



**POLICY
ANSWERS**

BOSNIA AND HERZEGOVINA'S ERA INTEGRATION

An update by POLICY ANSWERS

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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:

- Bosnia and Herzegovina obtained candidate status for EU membership on 16 December 2022.
- Bosnia and Herzegovina possesses relevant science strategies on all levels of government. However, those most recent strategies expired in 2022 and thus require renewal.
- Regarding participation in Horizon Europe, Bosnia and Herzegovina's success rate for proposals is almost at the level of the EU Member States' average.
- The capital of Bosnia and Herzegovina, Sarajevo, was selected as a part of the EU's "100 Climate-neutral and smart cities" mission.
- Participation in EUREKA and COST programmes has reached satisfactory levels.
- With two bridgehead organisations and five EURAXESS Service Centres, EURAXESS activities in Bosnia and Herzegovina have increased over recent years. Moreover, Bosnia & Herzegovina signed 14 declarations on the commitment to the Charter and Code, and three public universities obtained the HR logo.
- Regarding participation in the ESFRI roadmap, Bosnia and Herzegovina has made first steps; in July 2021, it became a part of DARIAH ESFRI, the pan-European Digital Infrastructure for the Arts and Humanities in research.
- Bosnia and Herzegovina is being classified as an emerging innovator in the European Innovation Scoreboard. However, it must be noted that with a performance of 34.9% of the EU average, it lies below the average of emerging innovators.
- Bosnia and Herzegovina actively participates in several projects related to gender equality. Beyond that, the fact that participation in Horizon Europe projects requires the presence of Gender Equality Plans (GEPs) has helped create better conditions for female researchers: Eight public universities as well as five private universities have developed and published GEPs.
- There has been steady growth in the production of research papers, with over 50% of all papers published in cooperation with international partners.
- Open Access is widely accepted by the research community: 39 journals in SCOPUS are registered with open access, only four of which charge an Article Processing Fee (APC).

Challenges for further ERA integration:

- The ERA Roadmap needs to be updated and renewed as the most recent one covered the period 2017-2021 and has since expired.
- New strategies should be approved for the next short-term period as the last one expired in 2022 (at all levels of governance).
- A country-level research infrastructure roadmap is needed to have insight into the research landscape.
- Investments in R&I are still scarce (below 1% of GDP). However, they are at an expected level for the current status of economic development.
- Further efforts are needed by the state-level Ministry to approve participation in ESFRI.
- In view of the low citation rates, it should be noted that the quality of research in Bosnia and Herzegovina is still relatively low.
- Although progress has been made in this area, gender equality measures need to be further advanced. For instance, at present, eight public and five private universities have published Gender Equality Plans.
- Existing grant schemes should consider responsible research and innovation elements as qualification and evaluation criteria, especially research integrity, ethics, and the gender dimension.



- It is necessary to further strengthen international cooperation, preferably involving Bosnia and Herzegovina's scientific diaspora, which can play a crucial role in the development and implementation of international cooperation.
- As there are still significant deficits in this area, it is imperative that the Smart Specialization Strategy (S3) be expedited.

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List of abbreviations used in this document

ANUBIH	Academy of Sciences and Arts of Bosnia and Herzegovina
ANURS	Academy of Sciences and Arts of the Republic of Srpska
BIH	Bosnia and Herzegovina
CEDAW	UN Convention on the Elimination of all Forms of Discrimination against Women
CREDI	Centre for Development Evaluation and Social Science Research
CoM	Council of Ministers
DARIAH	Digital Research Infrastructure for the Arts and Humanities
DASS-BIH	Data Archive for Social Sciences - Bosnia and Herzegovina
DEP	Directorate for Economic Planning
DIH	Digital Innovation Hub
EC	European Commission
EEN	Enterprise Europe Network
EIS	European Innovation Scoreboard
EIT	European Institute of Innovation and Technology
EOSC	European Open Science Cloud
EPO	European Patent Organisation
ERA	European Research Area
ERIC	European Research Infrastructure Consortium
EU	European Union
FBH	Federation of Bosnia and Herzegovina
FMON	Federal Ministry of Education and Science
FTE	Full-Time Equivalent
GAP	Gender Action Plan
GDI	Gender Development Index
GEP	Gender Equality Plan
GII	Gender Inequality Index
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
HDI	Human Development Index
HEI	Higher Education Institution
HES	Higher Education Sector
ICT	Information and Communication Technologies

ISA	International Searching Authority
KIC	Knowledge and Innovation Communities
MCA	Ministry of Civil Affairs of Bosnia and Herzegovina
MNRVOID	Ministry of Scientific and Technological Development, Higher Education and Information Society of the Republic of Srpska
OA	Open Access
R&I	Research and Innovation
RCC	Regional Cooperation Council
REI	Research Excellence Indicator
RI	Research Infrastructure
S3	Smart Specialisation Strategy
SCI	Science Citation Index
SEEIIST	Southeast Europe International Institute for Sustainable Technology
SSCI	Social Sciences Citation Index
UNECE	United Nations Economic Commission for Europe
WIDERA	Widening Participation and Strengthening the ERA
WIPO	World Intellectual Property Organisation

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

Jurisdiction in the field of higher education and science in Bosnia and Herzegovina (BiH) lies with two entities. At the federal state level, the Ministry of Civil Affairs of Bosnia and Herzegovina (MCA) takes care of tasks that are within the competence of BiH related to determining the basic principles of coordinating activities, aligning the plans of entity authorities and defining strategies at the international level in the areas of science and education. The Sector for Science and Culture and the Sector for Education of MCA perform tasks related to the coordination and development of education and science activities in BiH and monitor the implementation of domestic agreements and strategic documents in these fields. The MCA collects and analyses information, participates in the work of international organisations in the field of education and science, actively follows the integration processes of BiH towards full accession to the European Union (EU), and participates in the preparation of international agreements and contracts. According to the BiH Constitution, within the Federation of Bosnia and Herzegovina the Federal Ministry of Education and Science (FMON) only has a coordinating role in the field of Research and Innovation (R&I), while all competencies lie with the Cantonal governments. Within the Republic of Srpska, the Ministry of Scientific and Technological Development, Higher Education and Information Society of the Republic of Srpska (MNRVOID), among administrative and other professional tasks related to the Scientific and Technological (S&T) in the Ministry's jurisdiction, performs analysis and monitoring of the state of science in the Republic of Srpska, creating politics, strategies and plans of acting in the field of science, preparation of laws and other regulations from the scope of work.

In line with the division of responsibilities and competences, each of these institutions (MCA, FMON and MNRVOID) has developed its own strategy for the development of R&I. Based on publicly available data and published information, this provides a legal framework for the development of R&I in BiH.

Developed in 2016, the ERA Roadmap for BiH¹ laid out a scheme for the period 2017-2021 and is aligned with the ERA priorities. It provides a very brief description of the lines of action as per the defined ERA priority.

The MCA adopted a "Strategy of development of science in Bosnia and Herzegovina 2017-2022 (Revised framework document)"² in September 2016. The strategy provides strategic guidance and an action plan for the development of R&I in BiH. The overall goal of this strategy is to increase financial support for R&I actors. As part of this, ten key objectives were identified that are designed to enable greater participation in international R&I efforts and provide access to electronic and physical research infrastructures and databases.

In parallel to those strategic concepts, FMON, in 2011, adopted the "Strategy for the Development of Scientific Research and Research Development Work in the Federation of Bosnia

¹ Source: from https://era.gv.at/public/documents/2883/BiH_ERA_Roadmap.pdf (20.11.2022)

² Source: from

http://www.mcp.gov.ba/attachments/sr_Migrirani_dokumenti/%D0%A1%D0%B5%D0%BA%D1%82%D0%BE%D1%80%D0%B8/%D0%9D%D0%B0%D1%83%D0%BA%D0%B0_%D0%B8_%D0%BA%D1%83%D0%BB%D1%82%D1%83%D1%80%D0%B0/Nauka_i_kultura-dokumenti/NACRT_STR_ZA_NAUKU-lektorisana_strategija_sa_ugradjenim_kom_SR.doc (20.11.2022.)

and Herzegovina for the Period 2012-2022." The document defines the strategic guidelines and the plan for the implementation of the strategic goals, as well as the corresponding legal framework.

The goals of this strategy are similar to the MCA strategy described above. In addition, the BiH has adopted another document, the "Development strategy of Federation of Bosnia and Herzegovina"³, in 2020. It identifies four strategic goals, 18 priorities and 78 measures. Innovations and digitalisation are recognised as the first accelerators of development, with a special focus on promoting digitalisation of the economy, as well as the transfer and development of technologies. In the Federation of Bosnia and Herzegovina, the Cantonal level ministries are also adopting their strategies (e.g., Sarajevo Canton Development Strategy 2021-2027)⁴.

The last of the strategies currently active in BiH is the "Strategy of Scientific and Technology Development of Republic of Srpska 2017-2021 - Knowledge for Development"⁵, which was adopted by the MNRVOID in 2016. This strategy centers around six main goals, aiming at creating optimal conditions for the development of science and technology through encouraging excellence in the scientific research community that will be recognised at the national and international level and significantly contribute to the competitiveness of the economy and the creation of new jobs. In September 2019, a first report on the implementation⁶ of this strategy has been published. It concluded that the strategy was successfully implemented to a significant extent. However, the implementation is hindered by one major issue in particular, which is the low level of international recognition of BiH's R&I community, resulting in few opportunities for international collaboration. For instance, the number of publications in important scientific journals is very low, which leads to low visibility of the respective researchers throughout the rest of the global research community.

Further efforts at improving the research landscape were undertaken by the Regional Cooperation Council (RCC). The RCC published the policy document "A Framework for Research Infrastructure Roadmap of Bosnia and Herzegovina"⁷ (Framework for RI Roadmap) in March 2022. It summarises the existing research potential of BiH by identifying key research elements, such as research facilities, equipment, instrumentation and international cooperation, including the involvement in large European research infrastructures (RIs) and relevant projects.

