



Harnessing the potential:

**Research Capacity in
the Western Balkans**

REPORT

December 2017

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Table of contents

List of Figures	
List of Tables	
Acknowledgments	
Disclaimer	
List of abbreviations.....	
Executive Summary	1
Recommendations and indicators for monitoring.....	5
Introduction: Research Capacity in the Western Balkans.....	11
1. Objectives	11
2. Methodology of the study	11
3. Background of the study	12
4. Social and economic context	13
5. Institutional level interactions, roles and responsibilities	16
6. Research productivity	17
Part I General Findings: Common challenges in a diverse region	19
1. Funding.....	19
1.1 National funding	19
1.2 EU Research funding	21
2. Research governance	22
3. Research infrastructure & administrative support at universities	24
3.1 Research infrastructure	24
3.2 Administrative support for research	27
4. Research careers	28
4.1 Career development and the research–teaching balance	28
4.2 Doctoral education	29
5. Capacity of higher education institutions	31
5.1 Education	31
5.2 Internationalisation	32
5.3 Technology transfer and knowledge exchange	32
6. Individual perception of research environment	34

Part II - System reports	35
1. ALBANIA	35
HE and research system	35
Policy and institutional framework	36
Research productivity	37
Funding	37
Research infrastructure and research capacity	38
Research careers	38
Internationalisation	39
Technology transfer and knowledge exchange	39
Summary	39
Recommendations for Albania	39
2. BOSNIA and HERZEGOVINA	41
HE and research system	41
Policy and institutional framework	41
Research productivity	43
Funding	44
Research infrastructure and research capacity	44
Research careers	45
Internationalisation	45
Technology transfer and knowledge exchange	45
Summary	46
Recommendations for Bosnia-Herzegovina	46
3. THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA	48
HE and research system	48
Policy and institutional framework	49
Research productivity	50
Funding	50
Research infrastructure and research capacity	51
Research careers	52
Technology transfer and knowledge exchange	52
Summary	53
Recommendations for the former Yugoslav Republic of Macedonia	53

4. KOSOVO* ¹	55
HE and research system	55
Policy and institutional framework	56
Research productivity	57
Funding	57
Research infrastructure and research capacity	58
Research careers	58
Internationalisation	58
Technology transfer and knowledge exchange	59
Summary	59
Recommendations for Kosovo	60
5. MONTENEGRO	61
HE and research system	61
Policy and institutional framework	62
Research productivity	63
Funding	63
Research infrastructure	64
Research careers	64
Internationalisation	65
Technology transfer and knowledge exchange	66
Summary	66
Recommendations for Montenegro	67
6. SERBIA	68
HE and research system	68
Policy and institutional framework	69
Research productivity	70
Funding	70
Research infrastructure and research capacity	72
Research careers	72
Internationalisation	72
Technology transfer and knowledge exchange	73
Summary	74
Recommendations for Serbia	74

¹ This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo Declaration of Independence.

Appendix	see separate document
Appendix 1 Research productivity per country	
Appendix 2 Survey instruments	
Appendix 3 Site visits and semi-structured interviews	
Appendix 4 Online survey questionnaires	

List of Figures

Figure 1: Percentage of GDP invested in R&D in WB countries and selected EU MS (Source: EUROSTAT and country reports for AL, BiH and XK)	14
Figure 2: HEI relative “productivity” based on five years of publishing performance 2012-2016	17
Figure 3: Typical mode of operation in research	23
Figure 4: Access to research infrastructure and perception of relative quality	25
Figure 5: Frequency of practices in doctoral studies	29
Figure 6: Overall perception of the individual research situation (Q3)	34

List of Tables

Table 1: Average time allocated to research/week	28
Table 2: Research investment in Albania (Source: Communication on EU Enlargement Policy {COM (2016) 715 final})	35
Table 3: Research investment in Bosnia and Herzegovina (Source: Communication on EU Enlargement Policy {COM (2016) 715 final})	41
Table 4: Research investment in the former Yugoslav Republic of Macedonia (Source: Communication on EU Enlargement Policy {COM (2016) 715 final} and EUROSTAT (2015)).....	49
Table 5: Research investment in Kosovo (Source: Communication on EU Enlargement Policy {COM (2016) 715 final})	55
Table 6: Research investment in Montenegro (Source: Communication on EU Enlargement Policy {COM (2016) 715 final} and EUROSTAT “*”)	61
Table 7: Research investment in Serbia (Source: Communication on EU Enlargement Policy {COM (2016) 715 final} and EUROSTAT “*”)	68

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Disclaimer

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List of abbreviations

AL	Albania
BiH	Bosnia and Herzegovina
EU	European Union
ERA	European Research Area
FMES	Federal Ministry of Education and Science
FTE	Full Time Equivalent
MK	Former Yugoslav Republic of Macedonia
HE	Higher education
HEI	Higher education institution
JRC	Joint Research Centre
XK	Kosovo
MCA	Ministry of Civil Affairs of BiH
ME	Montenegro
R&D&I	Research, Development & Innovation
S3	Smart Specialisation Strategy
SPHERE	Support to the Higher Education Reform Experts
RS	Serbia
STEM	Science Technology Engineering Mathematics
WB	Western Balkans: Albania, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Kosovo, Montenegro, Serbia

Executive Summary

Since 2009, increased attention has been given to the evolution of Research and Development (R&D) in the Western Balkans (WB) to overcome the economic crises, and to make the region more stable and prosperous, also with regard to the potential accession to the European Union (EU). The **South-East Europe (SEE) 2020 Strategy** – inspired by the EU2020 Strategy and adopted by the WB ministers for economy in 2013 - includes a pillar for “Smart Growth” with Research & Development and Innovation being one of its policy dimensions: “SEE countries need to invest more and better in research and innovation, prioritising investments and contributing to a ‘smart specialisation’ of the region”. It addresses the “increase of investment in human capital to improve research excellence and productivity and in upgrading research infrastructures” and prioritises science-industry collaboration, technology and knowledge transfer activities, intellectual property rights management, and other measures for promoting and enhancing innovation in business, technology and science.²

In the same year ministers of science from the region endorsed the **Western Balkans Regional R&D Strategy for Innovation**. It was prepared under the World Bank Technical Assistance Project funded by the European Commission³, which identifies key priorities in R&D that are expected as crucial for increasing innovation, growth, and prosperity in the region. These developments have been supported by the EEU, in terms of funding through various programmes, and also through policy support. The **Berlin Process** (2014) was initiated in order to consolidate and support developments in the WB in view of a potential accession to the EU.

President Juncker's State of the Union speech (13 October 2017)⁴ not only confirmed the direction of the process towards further enlargement, but also called for its acceleration by setting the tentative date of 2025. As this will require, among other elements, a functioning research and education system, the present study was commissioned to contribute a mapping and analysis of the research capacity at higher education institutions in the WB, namely Albania, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Kosovo, Montenegro, and Serbia. The study, which is predominantly based on surveys to higher education institutions, and interviews with their staff and representatives from ministries, established a number of key findings that are valid for the entire region, albeit at different scale.

2 <https://wbc-rti.info/object/document/14742><https://wbc-rti.info/object/document/14742>

3 <https://wbc-rti.info/object/document/13147>

4 http://europa.eu/rapid/press-release_SPEECH-17-3165_en.htm

Key challenges

1. More and better investment in research

A significant increase in **national research funding** would be a necessary pre-condition for successful and sustainable research capacity building. National investment in R&D is low due to overall weak economies: Serbia invests 0.89% of GDP (2016), the other five systems 0.5% or less. This is well below the 2.04% EU average. Funding methods should be improved to stimulate and reward quality of research and related governance and management processes. This should include the enhancement of basic funding for strategic institutional capacity building (for research and education), but also performance-based and targeted funding, in particular to incentivise interdisciplinary research through collaboration within and between WB institutions, and with international partners. Some WB economies have introduced respectively enhanced recognition of research achievement for career development and competitive funding for research excellence. While these could serve as examples, they tend to require further calibration, for example, to reflect the differing natures of disciplines, in particular between science, technology, engineering and mathematics (STEM) and arts, humanities and social sciences. In this and other respects, more and improved data, for instance on research productivity, would be essential.

