. A closer look at the industry level is required to identify industries with relative strengths in performing R&D. However, the study on smart specialisation reveals that comprehensive R&D statistics for Montenegro's industry aren't available. This is largely explained by the small number in the business enterprise sector responding to the R&D survey.<sup>36</sup> To assess the industry's innovative potential, it is recommended to collect R&D expenditure data for NACE 3-digit industries.<sup>37</sup>

## 1.7 ERA Priority 5b: Open Access

As one of the first practical measures regarding Open Access (OA), implemented in 2018, the Ministry of Science allocated funds to co-finance the publication of papers by Montenegrin researchers in OA journals, covering article processing charges for researchers whose research was accepted for publication in scientific journals categorised as Q1-Q3 in given fields. An amount of 30,000 euros was allocated for this purpose in 2020. In the period from 2018 to 2020, 42 publications were co-financed on this basis. The Ministry of Science's Call for Applications for Financing Scientific Research Activities also supports the publication of scientific journals with OA, given that the journal is indexed in the Directory of Open Access Journals (DOAJ). In 2020, the amount allocated for this purpose was 30,000 euros. In terms of OA journal publications, there are currently nine such journals from Montenegro in the DOAJ. Until early 2020, only the University of Montenegro (UoM) amongst the scientific research institutions had signed the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities (22 October 2018). The UoM has developed a digital archive, which includes an open electronic database of doctoral dissertations defended at the UoM.

SCOPUS data on Montenegro OA reports that in the 2017-2022 period there were 1,895 papers available in OA (all OA); 1,218 of them were gold OA papers, 159 hybrid gold, 309 bronze and 1,187 green.

There are no data available whether Montenegro participates in Pasteur4OA. As for the OpenAIRE, the UoM through its team from the Faculty of Electrical Engineering, participates in the realisation of the H2020 NI4OS-Europe project, thus contributing to the European Open Science Cloud (EOSC) service portfolio. As part of NI4OS-Europe activities, the UoM has established the National Open Science Cloud Initiative (NOSCI) in Montenegro, which gathers the most relevant national research institutions. The UoM is also observer at the EOSC Association.

The recognition of the importance of all aspects of Open Science has resulted in the adoption of a policy for OA to research infrastructures at the UoM in October 2020, as the first such policy framework for the capitalisation on existing infrastructure, which has also been opened to third parties.

During the period of 29 September to 2 October 2022, the "Days of Science and Innovations" festival was organised by the Ministry of Science and Technological Development and took place in eleven towns in Montenegro<sup>38</sup>. Partners in the project were among others the Ministry of

<sup>36</sup> Hugo Hollander: Mapping economic, innovation and scientific potential in Montenegro - Final report, 15 March 2018.

<sup>37</sup> Ibid

<sup>38</sup> [https://ni4os.eu/2022/10/14/report-on-dissemination-in-the-frame-of-days-of-science-and-innovations-festival-in-montenegro/?utm\\_source=rss&utm\\_medium=rss&utm\\_campaign=report-on-dissemination-in-](https://ni4os.eu/2022/10/14/report-on-dissemination-in-the-frame-of-days-of-science-and-innovations-festival-in-montenegro/?utm_source=rss&utm_medium=rss&utm_campaign=report-on-dissemination-in-)

Education, the Ministry of Economic Development and Tourism, the EC, the EU Delegation to Montenegro, the UoM and two other private universities, as well as the American Chamber of Commerce in Montenegro. In accordance with the announced activity plan in the EOSC-Future project, a session dedicated to Open Science and EOSC has been arranged by a team from UoM to take place on 2 October 2022 during the festival.

Presentations focused on the concept of Open Science, strategies and recommendations adopted in the EU and in Montenegro, the significant achievements in this field, but primarily on EOSC as the most important e-infrastructure to support Open Science in Europe. There were separate presentations on the H2020 projects “National Initiative for Open Science in Europe - NI4OS-Europe” and “EOSC-Future”, in which UoM participates in the implementation. The main project goals, activities and achieved results were presented, with the focus on potential benefits that researchers in Montenegro may have from these two projects. The UoM team shared two open services developed under the NI4OS-Europe framework: OMAApp, a service for georeferencing images and mosaics creation, as well as an IoT platform, an open service for acquiring, visualising and processing data from IoT devices.