At the moment of writing this report (30.11.2022), it was not possible to access the Information System of Research Activities in Bosnia and Herzegovina (<http://www.registar.nub.ba>) that contains data on research institutions in FBH. The Agency for Higher Education of Bosnia and Herzegovina (<http://hea.gov.ba>) has accredited in total 22 higher education institutions (HEIs) in FBH, three in Brčko District and 14 in the Republic of Srpska⁸.

³ Source: <https://fzzpr.gov.ba/files/Strategije/Strategija%20razvoja%20FBiH%202021.-2027..pdf> (20.11.2022)

⁴ Source: https://zpr.ks.gov.ba/sites/zpr.ks.gov.ba/files/sarajevo_canton_development_strategy_2021-2027.06.07.pdf

⁵ Source: <https://www.vladars.net/sr-SP-Cyrl/Vlada/Ministarstva/mnk/Documents/PRIJEDLOG%20-%20strategije%20naucnog%20i%20tehnoloskog%20razvoja%20RS%202017-2021%20%286%29.pdf> (20.11.2022)

⁶ Source: <https://www.vladars.net/sr-SP-Cyrl/Vlada/Ministarstva/mnk/Documents/Izvjestaj%20o%20realizaciji%20Strategije%202017-2021.docx> (24.11.2022)

⁷ Source: <https://www.rcc.int/download/docs/Framework%20for%20RI%20Roadmap%20BIH%20digital.pdf/41b22ea46441bd82bdeac746849563f7.pdf> (25.11.2022)

⁸ Source: http://hea.gov.ba/akreditacija_vsu/ (25.11.2022)

The MNRVOID published its “Roadmap of Research Infrastructures in the Republic of Srpska”⁹ that identified more than 160 institutions dealing with R&I in the Republic of Srpska categorised into four main groups:

- Public institutes: 33
- Private institutes: 60
- Public universities and faculties: 38
- Private universities and faculties: 31

As a conclusion, it proposed eight policy recommendations ranging from structural and legislative improvements related to RIs and their better integration in large European infrastructures, thus proposing further investments in RIs.

The FBH has not developed a similar roadmap. This deficit is accompanied by a lack of comprehensive official data on institutions dealing with R&I. The BiH Institute of Statistics¹⁰ only retains data on six public universities, 19 private and three religious Higher Education Institutions (HEI).

Since 2012, the BiH Agency for Statistics (<https://bhas.gov.ba>) has established a new area of investigation, which focuses on collecting and disseminating data in the field of Science, Technology and Innovation¹¹ following the methodological recommendations of the OECD and Eurostat.

The Agency states that in 2020, BiH’s gross domestic expenditure was 34,24 billion BAM (Bosnian Mark)¹², 0.09% of which allocated for research and development. The same year the Agency registered 2,037.42 employees in R&I in full time equivalents (FTE).

The European Patent Organisation (EPO)¹³ has registered one patent application from BiH in 2021, and four in 2020. The World Intellectual Property Organisation (WIPO) recorded 64 intellectual property fillings in 2021¹⁴. In the European Innovation Scoreboard (EIS)¹⁵, BiH is marked as an emerging innovator with a performance at 34.9% of the EU average, which is below average for emerging innovators (50%). The EIS report concludes that there was an obvious decrease in innovation performance in the last two years due to several reasons. The main reasons are reduced performance in tertiary education, public R&D expenditures, design applications, and environmental-related technologies. However, performance has improved strongly for the export of medium and high-tech goods.

In the European Innovation Scoreboard (EIS) 2022¹⁶, it is noted that the indicators “performance compared to the EU in 2022” was at 14.5. When looking at the “Change in Performance 2015-2022”, EIS noted a decline in performance (-18,6). The same trend was maintained when looking at the “Change in Performance 2021-2022” (-2.2). The decline in the number of patent applications is due to a number of factors. Notable reasons include that other countries are a

⁹ Source: <https://www.vladars.net/sr-SP-Cyrl/Vlada/Ministarstva/mnk/Documents/Roadmap%20of%20RI%20in%20the%20RS%20-%20FINAL.pdf> (28.11.2022)

¹⁰ Source: First Release „Higher Education in Federation of Bosnia and Herzegovina“ Year XV, Number 12.3, Sarajevo, 2.3.2022., Institute for Statistics of FBH. (28.11.2022)

¹¹ Source: <https://bhas.gov.ba/Calendar/Category/28> (28.11.2022)

¹² Source: „Bosna i Hercegovina u brojkama 2021“, Agency for Statistics of Bosnia and Herzegovina, ISSN 1986-8561, Sarajevo 2021

¹³ Source: <https://www.epo.org/about-us/annual-reports-statistics/statistics/2021/statistics/granted-patents.html> (27.11.2022)

¹⁴ Source: https://www.wipo.int/ipstats/en/statistics/country_profile/profile.jsp?code=BA (28.11.2022)

¹⁵ Source: https://ec.europa.eu/assets/rtd/eis/2022/ec_rtd_eis-country-profile-ba.pdf (European Innovation Scoreboard 2021, doi: 10.2873/340166) (28.11.2022)

¹⁶ Source: https://ec.europa.eu/assets/rtd/eis/2022/ec_rtd_eis-country-profile-ba.pdf

more attractive environment for innovators, especially in terms of research conditions and remuneration for researchers; that patents are filed in the EU and abroad; and possibly most importantly, that there is no financially sound industry in BiH capable of funding R&I that could lead to a patent application. A look at the data from the Agency for Statistics of Bosnia and Herzegovina shows that the number of approved patents in 2011 was 148, while ten years later only four patents were approved. Overall, the number of approved patents decreased year by year throughout the last decade. According to the Global Innovation Index 2022¹⁷, BiH ranks 70 among 132 economies. This means an improvement of five positions in comparison to the previous report from 2021. BiH's performance is at the expected level considering the level of development and the share of its GDP that it allocates to R&I. This means that BiH produces fewer innovation outputs considering its level of innovation investments. When comparing the number of scientific publications, this refers to articles from the fields of physics, biology, chemistry, mathematics, clinical medicine, biomedical research, engineering and technology, and earth and space sciences that were published in a set of journals covered by the Science Citation Index (SCI) and the Social Sciences Citation Index (SSCI). Data and the methodology definition are adopted from the World Bank¹⁸, but data of the last three years is missing. Based on World Bank data, in 2018 the number of published articles was 704.

According to the SCIMAGOJR (SCOPUS), BiH has a H-index of 128¹⁹, with 18,020 registered documents and 162,213 citations, which amounts to nine citations per document. The same source counted 474 cited and 1,512 uncited documents in the database for the year 2021. The number of citable documents in 2021 was 1,894, while the number of uncitable documents was only 92.

In terms of international recognition and ranking of journals from BiH, only 16 journals from BiH are listed in SCOPUS²⁰; the five most cited journals are Open Access journals:

- *Bosnian Journal of Basic Medical Science* (H-index 29, total docs in 2021: 91)
- *Acta Informatica Medica* (H-index 24, total docs in 2021: 43)
- *South East European Journal of Economics and Business* (H-index 14, total docs in 2021: 20)
- *Medicinski arhiv* (H-index 26, total docs in 2021: 81)
- *Sport Science* (H-index 20, total docs in 2021: 10)

According to the CiteScore Percentile, the publications in the Top 10% of top journals for BiH are ranging between 8 and 11 in the past five years. The recent score is 10.2; the lowest scores were recorded in 2019 (8) and 2020 (9.2), which can be explained by the lockdown due to the COVID-19 pandemic.

BiH is associated with the Horizon Europe programme for the period 2021 to 2027, which allows BiH institutions to participate in and benefit from actions of the programme on equal terms with institutions from EU countries. Unfortunately, so far, no ERC grants have been awarded to BiH researchers since the launch of Horizon Europe. Also, BiH does not record any participation in Marie Skłodowska Curie Actions to date in Horizon Europe.

Besides paying participation fees for EU-funded R&I programmes such as Horizon Europe, COST and EUREKA, the Ministries at all levels (state and entity) provide additional funding to support R&I.

¹⁷ Source: <https://www.ipr.gov.ba/upload/documents/giibih2022.pdf> (28.11.2022)

¹⁸ Source: <https://data.worldbank.org/indicator/IP.JRN.ARTC.SC?end=2020&locations=BA&start=1999&view=chart> (28.11.2022)

¹⁹ Source: <https://www.scimagojr.com/countrysearch.php?country=BA> (29.11.2022)

²⁰ Source: <https://www.scimagojr.com/journalrank.php?country=BA> (29.11.2022)

At the state level, the MCA has issued the standard call for proposals for the allocation from the ongoing grant scheme to support R&I²¹:

- “Support to technical culture and innovation in Bosnia and Herzegovina” for the year 2022 was published in August 2022 with a total amount of approximately 60,000 euros
- “Programs for the preparation of projects and potential candidates for funds from the HORIZON programme” for the year 2022 (including support to COST and EUREKA projects), with a total amount of approximately 222,000 euros
- “Science Awards” for successes at the international level in 2022. The amount of the monetary award for science is ten times the average salary in BiH from the previous year. The prize for science is awarded in the form of a plaque and a cash prize. The latest average salary in BiH²² (Sept. 2022) was 1,154 BAM (approx. 590 euros), which means that the estimated award will be around 6,000 euros.