Research funding from the EU and its member states is often the only dedicated and flexible funding source for competitive research initiatives, and for related collaboration and mobility, internationally, and also within the region. The EU's research funding programmes tend to be beyond the reach of all except for the strongest institutions, due to the high competition and a lack of capacity and resources. Therefore, the Tempus programme (2007-2013) and Erasmus+ (2014-2020) have played a significant role for "regional research excellence", also with regard to equipment. However, issues relating to pre- and co-financing were frequently quoted as obstacles to using EU funds.

2. Reform of research governance

Governmental and university level governance also holds considerable impediments for research performance. The role of research in national development strategies is often unclear, lacking priority setting and resources. As a result, implementation of national strategies is stalling, and often without yielding tangible improvements. Relatively high levels of autonomy of faculties, departments and individual researchers hamper institutional research strategies, the development and management of infrastructure and fit-for-purpose research support systems. Past structures continue to exist in new institutional settings, making developments cumbersome without bringing real benefit, as for example the combination of universities and research institutes.

National and institutional governance reforms should be in place, which will depend on all parties relinquishing some existing individual benefits, in order to secure longer-term collective benefits. Similar reforms in EU systems may serve as examples, but there is no real recipe on how to achieve the right balance between bottom-up research and top-down steering and management.

3. Development of research infrastructure & administrative support

Funds for purchasing and maintaining research equipment and regular supplies of research consumables are scarce. Procurement rules and processes, while aligned with those of the EU, are often found to be inefficient in practice, incurring long delays to projects. They were also reported to yield at times prices higher than the published market rate of other enterprises that are unwilling to enter into a complex protracted tendering procedure. Due to funding mechanisms and decentralised governance, existing research infrastructure is often inaccessible to other researchers within the same institution. A lack of sufficiently qualified research support staff and structures result in an additional work burden for individual researchers and further entrenches the general tendency to work in isolation. There is also a lack of institutional research support and sufficiently qualified and experienced administrative staff.

There are however some examples of research units that have succeeded in developing good infrastructure, due to international funding support (EU schemes, World Bank).

4. Profiling of research careers

The core of the funding that universities receive is allocated for teaching and mainly linked to student numbers, making it difficult to achieve a good balance between research and teaching. The study shows that 90% of researchers across the region have teaching responsibilities, and salaries are commonly perceived as being only for teaching activity. Accepting additional teaching commitments is also a common means to top up salaries. All this tends to hamper attempts to make research achievement a stronger factor for promotion and career development. In addition, new criteria and regulations for career progression and research achievement often provoke undesired consequences, such as unfavourable metrics for social sciences and an increasing inclination for publishing in predatory journals. Despite this situation, most of the researchers who responded to the survey described themselves as motivated, satisfied with their careers, and proud of their institutions.

More critical is the situation of young researchers and doctoral candidates. The common approach of doctoral education (individual supervisor) cannot ensure access to resources (e.g. labs), nor enforcement of quality rules (e.g. against high teaching load). The lack of systematic training on generic and research skills is a disadvantage for the careers of young researchers in and outside of higher education and research. In some places, brain-drain is an obvious consequence, in particular with regards to young researchers, who would like to have similar opportunities and experiences as their colleagues from other European universities.

5. Strengthening of higher education institutions

Almost all the points addressed above require strong institutions with a solid capacity to develop and carry out research strategies, and which are able to cooperate at national, regional and global level. They will be crucial not only for research performance, but also for educating the next generation of graduates for unpredictable career paths in and outside higher education and research, and for responding to the needs of society, including the private sector.

This will require the right balance between autonomy and accountability, at systems and institutional levels. Higher education institutions would also need to negotiate individually with the ministries on goals and commitments under new funding approaches, and contribute collectively to the revision of laws and regulations. There are lessons to be learnt from EU higher education systems, where universities - while overall in a much more favourable situation regarding funding and resources - must carefully consider priorities and limitations, which is obviously much more pressing for the WB.

These changes would also benefit other mission goals, which in turn would synergise and cross-fertilise research and innovation: first, it will be crucial for WB institutions to achieve the quality improvement of learning and teaching for which the structural Bologna reform changes have laid the foundations; second, international exchanges and cooperation would not only rely on individuals, but become part of institutional strategic approaches, with better quality and visibility; and the third mission could be tailored to the specific needs of WB societies and industries.

Recommendations and indicators for monitoring

Based on this study, the following recommendations (including performance indicators) to national governments, the EU and higher education institutions (HEIs) are made:

Recommendation 1: More and better investment in research

National level

1.1 Increase investment in research

The WB governments are urged to make higher education and research a high priority and commit to a higher investment, closer to the EU target of 3%, as part of a national strategy towards a knowledge-based economy and society and, if relevant, in view of EU accession. Strategy implementation should be closely monitored.

1.2 Support the development of national performance-oriented, competitive research funding prioritising interdisciplinary research

Increased investment needs to go hand in hand with improved policies and processes for funding to ensure impact, for example, through institutional block grants and competitive research grants, also to enable new ways for research cooperation, among others for interdisciplinary research.

1.3 Ensure national funding for access to international research publications

A first step to improving research capacity in the region is to ensure that researchers can have access to and thus benefit from reading the published works of others. Ministries are urged to make funds available to increase access to journals and other online 'pay per view' research repositories.

National and EU level

1.4 Make provision to improve and maintain research infrastructures and ensure their shared access

WB governments and the EU are urged to continue investing strategically in research infrastructure in order to ensure that research becomes and remains competitive at EU level. (See also Recommendation 3)

1.5 Establish funding opportunities for inter- and multidisciplinary research, supporting increased collaboration among and within institutions

Both the EU and national funding agencies are urged to design more schemes that foster inter- and multidisciplinary research and to make this part of the policy mix.

1.6 Provide funding support for WB regional level research & higher education collaboration

With some notable exceptions, WB research institutions only join international research consortia, if at all, as partners. This prevents them from building up experience and resources to lead international collaboration projects, and also from developing projects geared towards the needs of WB society and economy, as WB national priorities can be different from those of the EU.

Funding provision for regional intra WB research and higher education collaboration would stimulate competition for excellence in the region and reflect national level priorities. It could also stimulate intraregional research and HE collaboration integration and synergies, as some of the systems are too small to develop research capacities and full HE systems at national level. This would make them more visible, stronger in resources and more attractive for international partners. It would benefit not only the HE and research sectors, but would also be likely to render much broader benefits for societies and economies, and also help to frame and steer policy collaboration, for example, at the WB Steering Platform on Research and Innovation, and complement and support the European Research Area (ERA) and the Bologna Process.

The idea of a research fund on regional priorities, allowing for limited participation of countries from outside the region and funds for HE collaboration (including PhDs), as well as mobility of teaching staff and students has been welcomed and strongly recommended by all interview partners. While this might not align with the announced EU accession processes, it is nevertheless mentioned here as a high potential instrument to address some of the issues mentioned above.

Indicators:

- Percentage of GDP invested into R&D
- Ratio of institutional block funding to competitively awarded research grants
- Value of annual budget for competitive research projects
- Percentage of total research funds designated for interdisciplinary research
- Investment into research infrastructure including maintenance
- Number, output and impact of regional research and HE initiatives

Recommendation 2: Reform of research governance

National and institutional level

2.1 Support the development of more fit-for-purpose governance and management with appropriate levels of subsidiarity and staffing

Improved governance and associated outcomes are likely to depend on all parties relinquishing some existing individual benefits in order to secure longer term collective benefits.