The quality of Montenegrin publications is below average, as measured by the share of publications in the top 10% and top 1% most-cited publications (using Web of Science data). Additionally, a lower ranking in citation performance compared to the ranking of published documents (using Scimago data) also suggests lower quality. About 6% of Montenegrin scientific publications are among the top 10% most-cited publications worldwide, although only 0.3% of Montenegrin scientific publications are among the top 1% most-cited global publications. Both results show that the quality of Montenegrin scientific publications is below average and requires improvement. For the 2017-2021 period, 2,668 publications were covered for Montenegro in Scimago. This number increased from 56 in 2017 to 401 in 2018, declined in 2019 before increasing again to 431 in 2021.

In terms of research specialisation, the activity index (also called the ‘Relative Specialization Index’) per area shows that Montenegro lacks well-established specialisations (WB, 2013). In fact, there is no scientific field with a speciality index above 1, indicating a lack of specialisation. The only two areas where Montenegro approaches a specialisation index of half of the world’s average are computer science, physics and astronomy.

## 1.8 ERA Priority 6: International cooperation

Activities in international cooperation started in April 2022 with establishing a connection with the European network of leading national innovation agencies (TAFTIE). IF as the responsible institution for Montenegro was introduced to the TAFTIE policy representatives and it was agreed that the IF connects with EU innovation agencies to exchange experience and knowledge.

During 2022, IF has organised online meetings with EU innovation agencies, attended TAFTIE Insight Sessions online and met other innovation agencies in person during the CEO Policy Forum in Brussels. From the start, the IF established cooperation with agencies from Croatia and the WB region (Serbia, North Macedonia) with the aim of strengthening the economic development of the WB region through joint innovation projects. The most intensive cooperation is with of the Innovation Fund of Serbia in transferring knowledge and good practices to Montenegro. Additionally, the IF joined the European Alliance of Innovation and became a partner with Founder Institute Serbia, which is a branch of the largest pre-acceleration programme at global level, the Founder Institute (FI).

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[the-frame-of-days-of-science-and-innovations-festival-in-montenegro&utm\\_source=rss&utm\\_medium=rss&utm\\_campaign=report-on-dissemination-in-the-frame-of-days-of-science-and-innovations-festival-in-montenegro](https://www.erasmusrp.eu/en/the-frame-of-days-of-science-and-innovations-festival-in-montenegro&utm_source=rss&utm_medium=rss&utm_campaign=report-on-dissemination-in-the-frame-of-days-of-science-and-innovations-festival-in-montenegro)

Special emphasis in the IF activities was put on developing the cooperation with international partner consortia to apply for EU funding under Horizon Europe (call: Expanding Investments Ecosystems), IPA CBC, Erasmus+ and the WB Fund. Two projects have received positive decisions on financing (Erasmus+ and WB Fund), while other applications are still in the evaluation phase. Strengthening international bilateral, regional and multilateral cooperation is one of the priorities in the SSRA 2017-2021.<sup>39</sup> The cooperation has largely been based on mutual visits of expert teams and networking. However, it did not involve the implementation of larger research projects. One of the main goals of the IF is to participate in EU Innovation Ecosystem initiatives and establish stronger cooperation with the EIT and the EIC. The IF manager for international cooperation is the Montenegrin NCP for the EIT, and therefore the IF plays an important role in the promotion of different EIT funding programmes to actors within the Montenegrin innovation ecosystem. The IF is involved in the submission process under two programmes (Collaborative Grants for Innovation and Innovation Enterprises) of the EIC Plug-in Accelerator Scheme. In 2021, seven patent applications were submitted, all from abroad. Patent applications from Montenegro residents have fluctuated significantly in recent years, with a tendency to decrease from 37 in 2012 to 5 in 2020. Similarly, patent applications from foreign countries have varied, starting from one in 2012, increasing to seven in 2015, and peaking at 16 in 2020<sup>40</sup>.

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<sup>39</sup> [https://era.gv.at/object/document/2763/attach/ME\\_ERA\\_Roadmap.pdf](https://era.gv.at/object/document/2763/attach/ME_ERA_Roadmap.pdf) page 19

<sup>40</sup> [https://www.wipo.int/ipstats/en/statistics/country\\_profile/profile.jsp?code=ME](https://www.wipo.int/ipstats/en/statistics/country_profile/profile.jsp?code=ME)

## 2. Horizon Europe participation and financial contribution

Montenegrin legal entities participate in all pillars of Horizon Europe, 5 projects in Pillar I, 3 in Pillar II and 2 in Pillar III (see graphs below). Montenegro’s proposal success rate is 2<sup>nd</sup> highest among the Western Balkans economies and above the EU Member States average.