The MNRVOID regularly announces competitive calls for several co-funding mechanisms²³. The latest, as of the end of 2022, were the following:

- “Co-Funding of the Infrastructure Improvement Program and Procurement of Equipment Necessary for Scientific Research Work in 2022”, total amount: 40,000 euros (max. 5,000 euros per institution)
- “Co-Financing of 32 Students of the Third Cycle of Academic Studies for Final Theses, or Doctoral Dissertations in 2022”, total amount: 40,000 euros
- “Financial support for innovation in the Republic of Srpska for 2022”, total amount of 20,000 euros
- “Co-Funding of Scientific Publications in 2022”, total amount of 35,000 euros.

The results of these will be known in due time, and the projects will be implemented in 2023.

The MNRVOID’s pilot programme “Synergy” was initiated in late 2019. According to data from the Ministry, five projects in total were supported with a total funding of 126,000 euros. In 2021, for the same programme, the Ministry has allocated approximately 100,000 euros²⁴ for projects that will be implemented starting in 2022.

The FMON also offers support to R&I²⁵ with the “CO-FUNDING OF SCIENCE PROGRAMS AND PROJECTS IN 2022”, which provides grants for:

- Programme 1: “Support for the organisation of domestic and international scientific meetings”; has supported 23 projects with a total amount of 132,763 BAM (67,880 euros) in 2022
- Programme 2: “Support for the printing of scientific journals, anthologies, etc.”; has supported ten institutions with a total amount of 19,265 BAM (10,000 euros) in 2022
- Programme 3: “Support for the printing of scientific books”; has supported 12 institutions with a total amount of 30,000 BAM (15,000 euros) in 2022
- Programme 4: “Support to commercial publishers from the territory of the Federation of Bosnia and Herzegovina in publishing new scientific literature”; has supported 19 publishers with a total amount of 25,186 BAM (12,878 euros) in 2022
- Programme 5: “Support for authors residing in the territory of the Federation of Bosnia and Herzegovina, who are not employed at any of the public higher education and

²¹ Source: <http://mcp.gov.ba/Publication/Category/sve-vijesti?page=1&category=2> (11.12.2022.)

²² Source: <https://bhas.gov.ba/Calendar/Category/13> (11.12.2022.)

²³ Source: <https://www.vladars.net/sr-SP-Cyrl/Vlada/Ministarstva/mnk/Konkursi/Pages/default.aspx>, (10.12.2022.)

²⁴ Source: <https://komorars.ba/mnrvoid-sinergija/> and <https://www.unibl.org/sr-lat/vesti/2021/11/konkurs-za-sufinansiranje-zajednickih-projekata-naucnoistrazivacke-zajednice-i-privrede-sinergija>, (10.12.2022.)

²⁵ Source: <http://www.fmon.gov.ba/Obavjest/Pregled?id=805>, (10.12.2022.)

- scientific institutions in the publication of recent scientific, professional and university literature”; has supported 21 authors with a total of 26,300 BAM (13,447 euros) in 2022
- Programme 6: Co-financing of research work, scientific improvement and study stays in BiH and abroad, for candidates residing in the territory of the Federation of Bosnia and Herzegovina, who are not employed at any of the public higher education and scientific institutions; has supported 11 researchers with a total of 25,708 BAM (13,144 euros) in 2022
- Programme 7: Support for projects aimed at promoting science and disseminating the results of scientific research among the general public; has supported 21 institutions with a total of 90,614 BAM (46,330 euros) in 2022

The Cantonal level ministries in the FBH also grant funds for R&I. For example, in 2022, the Sarajevo Canton announced 4 million BAM (>2 million euros) for grants supporting the development of science in this Canton²⁶.

Gross domestic expenditures for R&D in 2020 amounted to 70.58 million BAM (36.09 million euros) 55.70 million BAM (78.9%) of which were running expenses, while 14.88 million BAM (21.1%) were dedicated future investments. When looking at the total sum of funds for R&D, 29.4% are own funds, while 45% are funds received from the state and other levels of government. Out of the total number of observed units that performed R&D activities in 2020, 61.3% are from the higher education sector, 27.4% are from the business sector, and 11.3% are from the state sector²⁷.

The statistics show a steady increase in total government financing for R&D over the years 2017-2021 from 31.9 to 39.9 million BAM, which is in line with the overall efforts to increase the share of GDP that is allocated to R&D. However, this development contrasts with that of GERD in the public sector in the same period, which decreased from 10 million BAM to 3.5 million BAM. At the same time, there is a slight increase in the GERD in higher education from 32 to 40 million BAM. The reasons for this are mostly linked to the COVID-19 pandemic (decrease of financing in the public sector) as the funding was directed to combat the virus. On the other side, an increase in the higher education sector can be explained with an intensified R&D at public and private higher education institutions.

The JRC’s Adjusted Research Excellence Indicator (REI) shows that BiH has one of the lowest “research excellence indices” calculated with data from 2018, similar to the other Western Balkan economies. Positive is the fact that in 2010 this index was 10, while in 2018 it grew to 14.4, with 5.5% compound annual average growth rate.

For 2020, the domestic statistics record a total number of research papers of 748. With a share of 48%, the majority of research stems from the field of Engineering and Technology, followed by 15% from natural sciences. Considering the type of research, applied research is represented in 45% (337 papers out of 748), fundamental research in 36% (270) and experimental and development research in 19% (141)²⁸.

1.2 ERA Priority 2a: Optimal transnational cooperation and competition

Although there is an interest in participating in various funding programs, BiH does not participate in initiatives such as Open Balkans and Digital Agenda observatory. The Western Balkan Regional R&D Strategy for Innovation was endorsed by the ministers of science from the

²⁶ Source: Ministry of Science, Higher Education and Youth of Canton Sarajevo, https://mon.ks.gov.ba/sites/mon.ks.gov.ba/files/2022-05/Tekst%2520Javnog%2520poziva_2022_0.pdf

²⁷ Source: https://bhas.gov.ba/data/Publikacije/Saopštenja/2022/RDE_01_2020_Y1_1_BS.pdf, (11.12.2022.)

²⁸ Source: Agency for Statistics of Bosnia and Herzegovina, https://bhas.gov.ba/data/Publikacije/Saopštenja/2022/RDE_01_2020_Y1_1_BS.pdf (19.5.2023)

region in Zagreb, on 25 October 2013. It was supported by the World Bank, the Regional Cooperation Council and the European Commission²⁹.

Institutions from BiH are active in cross-border cooperation programmes, including the Danube Transnational Interreg programme³⁰ that supports the EU Strategy for the Danube Region (EUSDR). According to the data of the Directorate for European Integration of BiH³¹, out of a total of 111 projects financed in the EUSDR programme in the period from 2014 to 2020, BiH institutions were involved in 42 projects within the four priority axes of the programme: Innovative and Socially Responsible Danube Region; Environment and Culture Responsible Danube Region; Better Connected and Energy Responsible Danube Region; and Well-Governed Danube Region.

BiH regularly participates in the Central European Initiative (CEI)³². Due to the limited size of the CEI budget for grant schemes, only two projects were funded in 2022 by CEI. The project titled “Brcko District: Electrical Grid Expansion - Due Diligence & Advance Procurement” was awarded 150,000 euros under the CEI Technical Cooperation programmes in 2022. This project aimed to prepare the ground for investment from the European Bank for Reconstruction and Development in the field of sustainable energy. The second funded project was titled “Strengthening Ties and learning between the twinned Municipalities of Centar Sarajevo and Reggio Emilia” funded within the CEI Know-how Exchange Programme with an amount of 80,000 euros (CEI grant 40,000 euros). This project aimed to exchange know-how between the two regions (Reggio Emilia and Sarajevo Centre Municipality) regarding reforms in the public administration sector³³.

The participation of BiH in the EUREKA programme is limited to networking projects. Due to this fact, BiH institutions have participated in 17 EUREKA projects and register 23 participations in total. The total project costs were 16 million euros.³⁴ Most of the participating institutions in EUREKA projects were SMEs (42.31%) and universities (42.31%). Considering the frequency of participation, from 2008 to 2022 the number of participants by submission is less than five; the only slightly positive outlier was the year 2015, when the number of participations went up to eight. For several years BiH did not record any participation in EUREKA. Overall, the areas of technology where the most cooperation occurred were “industrial” with 35.29%, “environment” and “ICT” with 17.65% each.

Since the establishment of COST in 1971, BiH (as a part of former Yugoslavia) was a full member of the COST Association. This membership lasted until the re-organisation of the COST Association and withdrawal from the umbrella of the European Science Foundation. In 2009, BiH became a full member of the COST Association again. Due to easy access to the measures and a less stringent application system, which allows access to researchers with lower scientific visibility and lower achievements, this program was historically of great interest to researchers in BiH. Therefore, in 2021, 90% of approved actions were carried out by researchers from BiH: Researchers from BiH participated in 257 out of 289 actions running in 2021. The leadership positions were limited to 16 actions, and BiH researchers have participated in nine STSMs³⁵,

²⁹ Source: <https://www.rcc.int/docs/325/western-balkans-regional-r-and-d-strategy-for-innovation>

³⁰ Source: <https://www.interreg-danube.eu/>

³¹ Source: https://www.dei.gov.ba/uploads/documents/katalog-rezultata-projekata-prvi-poziv-compressed_1644917861.pdf (18.5.2023)

³² Source: <https://www.cei.int/>

³³ Source: „Annual Report 2022 of the CEI Fund at the EBRD“ available at https://www.cei.int/sites/default/files/publications/downloads/301.6.001-23%20CEI%20Fund%20at%20the%20EBRD_AR2022.pdf

³⁴ Source: <https://www.eurekanetwork.org/about-us/eureka-data> (30.11.2022)

³⁵ STSMs - Short-Term Scientific Missions (type of activity in COST action)

while six STSMs were organised in BiH. The total budget received for these participations was 99,517 euros, keeping in mind that COST does not fund personnel costs (honoraria)³⁶.