2.2 Review legislation to enable more collaboration and open access

In dialogue with institutions, national governments should identify and eliminate obstacles to research and education collaboration. Policies for open access to research infrastructure could initiate a positive dynamic. This would be key also with regards to cooperation with industry and general contribution to innovation.

Indicators:

- Existence and outputs/success of a national support programme for the development of institutional governance reform
- Number of institutions operating a policy of open access to research infrastructure
- Number of institutions applying the European Charter & Code for Researchers and having obtained the HR logo

Recommendation 3: Development of research infrastructure & administrative support

National and institutional level

3.1 Develop and maintain research infrastructure for shared use

National funding should be provided to purchase and maintain critical research infrastructures. This should include mechanisms to ensure and enable open access for researchers and easy cost sharing between departments and institutions. A policy of open access to research facilities should be the objective for both enterprise (commercial) use and academic collaborations between research groups and research institutions.

3.2 Develop research management capacity

In order to enhance quality and success of research grant applications and management, institutions should develop adequate administrative support structures with appropriately qualified staff. Support staff and researchers should be offered appropriate training on the preparation of high quality project proposals and project management. Participation should be recognised as part of career development.

The respective funds should be situated at institutional level to ensure that measures are designed at appropriate levels of subsidiarity and consider the needs of all researchers.

Indicators:

- Number of HEIs with research offices/units
- Number of FTE research per 100 FTE researchers
- Number of researchers who have completed training on proposal writing and project management
- Presence of a dedicated and active fund for maintaining and improving research infrastructure
- Number of frameworks/ policies for open access to research infrastructure enabling sharing of academic infrastructure costs and covering costs from economic activities

Recommendation 4: Profiling of research careers

National and institutional level

4.1 Enable diverse career paths, based on parity of esteem for research and teaching

Achievement in teaching should not be a substitute for research achievement; it should be better recognised for career advancement and remunerated accordingly. In addition, 'research positions' should be created that require and enable researchers to dedicate more time to research.

4.2 Establish assessment metrics that better recognise high quality research as part of career progression

Improved metrics should encourage quality publication, e.g. in international, peer-reviewed journals with a strong impact factor. This must take into consideration all research areas and should not be a reason to decrease disciplinary breadth and diversity – as publications in sciences and technology may be more readily published in international journals than those in the arts and humanities, which focus on national or regional level studies, e.g. in Albanology.

4.3 Provide research skills training for both PhD supervisors and doctoral candidates

Both PhD candidates and supervisors should be required to participate in skills training, in full consideration of the [EU Principles of Innovative Doctoral Education](#) and the [Salzburg Principles](#).⁵

⁵ https://euraxess.ec.europa.eu/sites/default/files/policy_library/principles_for_innovative_doctoral_training.pdf

Indicators:

- Improved ratios of teaching-to-research time, laid down in the employment contract, measured against a baseline that pre-dates policy change
- Number of FTE research positions
- Number of doctoral schools established
- Number of training courses established in line with the EU Principles of Innovative Doctoral Education and Salzburg Principles
- Number of supervisors who complete a formal supervising scheme
- Presence of metrics that focus on high quality research outputs as the mechanism for researcher promotion

Recommendation 5: Strengthening of higher education institutions

National and institutional level

5.1 Support the development of strong, multiply engaged universities

Universities should be encouraged and given support to develop distinct profiles and multiple missions in research, teaching and engagement with society, including the private sector. This requires institutional autonomy and accountability.

5.2 Education: support the development of research-based learning and teaching, including transversal and entrepreneurship training at all levels

Teaching should be informed by research and encourage students to engage in research and knowledge creation in preparation of diverse careers and positions. This requires a stronger emphasis of student-centred learning, learning outcomes, and transversal skills.

5.3 Internationalisation: support the development of institutional strategies and necessary capacities for strategic international collaboration

Internationalisation is known to improve research excellence and increase research capacity. Strategic internationalisation can also help to mitigate the effects of brain drain.

5.4 3rd Stream (Innovation): improve technology transfer and knowledge exchange

This could be achieved by creating more grant schemes to encourage collaborative research and permitting industry-sponsored PhDs and representatives from businesses to teach and supervise students. Broadening the policy mix away from pure technology development and into diversified methods of knowledge exchange has been shown to be beneficial in EU member states. Ecosystem approaches could be helpful for a more horizontal development of research and education in the specific local, national and regional context.

Indicators:

- Existence and impact of institutional strategies to support a third mission
- Graduate employment rate
- Number of new PhDs employed in the private sector
- Number and impact of strategic international partnerships, as regards mobility, research and education projects
- Diversified policy mix for innovation
- Number of HEI internationalisation strategies
- Institutional recognition of mobility in career progression

Introduction: Research Capacity in the Western Balkans

1. Objectives

This study focuses on assessing the research capacity at higher education institutions (HEIs) in the Western Balkans (WB), with the following main objectives:

- To map research capacity in the WB, comprising human resources and research infrastructure, national funding and investments in research.
- To deliver country analyses of research capacity, including some cross-regional and cross-EU comparisons.
- To provide recommendations for national authorities with regard to the building of research capacity in the WB.
- To highlight comprehensive recommendations for measures to be taken by the European Union (e.g. through future funding programmes).

The study was carried out under the European Commission's initiative "Support to the Higher Education Report Experts" (SPHERE)⁶, between January and December 2017.

2. Methodology of the study

Desk research centred on research productivity using the Scopus search engine for the period 2012-2016. As not all HEIs publish the total number of full-time equivalent (FTE) researchers, for some institutions, older sources (2014) giving the total number rather than the FTE, have been included. For this reason, the productivity data should be interpreted with caution. The full methodology and results for the productivity analysis can be found in Appendix 1.

The mapping of research capacity in the WB was carried out through desk research using three online **surveys** addressed to university leadership, deans and heads of departments, as well as individual researchers, with a total of 1 382 responses from around 70 HEIs. For a detailed analysis of the sample and lists of the responding institutions and departments, refer to Appendix 2; for a **copy of the survey questionnaires**, refer to Appendix 4.

⁶ The SPHERE initiative provides support to 250 higher education reform experts in 26 countries of the European Neighbourhood region. During the contract period 2014-2017, the initiative was conducted on behalf of the European Commission (DG EAC) and its Executive Agency for Education, Audiovisual and Culture (EACEA) by the University of Barcelona (Coordinator) and the European University Association (EUA), in close collaboration with national Erasmus+ Offices. <http://supportthere.org>

In addition, a series of semi-structured **interviews** with representatives of universities and ministries were conducted for all six systems. For a list of the institutions visited and a description of the site visit methods, refer to Appendix 3.

It has to be kept in mind that this study represents in first instance the views of representatives and staff of higher education (HE) and research institutions, from the survey, and the interviews. As the sample has been reasonably large, and responses converge across institutions and even systems, this should not be seen purely as “opinions”.

3. Background of the study

The WB, namely Albania (AL), Bosnia and Herzegovina (BiH), the former Yugoslav Republic of Macedonia (MK), Kosovo (XK), Montenegro (ME), and Serbia (SR), are close to the European Union (EU) and, in terms of economic and social development, have the most promising prospects among the EU neighbourhood regions.

Research cooperation between the EU and the WB region – which has been ongoing since the mid-1980s - has resulted in a number of positive developments, such as access for the Western Balkan institutions and researchers to the EU’s Framework Programme (FP), Eureka and COST. They have also received access to some services from the European Commission’s Joint Research Centre (JRC). Association status of some programmes has enabled them to send their representatives as observers to different EU committees and governance bodies related to research and innovation. This has created an opportunity for capacity building and training on EU research and innovation policies.