Montenegro has attracted most Horizon Europe funding in Pillar II (0.68 million euros), less in Pillar I (0.62 million euros) and Pillar III (0.28 million euros).

Figure 1: Participation in Horizon Europe programmes by thematic priority

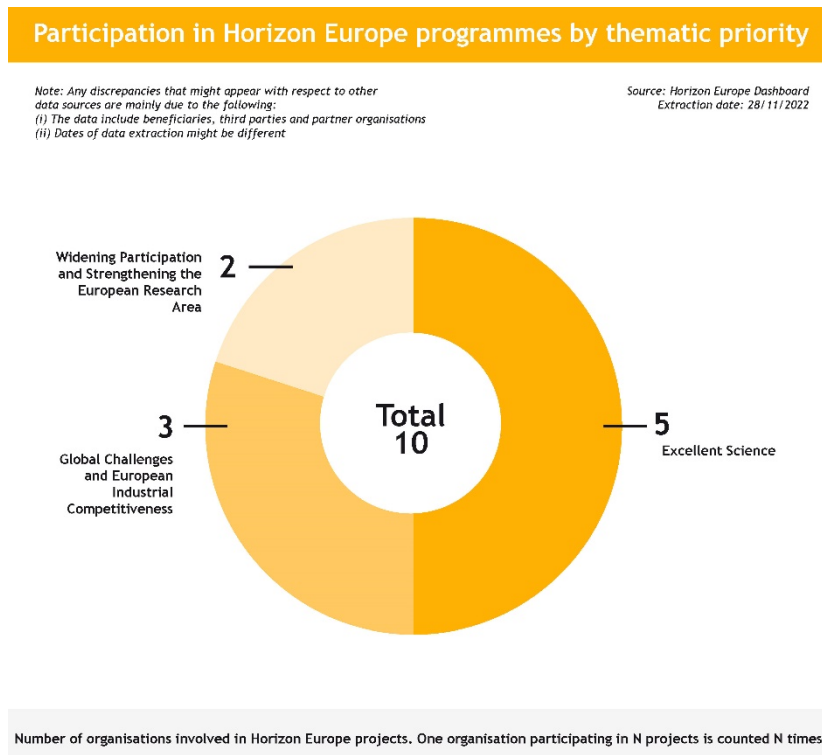




Figure 4: EU contribution across programmes in Mio. Euro

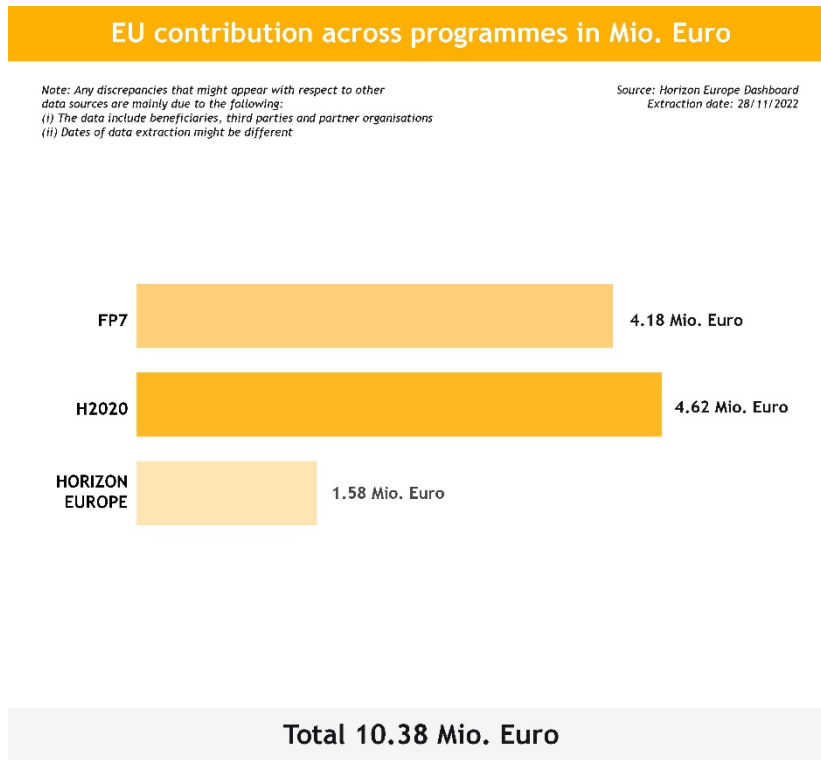


Figure 5: Data for signed up grants up to 28/11/2022



### 3. Smart Specialisation Strategy

Montenegro's S3 for the period 2019-2024 serves as the basis for priority investment in research and innovation and has a financial volume of about 174 million euros. The government is responsible for providing 116.4 million euros, while the private sector contributes 21.7 million euros, the EU 33.5 million euros and other international sources supply 2.5 million euros. The Montenegrin Ministry of Science coordinated the S3 process with the help of the Ministry of Economy and more than 300 stakeholders from the academic, economic, public and civil sectors; more than half of them came from the business sector. This exercise identified three priority domains: Sustainable Agriculture and Food Value Chain; Energy and a Sustainable Environment; Sustainable and Health Tourism, and ICT as a horizontal dimension that provides business and technological support to the other priority areas.

The operational programme for implementing the S3 2021-2024, including an action plan 2021-2022, states<sup>41</sup> the following objectives:

- providing a clear overview of the current state in the S3 priority areas;
- addressing the strategic objectives of the S3 more appropriately by revising operational goals and activities; and
- establishing a quality programme basis that can be built upon for further work on improving the S3 implementation.

The action plan for the period 2021-2022 consists of 12 operational goals and 65 activities; the proposed budget for the implementation amounts to 73.5 million euros.

### 4. Conclusion

In the last decade, Montenegro like the rest of the Western Balkans witnessed progress in industrial restructuring in terms of reconstruction and modernisation of the industrial base, based on wood-processing, metal-working, textile and motor-car industries.