BiH has a number of STI and other bilateral agreements (culture, sport, youth) with a number of the EU Member States in place, as follows:

- Austria (2016),
- Bulgaria (2003),
- France (2002),
- Greece (2003),
- Croatia (2003),
- Italy (2004),
- Hungary (2005),
- Germany (2004),
- Slovenia (1999),
- CERN (2021),
- Romania (2010),
- Slovakia (2011).

However, most of these agreements are already completed, while some are still ongoing.

Besides, BiH has some other STI and other bilateral agreements with other countries worldwide in place, including Kuwait, Qatar, Malaysia, China and the USA.

Regarding the European Institute of Innovation & Technology (EIT), BiH has two participations with the University of Sarajevo. The project titled “OpESEE: Open ESEE-Region Master for Maintenance Engineering”, which ended in March 2022, aimed to support entrepreneurs and release highly qualified mechanical engineers who want to run their own businesses in the field of maintenance engineering related to commodity operations in the ESEE region³⁷ (Eastern and Southeastern Europe). In July 2022, the two-year project entitled "Universities for huMAN-centered Entrepreneurship - UMANE" started within the EIT Raw Materials with the aim of promoting institutional change and developing innovative services and methodologies to support people-centered innovation and entrepreneurship at the consortium universities.³⁸ Moreover, stakeholders in BiH are eligible for EIT activities, but unfortunately not yet for the “Regional Innovation Scheme”³⁹. Another KIC project is coordinated by the University of Banja Luka, while the University of Sarajevo, the International University of Sarajevo and the Innovation Centre Banja Luka are full partners. They carry out a project titled “Deep Tech in Material Sciences: Greening the Balkan HEIs Innovation and Entrepreneurial Potential - DeepGreenInno”, which is supported by the EIT Manufacturing and EIT Raw Materials and aims to increase innovative capacity in green material technologies, green chemistry, and material chain-related environmental protection of the participating institutions. Over 280,000 euros have been withdrawn within these projects according to the Ministry of Civil Affairs of Bosnia and Herzegovina.

³⁶ Source: https://www.cost.eu/uploads/2022/10/COST-Bosnia_and_Herzegovina-factsheet-2021.pdf (30.11.2022)

³⁷ Source: EIT Raw materials, <https://eitrawmaterials.eu/project/opesee/>

³⁸ Source: EIT HEI Initiative, <https://eit-hei.eu/projects/umane/>

³⁹ Source: EIT, <https://eit.europa.eu/our-activities/eit-regional-innovation-scheme>

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

Research institutions from BiH have not participated in large pan-European Research Infrastructures (RI's), and also have not been included in the ESFRI Roadmap. However, the Council of Ministers of Bosnia and Herzegovina recently supported the initiative for the accession of BiH to the “Digital Research Infrastructure for the Arts and Humanities (DARIAH)”⁴⁰. In July 2021, BiH officially became a member of DARIAH and the University of Sarajevo was appointed as coordinating institution for the first programme period. A total of 11 research institutions from BiH are now partner institutions that will be able to benefit from this infrastructure.

The international cooperation agreement with CERN from 16 February 2021 marks the formal beginning of the relationship with the Government of BiH. Collaboration in the form of interaction with the BiH science community has been ongoing since 2009, when the University of Sarajevo made a clear commitment to collaborate with CERN. This agreement creates a framework that will provide long-term opportunities for the participation of scientists, engineers and technicians from BiH in research projects at CERN. In line with this, BiH is also signatory of the Memorandum of Cooperation for the projected establishing of the Southeast European International Institute for Sustainable Technologies (SEEIIST).

1.4 ERA Priority 3: An open labour market for researchers

EURAXESS Bosnia and Herzegovina (<https://www.euraxess.ba/>) was founded through an FP7 project in 2010, labelled as BAMONET. The network at that time consisted of two bridgehead organisations (the MCA of BiH and the University of Banja Luka). Additionally, two service centres were set up at the University of Banja Luka and the University of Sarajevo. Today the network consists of seven service centres, five in the Republic of Srpska entity and two in the Federation of Bosnia and Herzegovina entity.

Data from the EURAXESS Jobs portal shows minimal use of EURAXESS services by higher education institutions. As the publishing of posts and offers in the EURAXESS Jobs portal is not compulsory for BiH's institutions, only two posts were published on the date of writing this report, while there are no funding nor hosting offers listed.

In total, 14 institutions from BiH have signed Charter and Code. Three institutions continued with the process and were awarded the HR logo, and these are the University of Banja Luka, the University of East Sarajevo and the University of Sarajevo.

There are no official statistics on the foreign students in BiH. There are numbers of students enrolled on doctoral studies in the academic year 2021/2022, as follows:

⁴⁰ <https://www.dariah.eu/>

Table 1: Number of students at public and private universities in BiH

Public and private universities in Bosnia and Herzegovina		
1,297 enrolled (total)	614 male students	683 female students
Public universities		
1,017 enrolled (total)	475 male students	542 female students
Private universities		
280 enrolled (total)	139 male students	141 female students
Graduated PhD in 2021		
147 students (total)	76 male students	71 female students

There is no data publicly available regarding the share of doctoral candidates with citizenship of another EU Member State. According to unofficial information⁴¹, more than 5,400 foreign students study at BiH's universities. Most of them come from the neighbouring countries (Croatia (2,188) and Serbia (1,539)) and some EU Member States such as Germany (52) and Slovenia (20). Although this information is not official and reliable, it is generally a matter of common knowledge within BiH and thus worth noting that a lot of students from neighbouring regions are enrolled at private universities in BiH due to favourable study conditions (cheaper scholarships, part-time study possible etc).

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

Gender equality and gender mainstreaming in research are becoming more important issues from year to year in BiH. In general, gender equality is anchored in law at the highest level of legislation and consequently, it applies to the domain of R&I.

The two main baseline documents for guaranteeing gender equality are the UN Convention on the elimination of all forms of discrimination against women (CEDAW) and the General Framework Agreement for Peace in Bosnia and Herzegovina, also known as the Dayton Peace Agreement (the Constitution of BiH). Labour law and other positive regulations at lower levels of authority provide more concise measures and procedures for the prevention and elimination of gender inequalities in R&I.

Each entity government has established its own official gender offices: In the Republic of Srpska, it is the Gender Centre of Republic of Srpska⁴², while in FBH it is the Gender Centre of the Federation of Bosnia and Herzegovina⁴³. Overall coordination in the field of gender equality is the responsibility of the Agency for Gender Equality⁴⁴ of Bosnia and Herzegovina under the auspices of the Ministry of Human Rights and Refugees of Bosnia and Herzegovina and in accordance with the Law on Gender Equality in Bosnia and Herzegovina.

⁴¹ Source: <https://slobodnadalmacija.hr/vijesti/regija/u-bih-studira-pet-i-pol-tisuca-stranih-studenta-studenti-iz-dviju-drzava-brojcano-uvjerljivo-prednjace-a-skolarine-su-jeftinije-nego-u-hrvatskoj-1186031> (12.12.2022)

⁴² Source: <https://www.ravnopravnors.com/eng/index.html> and <https://www.vladars.net/sr-SP-Cyrl/Vlada/centri/gendercentarrs/Pages/default.aspx> (11.12.2022)

⁴³ Source: <https://www.gcfbih.gov.ba/> (11.12.2022)

⁴⁴ Source: <https://arsbih.gov.ba/english/about-the-agency/> (11.12.2022)

In 2018, the Agency for Gender equality of Bosnia and Herzegovina published “The Gender Action Plan of Bosnia and Herzegovina (GAP BiH) for the period 2018-2022”⁴⁵. This is the third edition presenting a strategic framework for creating gender equality in all areas of social and public life. It provides guidelines for the development of operational plans of institutions at all levels of the government in BiH. Within this framework, priority “1.4. Education, science, culture and sport” as a sub-item of the Strategic goal 1 “Development, implementation and monitoring of the programme of measures for the advancement of gender equality within the governmental institutions, as per priority areas” envisages eleven measures to be implemented by 2022. These measures aim at improving existing legislation and also at supporting different education, science and sports programmes with the objective to improve gender equality.

Since the Gender Equality Plan (GEP) is a compulsory document for public institutions related to participation in Horizon Europe, BiH’s institutions have already prepared a number of GEPs and published them on the websites of institutions, as required by the European Commission (EC). Based on the information that has been collected within the EU funded Horizon 2020-project WBC-RRI.NET⁴⁶ and the University Gender Resource Centre at the University of Sarajevo⁴⁷, there is a total of eight public and five private universities that have adopted their GEPs in BiH:

- University of Banja Luka (public university),
- University of Sarajevo (public university),
- University of East Sarajevo (public university),
- University of Bihać (public university),
- University “Džemal Bijedić” Mostar (public university),
- University of Mostar (public university),
- University of Zenica (public university),
- University of Tuzla (public university),
- International University of Sarajevo (private university),
- University of Herzegovina (private university),
- International University of Travnik (private university),
- Sarajevo School of Science and Technology (private university), and
- International Burch University (private university).

This data shows increased interest in resolving the issues of gender inequality in BiH’s institutions. Gender equality is recognised in all strategic documents of all relevant ministries. However, there is no specific, dedicated programme of support for gender equality policy in R&I. Nevertheless, gender balance is strictly monitored and it can be noted that women’s participation in publicly funded projects has increased.

According to the data from UNESCO’s “Women in Science”⁴⁸ from 2019, with a quota of 46.6% of female researchers, BiH has already made significant progress even compared to some EU Member States (data from 2017).