However, research systems in the region remain rather weak, with negative consequences not only for research and innovation, but also for the quality of HE learning and teaching, the economy and other social areas. There is a need to build research capacity and to better integrate the Western Balkan countries into the European Research Area (ERA), also with regard to the recently announced acceleration of their EU accession processes (President Juncker’s State of the Union speech, 13 October 2017⁷).

The assumption is that enhanced research capacity would not only boost research, innovation and education at HEIs but would, in the medium to long-term, also underpin capacity building and development in other areas, including the economy. Or, from a counterfactual perspective, the lack of research capacity could become a deadlock for economic and social developments, given the central role that HE plays in it, with regard to research and innovation, but also through its contribution to the workforce and active citizenship. This would likely become an impediment for EU accession.

In addition, research and education relations could be one of the drivers to promote and support stability and cooperation in the region. The countries are geographically connected, and share some segments of their – at times difficult - histories with each other. All have been going through significant political and structural transformations over nearly three decades.

7 See http://europa.eu/rapid/press-release_SPEECH-17-3165_en.htm

There have been some rather successful attempts to support collaboration between researchers from the WB and the EU. The SEE-ERA.NET, an FP6 Southern European Research Area networking project, aimed at integrating southeast European countries into the European Research Area by linking their research activities within existing national and regional programmes. Under FP7, the Western Balkan Country (WBC) INCO.NET focused on coordinating research policies within the WB. However, beyond these, and somehow contrary to strong interest expressed by researchers and institutional leadership during this study, intra-WB regional cooperation has remained relatively limited.

In April 2009, the Sarajevo Declaration produced an impetus for regional collaboration. It was signed jointly by regional ministers and the EU Commissioner for Science and Research with an aim to develop the Regional Strategy on Research and Development for the WB. Hopes were high, and a set of short-term as well as long-term measures were defined. Eight years later, it appears that the research systems in the WB are still weak which is shown by low investments into R&D and low numbers of research outputs, that are measured through publications. While many factors cause and have an impact on this, others have emerged very clearly in this study. It is hoped that this may contribute to improved policies and actions to address and overcome them.

4. Social and economic context

The WB are a diverse economic, social, and educational space with many features common to the entire region. The countries vary significantly in terms of their size and total population. Montenegro is the smallest country, with slightly more than half a million inhabitants, and Serbia is the largest, with a population of almost seven and a half million.⁸ With the exception of Albania, the countries share some common political and educational backgrounds, as former constituents of Yugoslavia. However, they also differ in their educational systems, in the number of HEIs, the ratio of public and private institutions, and the role and impact of their academies. Some of these differences can be attributed to the 1990s war and the long period of 'transition', compounded by the 2007 global economic crisis.

In the last 20 years, in all six country systems, the number of public and private HEIs has increased, as has the number of students, by 37% between 2007 and 2015 across the region.⁹ But access for all who qualify has not yet been achieved, and increasing participation remains a challenge. Debates on the role, quality and outputs of different types of institutions, in particular in comparison between public and private universities, have at their roots competition for scarce funding and unequal treatment by national authorities, which are considered not to value quality and merit. How to strike a balance between quantity and quality remains a particular issue for policy makers and university leaders in the WB. Within the research system, the position of universities and faculties has become stronger, as has the role of academies as the main public research actors been diminishing.¹⁰ This has brought

8 Source EUROSTAT http://ec.europa.eu/eurostat/statistics-explained/index.php/Enlargement_countries_-_population_statistics

9 From University to Employment: Higher Education Provision and Labour Market Needs in the Western Balkans Synthesis Report, European Commission, Directorate-General for Education and Culture 2016 https://ec.europa.eu/education/sites/education/files/2016-higher-education-labour-market-balkans_en.pdf

10 This has been confirmed in the country interview

with it an urgent need for redesigning structures and frameworks in order to enhance quality and quantity of research.

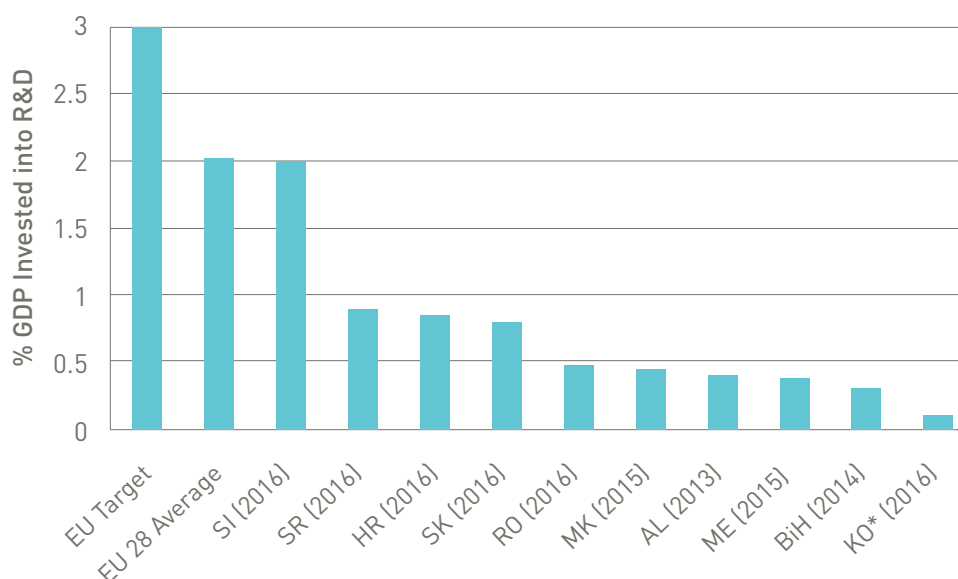
An analysis of the research capacity in the WB must consider the general social and economic situation. Poverty exists in all systems, but at different levels: the lowest is in Montenegro with less than 5%, and the highest is in Kosovo, with more than 45% of the population.¹¹ The decrease in this poverty and greater social cohesion are the priorities of the SEE 2020 Strategy.

Major industries have been closed down during the transition period from socialist to market economy due to lack of competitiveness, outdated technology, bad management and unsuccessful privatisation. Both war and the 2007-2008 global economic crisis have delayed the recovery, which also has implications for universities: academics responding to the study confirmed the absence of university-industry relations, but also pointed out that these existed in the past, but have not been sustained, due - among other reasons - to the changed economic and social situation.

Weak economies are certainly among the key factors that cause the overall low public and private spending on education: in all systems, GDP is low, and the investment in education and research is modest (Figure 1). Weak industrialisation, and in particular the lack of high-tech industry, has an impact on the demand for skills, and limits the demand for education and qualifications. Research is commonly not perceived as relevant for socio-economic development.

Figure 1: Percentage of GDP invested in R&D in WB countries and selected EU MS (Source: EUROSTAT and country reports for AL, BiH and XK)

N.B.: Only data for SR is available from EUROSTAT for 2016. The last available data for ME and MK is from 2015. AL, BiH and XK are not covered by EUROSTAT. Therefore, alternative data sources have been used, also from European Commission reports, published in 2017 (see country level report for sources).



11 Source: World Bank Western Balkans Regular Economic Report 2017

In the study survey and interviews, institutional leadership and researchers stated that the general public's perception of HEIs is not very favourable, and research is often not perceived as relevant by policy makers, as it is more often associated with the word 'cost' than 'investment'. In total, 90% of the individual researchers who responded to the survey agreed that research is not given a high priority by the state. Industry shows very little or no interest in educational and research institutions. On the other hand, close to 30% of the respondents also felt that researchers and institutions do not give sufficient consideration to applied research, and 67% stated that research tends to ignore the needs of industry and society. Such an attitude is also likely to impact negatively on funding as policy makers will question how much an HEI is contributing to economic and social challenges and whether HEIs are ready to adopt approaches that will allow them to develop and become more research-focused.