This process requires further development, although this is not yet possible as there is currently no fully operational national innovation system in place. Improvements in quality, adaptation of foreign technologies to national conditions, as well as continued product and process innovations will not be possible without innovative companies, an educated labour force and a more complex research and development system. Montenegro cannot achieve long-term growth solely on the basis of cheap and unskilled labour. Instead, it must increase the proportion of skilled workers, prioritize quality and national innovation, and effectively adapt to and utilize foreign technologies and software. To achieve this shift, higher education and vocational training systems must be reformed, and companies must be supported in their efforts to increase innovation activities.

This shift or the integration of the national science, technology and innovation system into the European Research Area cannot take place overnight. It requires a social consensus and full stakeholder agreement, as well as much better knowledge of national restrictions and abilities. It also requires a better knowledge of Montenegro's position in the international environment. It is not possible to mobilise social institutions and organisations without a precise identification and quantification of problems and potentials.

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<sup>41</sup> <https://s3.me/>



## ABOUT POLICY ANSWERS

POLICY ANSWERS (R&I POLICY making, implementation ANd Support in the WEsteRn BalkanS) supports policy coordination in the Western Balkans and with the EC and the EU. 14 partner organisations, representing network nodes in the region and EU expert organisations, support policy dialogue through formal meetings (such as ministerial and steering platform and ad-hoc policy meetings), monitoring and agenda setting, capacity building and implementation of the EU's Western Balkan Agenda, as well as the alignment of thematic priorities. The project implements regional pilot activities and offers an information hub based on the [westernbalkans-infohub.eu](http://westernbalkans-infohub.eu) online information platform. The partners provide analytical evidence via monitoring and mapping activities of the stakeholder ecosystem, of the implementation of the Western Balkans Agenda and of the Western Balkans' integration into the European Research Area as well as via strategic foresight. POLICY ANSWERS also allows for tailored and targeted capacity building activities in the Western Balkans as well as regional alignment of priorities in relation to the digital transformation, the green agenda and towards healthy societies. Pilot activities provide learning opportunities on policy and programme level and reach out to final beneficiaries related to improved academia-industry cooperation, researcher mobility, inclusion of youth in policy processes, promotion of research infrastructures and increased innovation skills in all areas.