Data provided by the Agency for Statistics of Bosnia and Herzegovina⁴⁹ shows that the total number of researchers registered in 2020 was 2,541, out of which 1,237 were female (49%). The same report declares the following distribution between the three main sectors:

- Business sector: 310 full-time employed researchers, 171 out of which were women (55%);

⁴⁵ Source: https://arsbih.gov.ba/wp-content/uploads/2019/02/GAP-BIH-2018-2022_ENG.pdf (11.12.2022)

⁴⁶ More details on the project on <https://wbc-rri.net/> (12.12.2022)

⁴⁷ Source: <https://unigerc.unsa.ba/gender-akcioni-planovi/> (20.5.2023)

⁴⁸ Women in Science, UNESCO Institute for Statistics, Fact Sheet No. 55, June 2019, <https://uis.unesco.org/sites/default/files/documents/fs55-women-in-science-2019-en.pdf>, (11.12.2022.)

⁴⁹ From the publication https://bhas.gov.ba/data/Publikacije/Saopštenja/2022/RDE_01_2020_Y1_1_BS.pdf (11.12.2022)

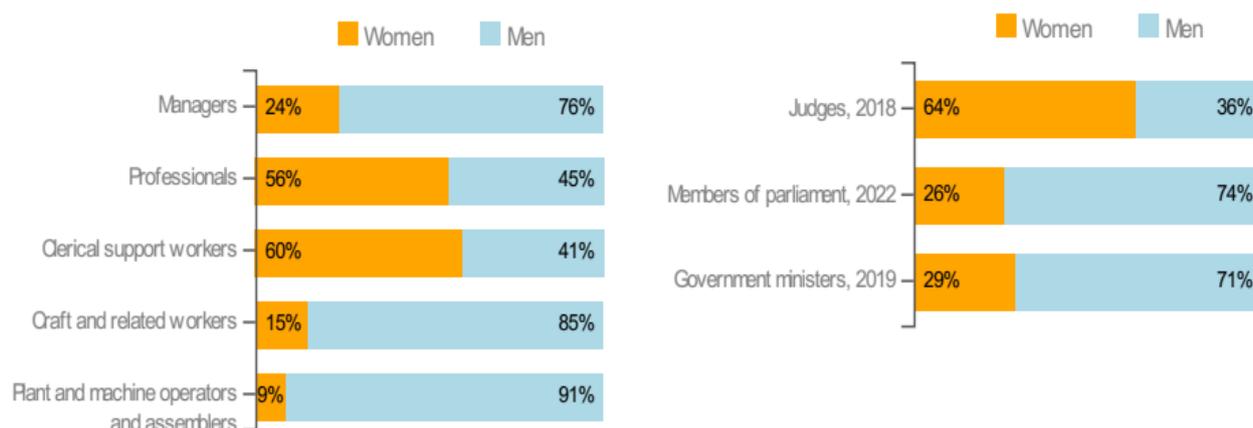
- Governmental sector: 101 full-time employed researchers, 29 out of which were women (29%);
- Higher education sector: 1,300 full-time employed researchers, 705 out of which were women (54%).

The UNDP analysis⁵⁰ on Gender Development Index (GDI) shows that for 2021, BiH was categorised in Group 3 (defined as having medium equality in Human Development Index achievements between women and men) with a GDI Value of 0.940. According to the Human Development Index (HDI), BiH was ranked 74th worldwide out of 191 analysed countries. Another indicator, the Gender Inequality Index (GII), ranks BiH in the 38th position (GII Value 0.136). Both analyses place BiH in the group of countries with High Human Development and very close to the highest-ranking group.

These analyses show that participation in the labour force (percentage of all female citizens aged 15 and older) in BiH is 32.3% against 52.4% for males. Related to high-ranking political positions, the same analysis found that 24.6% of seats in the BiH parliament are occupied by females.

Data from the United Nations Economic Commission for Europe (UNECE)⁵¹ show the participation of women in public life (Figure 1), and highlights the professions in which women are most represented:

Figure 1: Participation of women in the public life of BiH, source: UNECE



Analysing the participation of women in Grade A positions in the Higher Education Sector, it can be concluded that the situation is even more in favour of females. Data from the publication “She Figures 2021” produced by the European Commission⁵² refers to the year 2018 and shows that the total number of academic staff was 1,788, 853 out of which (47.7%) were females. Out of 320 Grade A academic staff, 149 (46.6%) were females. A similar situation occurs also in other grades: Grade B 41.3%, Grade C 48.6% and Grade D 51%.

Compared with previous studies, it becomes clear that the percentage of Grade A positions for women is slowly, but steadily increasing: from 45.2% in 2015 to 46.6% in 2018.

Furthermore, data from “She Figures 2021” show an increase in the proportion of women among heads of institutions, with women making up 25.5% of heads of institutions in the higher

⁵⁰ Source: <https://hdr.undp.org/data-center/specific-country-data#/countries/BIH> (12.12.2022.)

⁵¹ Source: https://w3.unece.org/CountriesInFigures/data/a_0001782_print_070_en.pdf (12.12.2022.)

⁵² Source: <https://op.europa.eu/en/web/eu-law-and-publications/publication-detail/-/publication/058103b5-4da0-11ec-91ac-01aa75ed71a1> (12.12.2022)

education sector (HES) in 2019 (EU-27 average 23.6%). Women made up 25.5% of heads of universities or equivalent institutions, as defined by the ability to award doctorates (EU-27 average: 17.9%). However, there is no improvement in participation as board members: In 2019, only 16.7% of all board members were female, and not a single woman was found to act as board chair.

She Figures data shows that only in nine countries, more than 40% of grade A academic staff in one or more academic fields were women. In BiH, females Grade A are mostly represented in natural, medical, agricultural and social sciences. Only in a minority of other economies was the proportion of men in grade A positions equal or higher than that of women in these fields, which was the case in BiH for the field of humanities.

Table 2: Number of researchers by sector, by field of R&D and sex in 2018 (source: She Figures 2021)

Sector	Natural Sciences		Engineering and Technology		Medical and Health sciences		Agricultural sciences		Social sciences		Humanities		Not Specified	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M
Higher Educ. Sector	158	165	200	356	80	38	51	55	235	237	129	84	4	9
Gov. Sector	11	13	3	6	9	15	n/a	n/a	8	7	6	11	8	38
Bus.-Enterpr. Sector	1	1	39	51	n/a	n/a	9	11	4	1	8	11	1	4
Total	170	179	242	413	89	53	60	66	247	245	243	106	13	51

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

Data from the statistical institutes in BiH shows that the highest proportion of GERD is allocated to the higher education sector at 56.5%, followed by the business sector at 38.6%, and the governmental sector at 4.9%. This observation reflects several factors: first, most researchers are engaged in the higher education sector and second, the majority of R&I is done in the same sector due to less developed capacities of industry in BiH and a lack of sufficient funding to be invested in R&I by the business sector.

Considering spending on R&I in the business sector, most funding is spent on R&I in the manufacturing industry (48.2%), financial and insurance activities (23.8%) and electricity, gas, steam and air conditioning supply (8.5%) and agriculture (8.5%). These figures can be explained by the level of labour costs and also the level of capital investments in 2020.

The level of public-private co-publications is quite low in relation to the overall publication output. According to the SCOPUS available data (dataset 2017-2022), this indicator has significantly decreased in the past two years (by almost 50%, from 4.4% in 2019 to 2.6% in 2021). Overall, the 3% share of co-publications is low, leaving ample room for improvement in this area. Another negative trend can be observed in patent-related publications and corresponding citations. While some progress can be observed in patent applications, the corresponding publications that follow these patents are lacking and represent another point for improvement.

The Enterprise Europe Network (EEN) is established in both the FBH⁵³ and the RS⁵⁴. The range of activities includes, amongst others, consulting, assistance in international cooperation, and support of industrial innovation. Despite the COVID-19 crisis, these activities have continued during 2020 and beyond.

Currently, there are two innovation centers active in BiH: Inovacioni centar Banja Luka (Innovation centre Banja Luka - ICBL)⁵⁵, BIT Centar Tuzla (BIT Centre)⁵⁶ and INTERA Tehnološki park Mostar (INTERA Technology park)⁵⁷.

The ICBL was established under the auspices of MNRVOID in collaboration with the City of Banja Luka, two public universities in the Republic of Srpska (Banja Luka and East Sarajevo) and the Development Agency of the Republic of Srpska. ICBL is the centre for the development of entrepreneurship in the Republic of Srpska by supporting entrepreneurs and companies (SMEs) to develop their business idea with professional advising, training and incubator space.

INTERA is also a non-profit and non-governmental organisation established with the aim of promoting entrepreneurship and development. Like ICBL, INTERA organises trainings and courses, and provides professional advising, incubation and co-working spaces for future SMEs and promising entrepreneurs.

The BIT Centar Tuzla⁵⁸ is a place for the development of companies from the field of Information and Communication Technologies (ICT), divided into three main groups of activities: the ICT Incubator, the ICT Training Centre and the ICT Research Centre. The purpose of the incubator is to assist and accelerate the development process of companies located in the BIT Centre Tuzla providing companies with the necessary services, training, infrastructure and other necessary support. The ICT Training Centre aims at training entrepreneurs in the field of ICT, while more intensive ICT work is being done in the established research centre. The BIT Centre Tuzla also offers business consulting, business training, business networking, knowledge and technology transfer, the possibility of applying for initial seed capital, financial, marketing, accounting and legal services. The BIT Centar Tuzla provides professional services: business consulting, business trainings, business networking, knowledge and technology transfer, the possibility of applying for initial capital, financial, marketing, accounting and legal services. It was also an intermediary in the establishment of a specialized laboratory for training students in programming and development of microcontrollers.

All institutions provide high-quality courses and trainings for different target groups as well as traineeships. Collaboration is established with international partners and both institutions have implemented several projects funded by different donors (including EU-funded projects). The activities of these two institutions aim at improving prospects for careers in business, linking academic and industrial communities to foster collaboration on joint projects.