Today, the main players in research and academia, government and business sectors are often in opposition to each other. The survey confirms that there is a serious lack of trust and cooperation, and even frequent cases of conflict between HEIs and governmental institutions. Low levels of coordination among the different ministries and agencies on matters related to HE and research further complicate the situation.

The study has confirmed that while there are strong commonalities in challenges and comparative research contexts, the six countries also differ significantly among themselves. They are at different stages of transition and modernisation of their HE and research systems and therefore are facing different challenges. The study has also revealed that despite good progress and development, strongly linked to EU funding and policy support, all the Western Balkan countries still have a very high need for support for financial, governance and operational issues. Resulting recommendations should pave the way to improving research capacity and should make it easier for policy makers at both the European and national levels to support the development of research institutions.

Conclusions

- Funding, including private investment in R&D, is far too low to support research that is competitive at EU level.
- There are too few industrial and high-tech businesses and their demand for public research is very low.
- Public research systems are not connected to the industrial sector.
- The general perception of the relevance of research is quite negative.

5. Institutional level interactions, roles and responsibilities

In many Western Balkan countries, education, research and innovation are funded and administered by different ministries. This often leads to a poor flow of information, and miscommunication, and creates frustration and tension. Relatively frequent reforms of laws and regulations do not seem to lead to stronger alignment. In addition, the new laws are often only partially implemented, for example, due to restrictions on the national budget as seen in Kosovo and the law on science. Recent new laws on HE in Serbia and Bosnia and Herzegovina have encountered strong opposition by HEIs. This has raised tensions with the associated ministries because policy makers are perceived to be interfering with HEIs' autonomy and acting to enforce integration of the universities, for example by reducing the powers of faculties and shifting them to the rectorate or by moving powers from the university to the associated ministry.

A functioning research system relies upon many factors: it requires a strong education system, adequate resources (both human and financial), and adequate mechanisms for implementation and monitoring. Across the WB these components are frequently not or not fully in place, or do not function efficiently. The research system also requires a confluence of strategy, structure and policies that are focused, coherent, transparent and accountable. In contrast, what has been observed through the lenses of this study were largely fragmented systems that are frequently sub-optimal and not operating well. There are occasional exceptions and of course excellent individuals, research groups, departments and institutes. However, even outstanding groups reported that they did not receive sufficient institutional support at the level of the department, faculty, university or through national bodies and structures.

National academies of sciences and arts have played an important role in the overall national research performance. Recently, however, their role in the majority of the Western Balkan countries has changed and lost its significance. In some countries, such as Albania, the government's intention was to move most of the research to universities. This has triggered some tension and dissatisfaction between the different institutions. A different example is seen in Serbia, where the Serbian Academy of Sciences and Arts is still very active, one of its main activities being international cooperation.

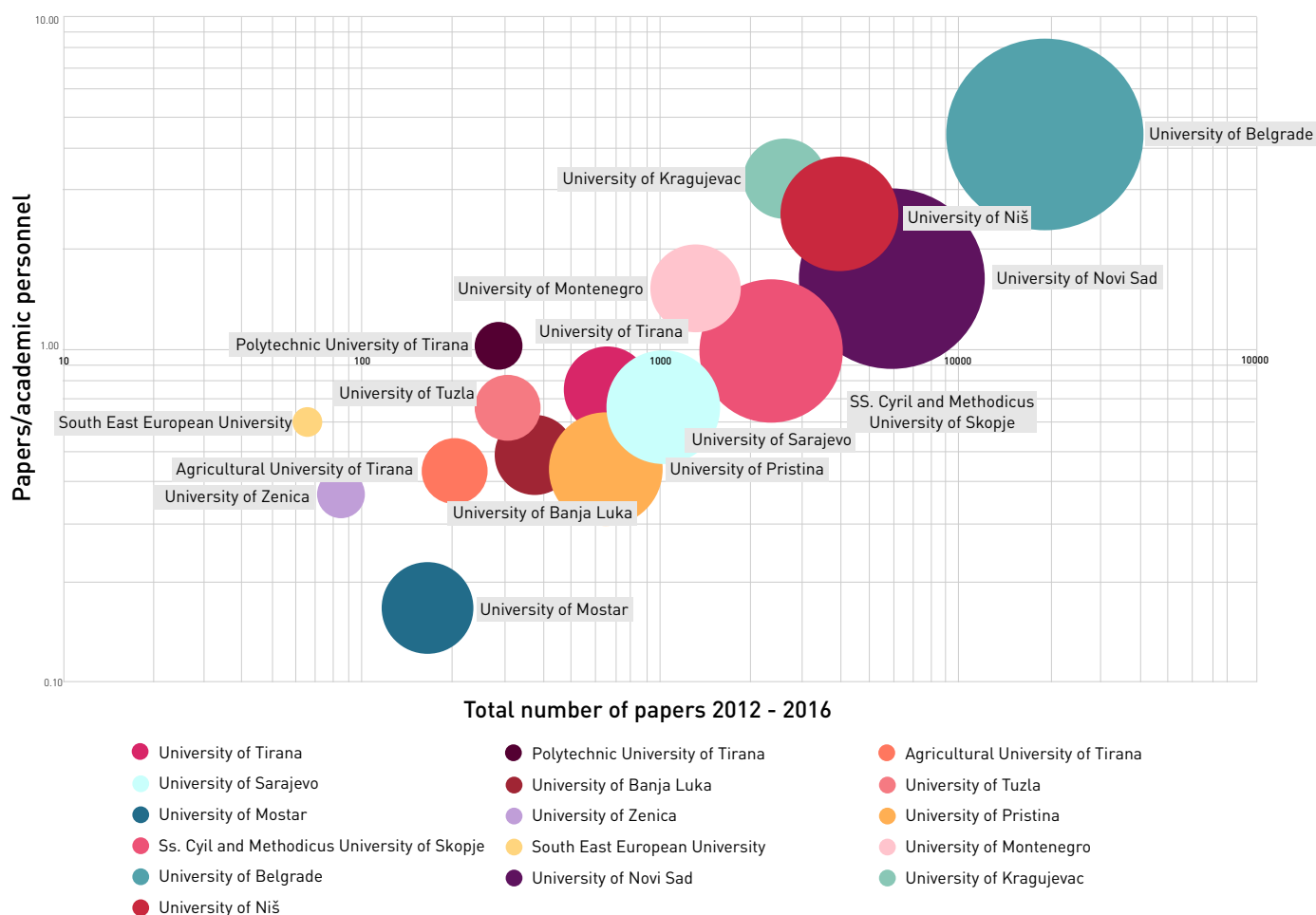
Conclusions

- Within the national research systems, the main players do not cooperate with each other and have low levels of trust.
- National laws and institutional regulations are inadequately implemented, and undergo frequent changes without yielding clear improvements.

6. Research productivity

Figure 2 shows the productivity of HEIs in the region based on their publishing performance (for the full methodology see the methodology section above).

Figure 2: HEI relative “productivity” based on five years of publishing performance 2012-2016



The chart illustrates three important parameters:

- The horizontal axis indicates the **total absolute number of papers** published between 2012 and 2016 (in the English language and appearing in the SCOPUS database). This is the most accurate data-set.
- The vertical axis gives the **average number of papers per academic**. This is the more insightful statistic, but because FTE is not an established concept for all institutions or a reported figure, these figures are the least reliable.
- The size of each ‘bubble’ represents the **size of the HEI based on the size of its academic personnel**.

The University of Belgrade dominates the chart being the largest HEI in the region, and also as having the largest number of papers and papers per researcher. It is followed by the other three large Serbian universities (Novi Sad, Kragujevac and Niš).