The EU4DigitalSME project⁵⁹ has announced a public call for the establishment of three functional Digital Innovation Hubs in Bosnia and Herzegovina to support SMEs during the digital transformation, making them competitive, skilled, cost-effective and environmentally friendly. The public call is open to all organisations, institutes and faculties as well as individual applicants and partnerships that wish to become a Digital Innovation Hub (DIH). As DIH⁶⁰, they will help companies to become more competitive regarding their business, products or services

⁵³ More information <https://een.ba/bs>

⁵⁴ More information <https://eunors.org/>

⁵⁵ Source: <https://icbl.ba/> (12.12.2022)

⁵⁶ Source: <https://www.bitcentar.com/> (12.12.2022)

⁵⁷ Source: <https://intera.ba/> (12.12.2022)

⁵⁸ Source: <http://www.bitcentar.com/>

⁵⁹ Source: <https://europa.ba/?p=74214> (13.12.2022)

⁶⁰ Source: <https://eu4digitalsme.ba/digitalni-inovacijski-hub/> (13.12.2022)

using digital technologies and lead the digital transformation of SMEs in BiH. Successful applicants will receive training, mentorship and the opportunity to exchange experiences with DIHs in the European Union and other partner countries within the tailored sector or topic of the DIHs from BiH. Under this call, several companies have applied, and four digital hubs signed a Memorandum of Understanding with the “Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH” (GIZ) within the EU4DigitalSME project.⁶¹

The latest data for BiH related to the innovation potential and activities of enterprises was published in 2020 for the period 2016-2018 by the Agency for Statistics of Bosnia and Herzegovina: out of the total number of enterprises, 35.6% introduced at least one of the innovation activities in the observation period 2016-2018. In the same observation period, 64.4% of enterprises have not implemented any innovative activities. The innovation activity of enterprises increases as their size increases. Thus, 59.4% of enterprises in the observed number of large enterprises (250 or more employees) were innovation-active, 46.6% in the observed number of medium enterprises (between 50 and 249 employees), and 31.5% of enterprises in the group of small enterprises (between 10 and 49 employees)⁶².

The World Bank reports a steady increase in the percentage of medium and high-tech exports (as a percentage of manufactured exports).⁶³ The highest share of innovators (63.9%) is from the information and communication section. Looking at the data from the World Bank, it can be observed that the percentage of manufactured exports has slightly grown from 24.38% in 2014 to 18.65% in 2019.

1.7 ERA Priority 5b: Open Access

Most of the journals published in BiH by relevant R&I institutions are Open Access (OA) publications. The Directory of Open Access Journal⁶⁴ counts 39 journals from BiH, only four of which charge article processing fees. The journals are covering different research areas ranging from agriculture, education, economy, philosophy to ICT and engineering.

SCOPUS provides more details on the publication productivity of BiH researchers. In the time period from 2017 to January 2023, there were 7,834 OA publications from BiH: 4,546 publications had a gold OA status, while another 4,918 publications had a green OA status. Over the period from 2017 to 2022, an increase in the number of publications with open access was observed: In 2017, the number of OA papers registered in SCOPUS was 1,401 and increased to a peak in 2021 with 2,087 OA publications. The total OA number decreased again to 1,898 OA papers from BiH in 2022.

In 2021, according to data from Scimago⁶⁵, BiH researchers have published 1,894 citable and 92 non-citable papers (total 1,986 papers). Out of this number 1,199 papers (60.37%) were published in OA according to SCOPUS. The trend compared to previous years is positive regarding the number of publications using the same data source:

- 2021 - 1,199 (60.37%)
- 2020 - 996 (53.43%)
- 2019 - 904 (54.43%)
- 2018 - 790 (52.39%)
- 2017 - 668 (48.16%)

⁶¹ Source: <https://eu4d=igitalsme.ba/en/news/njemacki-giz-i-eu-saradjuju-sa-digitalnim-inovacionim-hubovima-u-bih/> (13.12.2022)

⁶² First release „Innovation activity of enterprises, 2016-2018“, Year IV, No.1, 30.4.2020, Sarajevo

⁶³ Source: <https://data.worldbank.org/indicator/TX.MNF.TECH.ZS.UN?locations=BA>

⁶⁴ More information: <https://doaj.org/> (5.12.2022)

⁶⁵ Source: <https://www.scimagojr.com/countrysearch.php?country=BA> (5.12.2022)

While the MCA is not providing funding for the publishing of R&I publications, this is not the case for entity-level ministries.

In the Republic of Srpska, MNRVOID yearly publishes the call for “Co-Funding of Scientific Publications”. A total amount of 35,000 euros was earmarked for 2022. This call applies to all types of R&I publications of relevance to the research community.

The FMON supported researchers with several grant schemes in 2022:

- Programme 2. “Support for the printing of scientific journals, anthologies”, supported 1 ten institutions with a total amount of 19,265.60 BAM (10,000 euros)
- Programme 3. “Support for the printing of scientific books”, supported twelve institutions with a total amount of 30,000 BAM (15,000 euros)
- Programme 4. “Support to commercial publishers from the territory of the Federation of Bosnia and Herzegovina in publishing new scientific literature”, supported 19 publishers with a total amount of 25,186.25 BAM (12,878 euros)
- Programme 5. “Support for authors residing in the territory of the Federation of Bosnia and Herzegovina, who are not employed at any of the public higher education and scientific institutions in the publication of recent scientific, professional and university literature”, supported 21 authors with a total amount of 26,300 BAM (13,447 euros)
- Programme 6. Co-financing of research work, scientific improvement and study stays in the country and abroad, for candidates residing in the territory of the Federation of Bosnia and Herzegovina, who are not employed at any of the public higher education and scientific institutions, supported eleven researchers with a total amount of 25,708.60 BAM (13,144 euros)
- Programme 7. Support for projects of popularisation of science and promotion of the results of scientific research and research and development with a total amount of 90,614.36 BAM (46,330 euros)

However, it must be noted that these data also include commercial and proprietary publications, not just publications in OA. There are currently no official data on the share of funding for publications in OA.

Keeping in mind that higher education institutions are publishing their own journals mainly in OA format, and that there are no official data on the share of research performing organisations making their data available in OA, it may be concluded that all institutions with OA journals are sharing their research data the same way. Universities, both public and private, also have public repositories of PhD theses and Master theses. In addition, some universities publish scientific data on researchers containing bibliography with active links to the repositories of papers. BiH researchers are using Research Gate and Academia.edu as repositories to post their papers in OA. Currently, there are 25 institutions with a total of 6,621 members registered at the Research Gate portal⁶⁶. As expected, most of these researchers come from public universities.

However, OA is becoming a crucial part of the accreditation process in BiH and it is validated by the evaluation committee that is appointed for overall accreditation of the institution by the relevant authority (Agency for Higher Education). Therefore, the awareness of OA is high among the academic community. Several Horizon2020 projects have been dealing with the issue of OA. The most recent one, the ongoing project “Responsible Research and Innovation in the Western Balkans - WBC-RRI.NET”⁶⁷, pays special attention to OA and Open Science principles.

⁶⁶ Source:

<https://www.researchgate.net/search.Search.html?query=bosnia+and+herzegovina&type=institution>
(1.12.2022)

⁶⁷ Source: <https://wbc-rri.net/> (1.12.2022)

Related to the support of the European Open Science Cloud (EOSC), the University of Banja Luka is participating in the project “National Initiatives for Open Science in Europe” (NI4OS Europe)⁶⁸; this is BiH’s only link to EOSC. At the moment, there are no legal measures supporting or preventing OA related to publications or research data. All ministries formally declare their support for the advancement of OA, and they take OA journals as commercial journals into account when supporting researchers with grants. The University of Banja Luka has established an OA repository for academic papers, named “Digital repository of Academic Archives from University of Banja Luka”⁶⁹. The University of Sarajevo⁷⁰ and University of Banja Luka⁷¹ have adopted guidelines entitled “Policy of open access to scientific research infrastructure”, which provide information on open access to research infrastructure, as well as the basics of intellectual property rights (IPR).

1.8 ERA Priority 6: International cooperation

International cooperation in R&I is a constant in BiH since 1996. Researchers are actively participating in different bilateral or multilateral funding programmes, such as Framework programmes of the European Union for R&I (FP5, FP6, FP7, H2020, Horizon Europe). Data from SCOPUS show that international cooperation is a very prevalent feature in the publication of papers. However, due to insufficient data, it is unfortunately not known with which countries BiH primarily cooperates in this area. It can be noted that between 2017 and 2021, 53% of the scientific output was generated in collaboration with international partners, while 12.9% was the result of internal collaborations. Notably, though, those numbers have decreased in the time period from 2018 and 2020, as illustrated by data from SCOPUS⁷², which included the percentage of international collaboration in publications:

- 2021- 58.61%
- 2020 - 50.70%
- 2019 - 51.29%
- 2018 - 55.70%
- 2017 - 54.79%

Qualitatively, international collaboration was very effective, as can be observed from the high number of citations: SCOPUS records more than 61,493 citations.

In the academic year 2021/2022, there were 25,168 students enrolled in the winter semester of the first cycle of higher education, including integrated studies, out of which 19,873 students were enrolled in all study years, while 5,295 were candidates for graduation⁷³.

The number of foreign students is recorded only for public and not for private universities. Therefore, no official statistics on this indicator are available. At the time of reporting, there are 42 projected international students projected to enrol in the third cycle of studies at public universities in the Republic of Srpska, 17 at the University of Banja Luka, and 25 at the University

⁶⁸ Source: <https://ni4os.eu/> (1.12.2022)

⁶⁹ Source: <https://sova.unibl.org/en/homepage/> (1.12.2022)

⁷⁰ Source: https://cir.unsa.ba/wp-content/uploads/2021/09/POLITIKA-OTVORENOG-PRISTUPA-II-UNSA_Senat_juni-2021-.pdf (19.5.2023)

⁷¹ Source: https://etf.unibl.org/images/akta/ostali/Politika_otvorenog_pristupa_NII_UNIBL-ETF.pdf (19.5.2023)

⁷² Source: <https://www.scimagojr.com/countrysearch.php?country=BA> (5.12.2022)

⁷³ Source: Preliminary data „Enrolled students“, Annual release on 15.4.2022, No. 108/22.

of East Sarajevo. The number of foreign students enrolled in institutions of higher education in the Federation of BiH was 3,758, which is 7.1% of the total number of students enrolled⁷⁴.

In line with expectations, the institutions with the highest scientific output are the two largest public universities in Sarajevo and Banja Luka. The University of Sarajevo is leading with 2,736 publications and 8,4 citations per publication. Also, the largest number of authors are affiliated with the University of Sarajevo (2,161). The University of Banja Luka, as the second largest university in BiH, ranks second with 1,373 publications and 6,5 citations per publication, published by 830 authors affiliated with this university. Researchers from the private sector were also very active in publishing papers, most of them from telecommunication companies and the related industry.

According to the data from SciVal⁷⁵, the trend for scholarly output is positive (from 1,380 in 2017 to 2,080 in 2021), while the trend for citations is currently gradually worsening (from 22,945 in 2017 to 5,829 in 2021). The indicators on “Citations per paper” and “Views per paper” confirm that this data can be explained as an overproduction of papers without significant research value.

This conclusion can be linked with the next two indicators: “Outputs in Top Citations” and “Publications in Top Journals”. The values of both indicators are at rest and lie within the limits of the previous values without significant deviations, which means that there could be a lack of novel forces and strengths among researchers in BiH which can be caused by increased brain drain during the past several years. In 2021, “Outputs in Top Citations Percentiles (top 10%)” was at 8.6, while “Publications in Top Journals Percentiles” was at 10.2.

The overall performance must be considered unsatisfactory, considering that the number of authors has increased significantly (47%), while the number of citations has decreased despite the increase in scientific output (50%).

There are no official statistics related to the export of medium and high technology products as a total share of product export registered by all three statistical institutions in BiH. However, we can see that there are more non-innovators enterprises (3,755).

BiH has two academies of sciences and arts: ANUBIH (Academy of Sciences and Arts of Bosnia and Herzegovina, Sarajevo) and ANURS (Academy of Sciences and Arts of the Republic of Srpska, Banja Luka). However, both academies are working in parallel on international cooperation, which is mainly based on bilateral agreements with other academies in Europe. There are no STI international strategies defined, except as a part of regular work programmes and plans.

Related to the international cooperation connected to patenting, it was reported that ten PCT (Patent Cooperation Treaty) applications were filed in 2021 in BiH and 13 when the country of origin was BiH, according to WIPO data published in the “PCT Yearly Review for 2022”. This represents an increase from 2020 data, when seven applications were filed at the receiving office and seven by country of origin⁷⁶. Taking a further look at WIPO data⁷⁷, it can be observed that international cooperation in this field is limited to a collaboration with the European Patent Office (EPO) as International Searching Authority (ISA), where 12 patent applications were filed in 2021 and seven applications in 2020. The difference of one patent application (compared to WIPO) is likely related to the date of data collection and stage of application.

⁷⁴ Source: First release „Higher Education in Federation of Bosnia and Herzegovina“, Year XV, Number 12.3, 2.3.2022, Institute for Statistics of FBH, Sarajevo

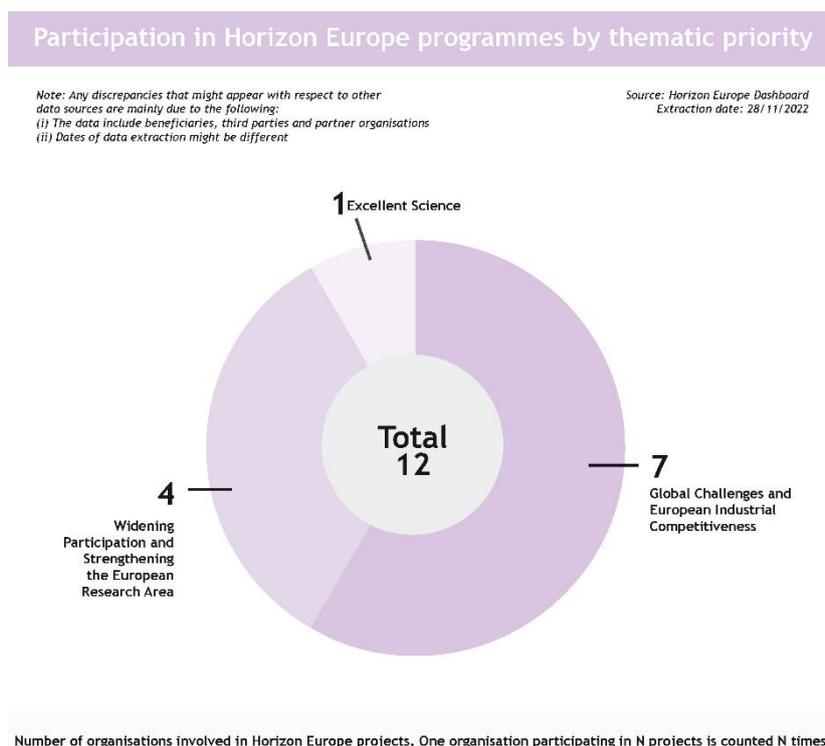
⁷⁵ Source: SCOPUS (Dataset 2017-2021, data last update: 30.11.2022.)

⁷⁷ Source: WIPO IP Statistics Data Center, <https://www3.wipo.int/ipstats/searchForm> (available upon registration)(6.12.2022)

2 Horizon Europe participation and financial contribution

According to data from the Funding and Tenders Portal (Horizon Dashboard) Country profile⁷⁸, the participation success in Horizon Europe by BiH institutions is the following: As of February 2023, 112 eligible proposals were submitted and 135 eligible applications were evaluated. The total requested eligible EU contribution was 31.23 million euros.

Figure 2: Participation in Horizon Europe programmes by thematic priority



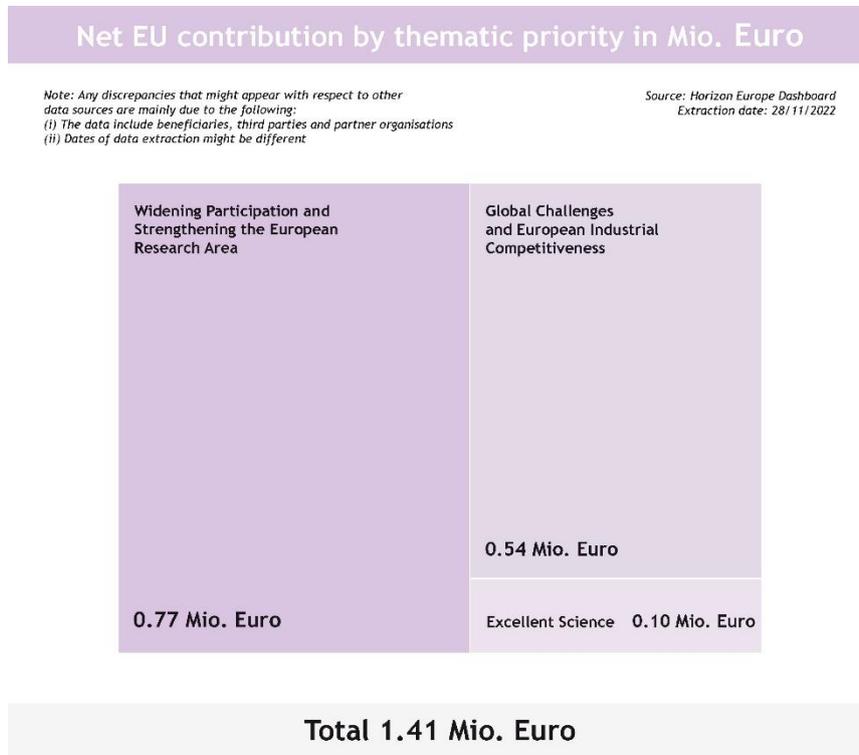
It can be observed that the largest share of participation is in the second pillar of the programme: Global Challenges and European Industrial Competitiveness (Figure 2). This was to be expected, as most of the calls for cooperation were published in this pillar. Even though in 2021 the EC published calls dedicated to the Western Balkans within the part of “Widening participation and Strengthening the ERA”, only four applications were successful. The main reason for this is that information was disseminated insufficiently among the institutions. Due to a sudden change in the NCP structure and personnel, who had previously worked in BiH for more than 15 years, assistance to the institutions and information sessions were suspended. The newly appointed NCPs are not yet familiar with the programme, as some of them are coming into contact with the framework for the first time, and it takes time to become familiar with it in order to start promoting the program and supporting the institutions. Until then, institutions in BiH that want to participate in the programme are on their own to find information and participate without the support of the NCP.

The net EU contribution in the programme so far was 1.41 million euros. Although most of the projects were funded under Pillar 2, around half of the funding went to projects in the

⁷⁸ Source: <https://webgate.ec.europa.eu/dashboard/sense/app/a976d168-2023-41d8-acec-e77640154726/sheet/0c8af38b-b73c-4da2-ba41-73ea34ab7ac4/state/analysis> (9.12.2022)

“Widening Participation and Strengthening the ERA”-pillar (WIDERA) (0.77 million euros, see Figure 3) while projects relating to Pillar 2 received 0.54 million euros. It can be concluded that BiH researchers were less successful as Pillar 2 project partners than in the WIDERA part.