HEIs with larger numbers of researchers would be expected to have the highest absolute number of publications. However, this is not always the case, for example when comparing the University of Mostar with the University of Montenegro.

Other HEIs performing rather strongly for their size include the University of Montenegro, the Polytechnic University of Tirana in Albania and the South East European University MK, whereas the BiH's HEIs of Mostar, Zenica and Banja Luka appear to be rather weak.

During interviews at several institutions, in particular in Montenegro and Serbia, it was mentioned that the requirements for research output have been raised as a condition for academic promotion. This seems to be perceived differently by different generations of academics: more senior faculty members consider the requirements as too high, whereas younger researchers tend to welcome more competition, but also point towards the performance challenges, given the lack of institutional resources and support.

The results of this productivity study need to be interpreted with caution. Many HEIs do not state FTE and researchers are often affiliated to more than one institution. Results are outlined for each WB country in the country level reports. The full data set can be found in the associated Appendix 1.

Conclusions

- Research productivity is unevenly distributed across WB systems and not necessarily linked to institutional human research capacity (number of researchers).
- Higher research output requirements for academic promotion has had a positive impact on overall institutional research productivity.

Part I General Findings: Common challenges in a diverse region

1. Funding

1.1 National funding

The survey results showed a widespread agreement among the research communities of all six systems that research capacity building is hampered by a serious lack of funding. 73% of institutional representatives (Q1 senior management) state this, and a very similar response was obtained from faculty managements and department heads (Q2). Insufficient research funding and insufficient priority given to research by the state are perceived to be the greatest problems for capacity building in the region.

Policy papers and strategies at the national level reveal plans and commitments to increase funding, but this is still not taking place. The percentage of GDP invested in research is low, albeit with significant differences between the systems (see Figure 1).

There is almost no private sector investment in R&D activities; therefore, nearly all the funding for R&D comes from public resources, and usually from the ministry responsible for 'science'. Laws often prevent other interested and related ministries from becoming involved in research, which is an obstacle for the development of comprehensive national strategies that address specific economic and social priorities and needs.

The funding problem is also caused by funding methods. Interviews revealed that most academic staff feel that their salary is for their 'teaching' activity, and that there are no clear contractual rules or requirements to carry out research. This situation is exacerbated by the fact that teaching staff frequently take on additional unregulated teaching loads, often at other institutions in order to increase their effective salary. Obviously, this reduces the time available for research and has a negative impact on research performance, as well as on teaching. Institutions and researchers find themselves in a vicious circle: with no clear funding opportunities for research and low salaries, they focus on teaching and, by doing so, they become even less research-active, and thus undermine their competitiveness.

The method of funding allocation can also have a negative impact on research productivity, for example, when funding is distributed within the institution, not according to research costs, but by undergraduate head count. Some faculties, such as law and economics, have large numbers of students, but low research costs, while science faculties with higher research costs, but fewer students receive far less funding. This approach results in considerable imbalances in funding allocations, usually to the disadvantage of the less popular (STEM) undergraduate fields. It also creates tensions and division within the institution and prevents collaboration between researchers, departments and faculties, as well as shared use and maintenance of equipment.

This is an example, as funding allocation to the different parts of the institution is handled differently in each WB system. According to the survey for institutional leaders (Q1), 89% of Albanian institutions reported that allocation is carried out by the Senate, while 50% of HEIs from Bosnia and Herzegovina and 58% from Serbia reported that the ministry is responsible. This is just to highlight the differences, as funding allocation is too complex an issue to speculate here about the direct impact that this may have.

Other factors that impact negatively are the uncertainty and lack of transparency in funding processes and conditions: often funding provision is delayed, or there is no clear indication of the time when it will arrive, or when new calls will be launched, whether and for how long funding will be prolonged, etc. In addition, public procurement rules were described in interviews as unfit for purpose, delaying purchase of research equipment for months. Researchers reported cases where the equipment arrived several years after the research project had been concluded. These challenges were among the main complaints heard from individual researchers during the study.

Both the research community and policy makers acknowledged that, in addition to increasing research funding, better systems and methods for funding allocation and administration must be developed.

Conclusions

- Lack of funding for research and development is common to all the Western Balkan systems, keeping the whole region uncompetitive compared with the EU.
- Funding is not diversified and depends almost solely on public money.
- Funding methods lack stability, transparency and reliability.
- Research funding is often tied to teaching and student numbers, rather than to research needs and merits.
- Research funding allocation to the different parts of an institution becomes an obstacle for inter- and multidisciplinary research, and also inhibits shared use of research infrastructure.
- Systems and methods for research funding allocation need to be improved.

1.2 EU Research funding

Given the low national funding capacity, international funding, including that provided by the EU, plays a vital role for research, but also for other areas of HE activity in the WB. 70% of Q3 survey respondents thought EU grants were very important for their research, while a further 22% felt they had some importance.

Both individual researchers and institutional leadership used both the surveys and interviews to point out their major challenge: namely they do not feel competitive enough to secure H2020 funds against applicants from EU countries. They were more successful with earlier Framework Programmes and smaller grant schemes such as EUREKA and COST. These programmes helped them to network and opened up possibilities for collaboration with the international research community. The REGPOT scheme, although applied in the WB region in a very limited way, was perceived as a good way to internationalise the research system, to employ young researchers and to update infrastructure. Interviewees frequently mentioned the TEMPUS programme which, despite not being designed to fund research, enabled collaboration, mobility exchanges and also access to equipment that could support research. This, and a relatively high success rate for applications, seem to have motivated many institutions and individual researchers to participate.¹² However, although the smaller schemes are more accessible for the level of research in the region, securing co-financing and managing pre-financing for research grants (until funds can be claimed back), were mentioned as serious obstacles. As there are no internal funds for research, relatively small sums of money (for example, paying for costs not covered by the grant budget) becomes a problem.

In this and other respects, there was a relatively high interest in funding opportunities for WB regional research collaboration. For example, the idea of a WB regional fund has been discussed during interviews, and was also presented at the 6th Western Balkans Platform on Education and Training (Belgrade, 28-29 September 2017). On both occasions, it was welcomed as a chance to address specific regional priorities and challenges and to work with colleagues in neighbouring countries. Such a fund might also be an opportunity to implement the South East Europe (SEE) 2020 strategy, the Multi-annual Action Plan for a Regional Economic Area in the Western Balkans Six (MAP)¹³ and smart specialisation strategies, and to build clusters of 'regional excellence'. The establishment of such a fund may no longer be possible as an EU initiative, due to the planned accelerated accession of some of the WB countries. But it could be an option for other donors/ actors, and the underlying principle may also find some consideration in future EU actions.

Ideally, such a fund should be open to all researchers, regardless of their seniority, focus on collaborative research activities, enable upgrading and maintenance of existing research infrastructure, support high-quality publications from the region, as well as provide access to international journals and databases. Special emphasis should be placed on encouraging

¹² Between 1991 and 2013, the EU co-funded 720 cooperation projects with a total value of 254 million euros in the Western Balkans <https://publications.europa.eu/en/publication-detail/-/publication/7b88fa03-a2b2-4842-a80d-73f56a36ddd3/language-en>

¹³ <https://www.rcc.int/docs/383/multi-annual-action-plan-for-a-regional-economic-area-in-the-western-balkans-six>

interdisciplinary research and two-way mobility (incoming and outgoing), in particular for young researchers. To ensure that the research activity retains its focus on the WB, EU partners should enjoy only restricted eligibility to activities.

Such a funding scheme should also encourage exchanges at the institutional and system levels, for example, towards more efficient governance and funding approaches that would enable a more active participation of HEIs and a better functioning of the relevant national agencies.

Conclusions

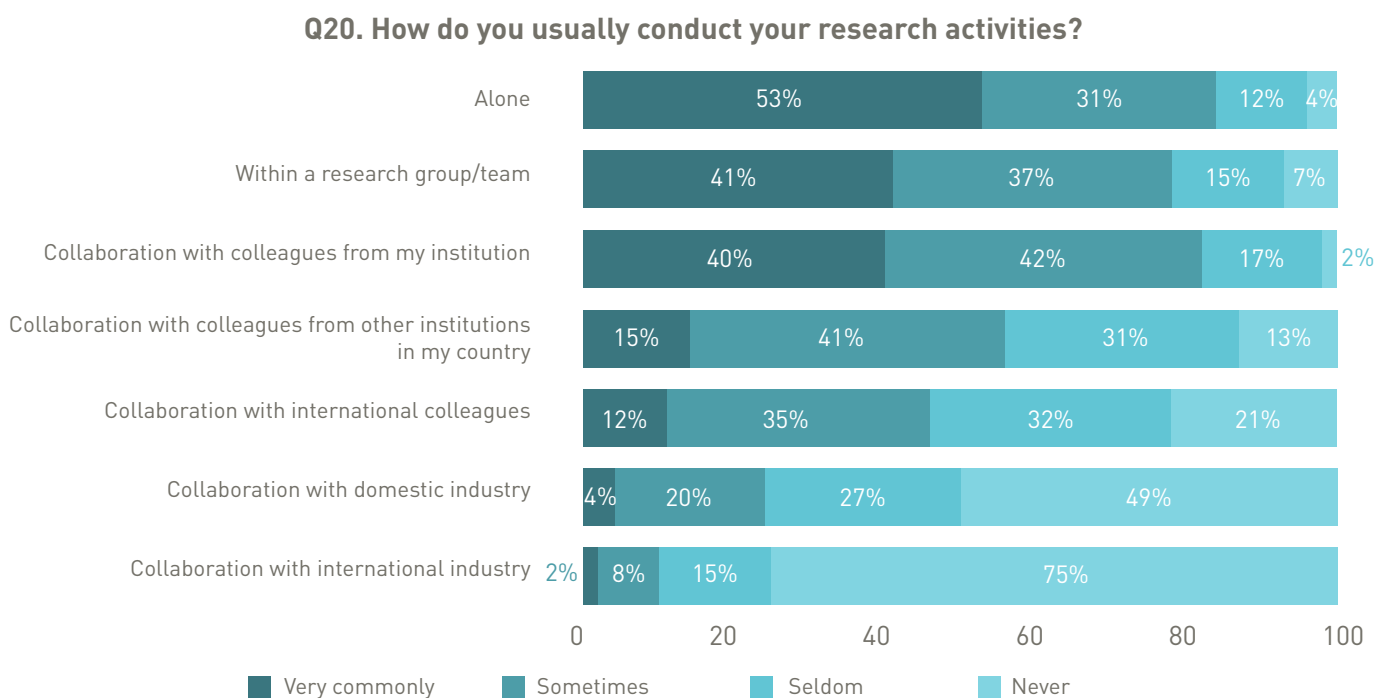
- Issues relating to pre-financing and co-financing remain serious obstacles to using EU funds and need to be addressed both for existing and new funding programmes.
- Flexible low-threshold funding instruments allow institutions to support capacity building in research and other priorities areas.
- A regional fund would contribute to realising the region's research potential by addressing regional and national priorities, and enabling smart specialisation.
- Such a fund should be designed for all types of researchers, support two-way mobility, inter- and multidisciplinary, research infrastructure and access to and publishing of high-quality publications.

2. Research governance

The prevailing governance model of universities in the WB is decentralised with highly autonomous faculties. This may however not be favourable for strategic research and institutional development. At most institutions in the region, and despite the existence of the position of vice rectors for research, the institutional leadership does not have much influence on research. In contrast, there is strong autonomy for individuals who can define their research direction, and also for faculties. Universities and ministries struggle to define and implement research priorities and development plans.

94% of respondents (Q2) reported that their researchers are more or less free to choose their research topics as well as how they organise their research. One of the consequences is a low level of collaboration among the members of the research community as most researchers work alone (Figure 3). Concepts such as 'research group' and cross-disciplinary work have not really been accepted and neither are they supported by funding schemes nor by research management through processes or people.

Figure 3: Typical mode of operation in research



In some of the WB systems faculties are autonomous legal entities, with the right to employ teaching and research staff and no obligation to take directions from the university or ministry regarding how they distribute and use their budget. This can represent an impediment for intra-institutional collaboration and for the development and maintenance of infrastructure and services that benefit the entire institution. For instance, supporting units are usually created at faculty or department rather than institutional level. As a consequence, they remain relatively small with little capacity for responding to highly irregular workloads (either over- or underemployed), and with no benefit for the rest of the institution.

As demonstrated by the results of the research productivity study, most of the research activity in the region takes place at either universities or research institutes. More recently, these research institutes have become affiliated with HEIs as additional entities or as associate institutions. This mixing of roles and activities (teaching versus research) under the same umbrella organisation will require additional institutional management to address the added complexity of the process and activities, and to ensure added value.

In short, the present governance structure can imply severe restrictions on further developing research capacity. But while the problems are generally acknowledged, there is strong resistance to change which is suspected to lead to loss of autonomy or other disadvantages.

Conclusions

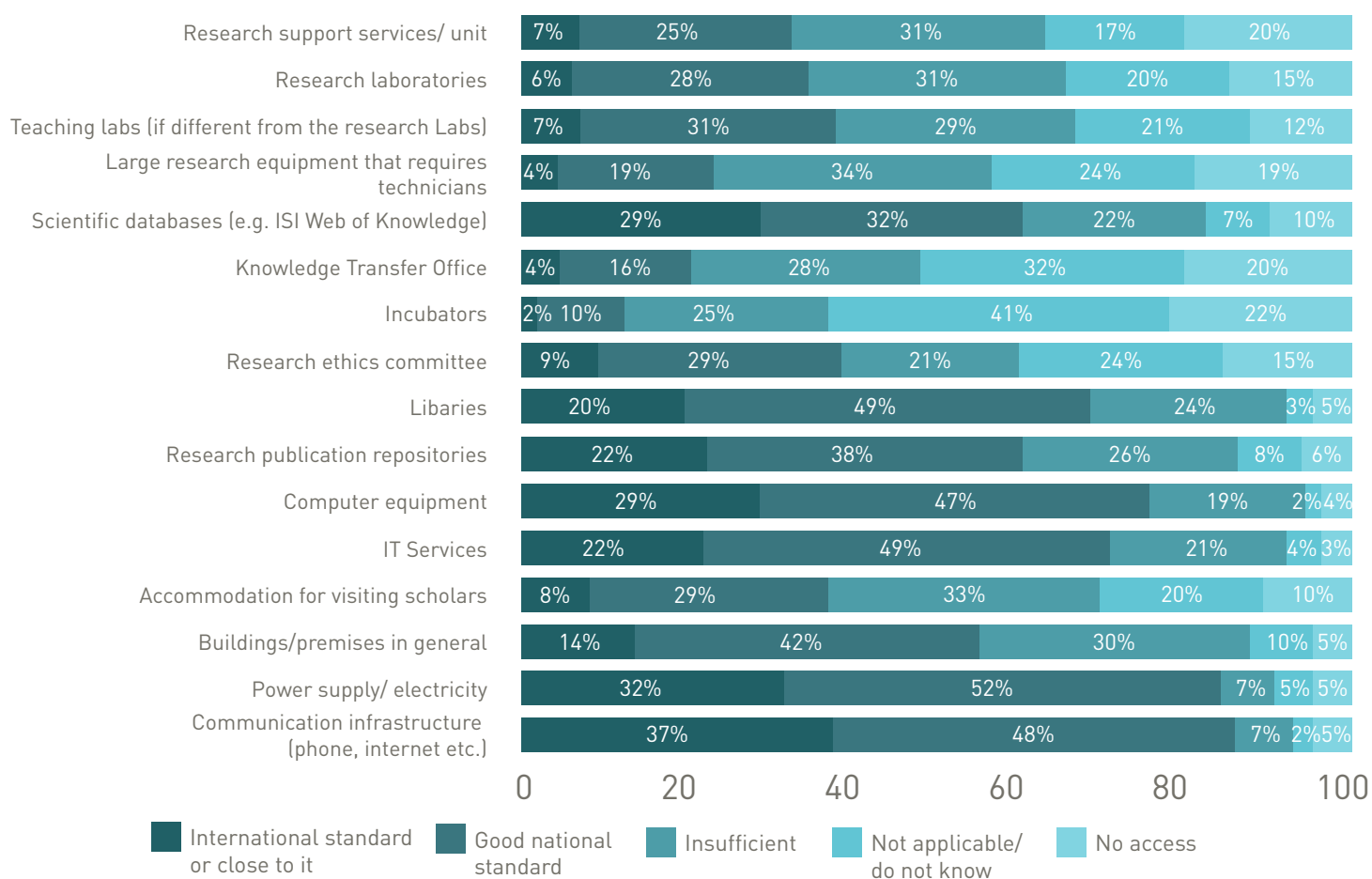
- The institutional governance system is not designed to provide support for strategic research development, neither through policies, nor funding. Autonomy and governance are not distributed to enable effective and efficient management and further development of research capacity.
- Individual researcher autonomy is very high and there are no real mechanisms to enable senior management to help the progress and development of the institution as a research base.