Figure 3: Net EU contribution by thematic priority in Mio. Euro



Compared to the previous Framework Programmes, results show a positive trend in participation and EU contribution since BiH became associated for the first time to FP7. The highest number of participations was recorded in H2020 (118) due to increased awareness related to the intensified work of the NCP system in BiH (Figure 4). If the trend in participation in Horizon Europe programme keeps this pace until the end of Horizon Europe, it is realistic to expect that BiH will be able to receive at least the same amount of funding as in Horizon 2020 (8.5 million euros).

Figure 4: Participation across European Framework Programmes

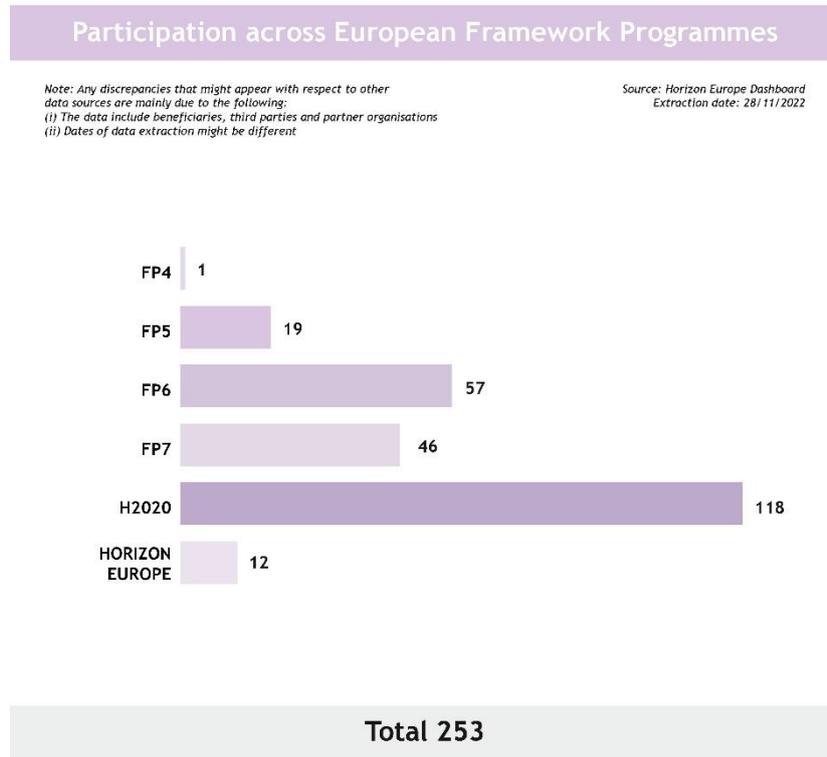


Figure 5: EU contribution across programmes in Mio. Euro

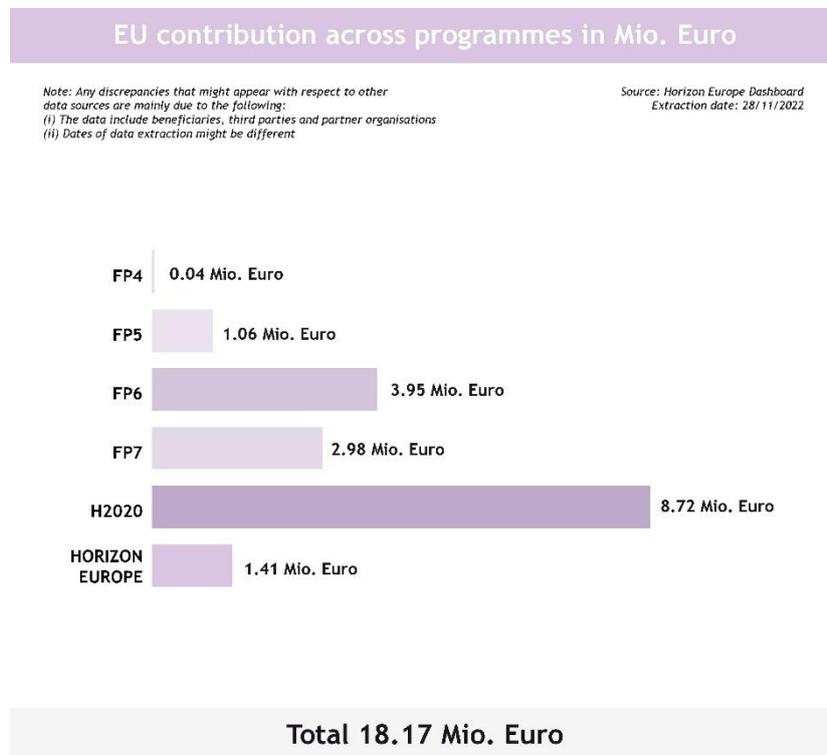


Figure 6: Data for signed grants up to 28/11/2022

Data for signed grants up to 28/11/2022

Note: Any discrepancies that might appear with respect to other data sources are mainly due to the following:
 (i) The data include beneficiaries, third parties and partner organisations
 (ii) Dates of data extraction might be different

Source: Horizon Europe Dashboard
 Extraction date: 28/11/2022

Bosnia and Herzegovina	
Total number of participations	12
Total net EU contribution	1.41 Mio. Euro
Number of applications	135
Number of EIC participations	0
Number of MSCA participations	0
Number of Seals of Excellence	0
Number of SME participations	0
Number of signed grants	10
Number of eligible proposals	112

It can be observed that the level of participation of BiH researchers in the European Framework Programmes goes hand in hand with the level of EU contribution for funded projects. Until now, the most successful programme for BiH was Horizon 2020 with 8.72 million euros of EU net contribution (Figure 5). The reasons for this success include intensified support from the NCP system in BiH and the quality of information provided to the researchers. However, the Horizon Europe programme has only started and there are plenty of opportunities for BiH researchers in the years to come.

Within Horizon 2020, the success rate of BiH was slightly higher than the overall average success rate of EU Member States. Currently, BiH's success rate in Horizon Europe is almost on par with the EU Member State average.

Given their experience, it is not surprising that the universities of Sarajevo and Banja Luka, the two largest public universities are among the five most successful BiH institutions in the Horizon Europe programme. It can be concluded that the interest for this programme from the industrial sector is growing slowly, with two participations of private for-profit entities (excluding higher or secondary education institutions) and followed by also two participations of public bodies (excluding higher or secondary education institutions).

3 Smart Specialisation Strategy

The Smart Specialisation Strategy (S3) process in BiH is still in the preparation phase.

In June 2019, the Council of Ministers (CoM) of BiH, the Directorate for Economic Planning (DEP), together with the MCA and Ministry of Foreign Trade and Economic Relations, established a working group for drafting a S3 in BiH. Relevant stakeholders were invited to appoint their representatives in an inter-institutional working body aimed at starting the development of the S3 in BiH. The official appointment took place on 26 November 2020, when the CoM adopted a Decree on the Nomination of a Working Group for Smart Specialisation Strategy in Bosnia and

Herzegovina and set the deadline for the preparation of the strategy to 2023. Further activities were carried out in February 2021, when the DEP sent a letter of intent to the JRC to sign a Memorandum of Understanding regarding support for the S3 process.

The Working Group is a temporary, inter-ministerial expert body of the CoM responsible for drafting the S3 of BiH. The working group is obliged to prepare the S3 within three years from the day of publishing the Decision in the Official Gazette of BiH.

Based on strategic and other legal guidelines in BiH, it is possible to identify potential sectors for the S3. These sectors are ICT, energy, agriculture and food production, creative and circular economy. However, these sectors shall be identified in the S3 expected for the end of 2023.

The Republic of Srpska has initiated its own S3 preparation, but so far, no official results and publication of the strategy have been made available.

4 Conclusion

In the case of BiH, a moderate but steady improvement in terms of ERA priorities can be observed. Researchers from BiH participate in relevant initiatives and projects initiated by the EC, proving that they are an adequate member of the European R&I community.

All levels of governance involved in R&I continuously put efforts in improving the overall research landscape. However, these efforts are not sufficient to achieve the goal of investing at least 1% of GDP in R&I.

Due to the COVID-19 situation since Spring 2020, some of the progress that had been initiated prior to the global health emergency was delayed and slowed down. However, BiH's entry into Horizon Europe offers researchers the opportunity to build on the successes of the previous European Framework Programme.

In recent years, the volume of scientific output has increased, in part thanks to greater international cooperation within the framework of projects and bilateral agreements. However, the number of citations does not follow this upwards trend, nor does the number of papers resulting from patenting activities. It appears that there is a relatively high number of publications from BiH that are not of excellent quality, and that are not published in prestigious journals, but rather in local journals which do not have international reputation.

Some progress has been made in participating in pan-European infrastructure initiatives (e.g., DARIAH), but further efforts are needed by relevant stakeholders to integrate BiH researchers into other ESFRI initiatives. Given the ongoing phenomenon of brain drain in BiH, there is a shortage of qualified research personnel in the BiH labour market. Recently, the first publications of research positions have been posted on the EURAXESS Jobs portal, opening access for foreign researchers to employment in the BiH research community.

There is clear progress in the area of gender equality: Institutions willing to participate in Horizon Europe have already drafted and published eight GEPs, while several others are in the preparatory phase and will likely be publishing soon. The internationalisation of research is progressing only at a slow pace. Participation in joint projects is good, but generally not satisfactory and needs to be managed in a more proactive way. It is crucial to provide further support to early-stage researchers to participate in COST actions in order to gain knowledge and visibility of research as a prerequisite for participation in EUREKA or Horizon Europe projects. On the other hand, more experienced researchers should take a more proactive approach to internationalisation by applying and participating more in the aforementioned programmes.

Bosnia and Herzegovina's S3 is one of the most important strategic documents to be published. Therefore, it is necessary to ensure stronger collaboration between all relevant stakeholders. The role of the Academies of Sciences should be strengthened as they dispose of experienced researchers and could act as initiators for strategic change in the research landscape in BiH.



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 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.