3. Research infrastructure & administrative support at universities

3.1 Research infrastructure

Many research institutions and universities in the WB are located in city centres, in old architectural buildings that have not been adequately maintained for many years, rather than in purpose-built teaching and research facilities. The majority of researchers who responded to the survey (Q3) consider basic services, such as computers, IT, telephone, electricity, and libraries, to be good, but research infrastructure, equipment as well as facilities, as inadequate (Figure 4). And 73% of the institutional leadership (Q1) felt that equipment, as well as infrastructure, was insufficient or simply non-existent. Laboratories and other facilities, if they did exist, often did not meet the needs. About every other respondent (Q3) confirmed that important infrastructure (such as research labs, large research equipment, incubators) and research support (knowledge transfer offices, research support units) were either not accessible, or insufficient. 10% stated that they had no access to scientific databases, and 22% answered that access was insufficient.

Figure 4: Access to research infrastructure and perception of relative quality



It is noted that 38% of respondents to Q3 reported research infrastructure to be technologically outdated and inadequate for conducting modern research.

National funding for purchasing new, but also for maintaining existing equipment and supply of consumables, is very scarce. Some WB countries, notably Serbia, have made good use of IPA funding and this could be a good example for others to follow. Researchers indicated during interviews that the costs of materials could be higher in the WB than in the EU. In addition, the current procurement practice could further raise the price, as lower price suppliers in the region are not always willing to participate in the procurement process. As a result, the lowest priced tender is accepted rather than the lowest available market price.

Access to research equipment purchased is often limited to a research group or department, and not shared within and between HEIs, a practice that is deeply rooted in the system. Attempts to enable access to infrastructure for researchers from other parts of the institution is usually perceived as an attack on the research unit's or the individual researcher's academic autonomy. The fact that it has been purchased and is maintained by the unit's or department's funding, turns it into its "property". During one HEI site visit, researchers from

different faculties confirmed that they would give each other access to equipment and facilities, but this was referred to as a personal arrangement, not as a right or rule. In addition, it was mentioned that this would not include some special labs, “as they are very expensive to buy and maintain”. There is clearly a lack of awareness of the costs associated with maintaining equipment as well as a lack of understanding for shared approaches and their potential benefits.

Interviewees frequently mentioned EU programmes and, in particular, the TEMPUS programme as useful for buying research equipment. While it had not the explicit aim to support research, it allowed for purchasing equipment, and was apparently sufficiently flexible to extend this to research equipment.

Only a small number of research units reported that they are well equipped and can perform up-to-date research, competitive at EU standards. They were predominantly funded through different EU schemes or the World Bank. Some high-profile success stories have been noted, for example, the BioSense Institute in Serbia with the ANTARES Centre of Excellence for Advanced Technologies in Sustainable Agriculture and Food Security funded under H2020, and the BIO-ICT Centre of Excellence in Montenegro funded through the World Bank. These are good examples that should be shared with other institutions in order to pass on the experience of graduating to a higher level of excellence.

Conclusions

- There is a lack of research infrastructure, and existing facilities are frequently outdated and not fit for purpose.
- Research equipment is not shared between researchers across faculties and departments.
- National funds for purchasing new and maintaining existing equipment are very limited.
- There are examples of research units that have succeeded in developing good infrastructure, due to international funding support. They could provide valuable road maps for other ambitious institutions and groups of researchers.

3.2 Administrative support for research

Administrative support for research is very limited. 67% of Q1 respondents reported insufficient administrative capacity to prepare research proposals and to manage research. Administrative staff, if available, are often not sufficiently skilled and prepared to provide support, for example, in writing proposals and securing grants. They also lack the foreign language command needed. Many universities have not established any systematic support, while others have started to provide some services, but of limited scope and with not enough skilled staff. Research support structures are, if existent, usually at the level of an individual faculty, department or research institute, which makes it more difficult to balance workload with staff numbers, and also prevents knowledge and experience sharing. For example, departmental offices usually search by themselves for funding opportunities. Overall, there is usually not enough funding to provide a support office for each department, and the cost of employing and training better-skilled staff is a serious and long-term obstacle.

As a consequence, most researchers receive very little or no support at all for proposal preparation and project management. The few highly skilled administrative support staff are overloaded and, in particular, the junior staff, but also many of the senior researchers report that they work long hours, during weekends and holidays, in order to cope with the high workload and make up for the lack of structured support. In some of the interviews, researchers proudly pointed to their resilience, and their ability, to do a lot with little means. While these issues are common in nearly all institutions, they are amplified in non-integrated institutions.

Conclusions

- There is a lack of institutional research support and sufficiently qualified and experienced administrative staff.
- Researchers spend valuable time developing their own proposals alone rather than working as a project team, which further entrenches the general tendency to work in isolation.

4. Research careers

4.1 Career development and the research–teaching balance

As already mentioned above, the balance between time allocated to teaching and time for research is perceived to be poor. Teaching has prevalence, and most academic staff feel that they are paid primarily for teaching. By doing more teaching, they can also enhance their salaries; this in turn becomes a de-motivator for doing research. Among the researchers surveyed (Q3), only 8.3% were full-time, and 31% indicated devoting less than eight hours per week to research (Table 1).

Table 1: Average time allocated to research/week

Time allocated to research per week	Share of survey participants
None/ not applicable	3%
Less than 8 hours	31.2%
Less than 20 hours	34.3%
More than 20 hours	23.2%
Full-time	8.3%

Academic promotions, however, are based on research output, and the pressure to publish internationally is increasing. This has opened the door to so-called ‘predatory journals’, which publish scholarly papers without peer review, in return for a fee. Some ministries, for example, in the Republika Srpska in BiH, have started to publish a black list of journals that they consider not to meet the necessary quality standards. Researchers are asked to avoid publishing in these journals.

Conclusions

- Teaching dominates the work of academics, and there are too few incentives on research and research careers.
- The common perception is that their salary is for teaching only, but not for research.
- Pressure to publish can lead researchers to use poor quality journals that do not apply peer review.

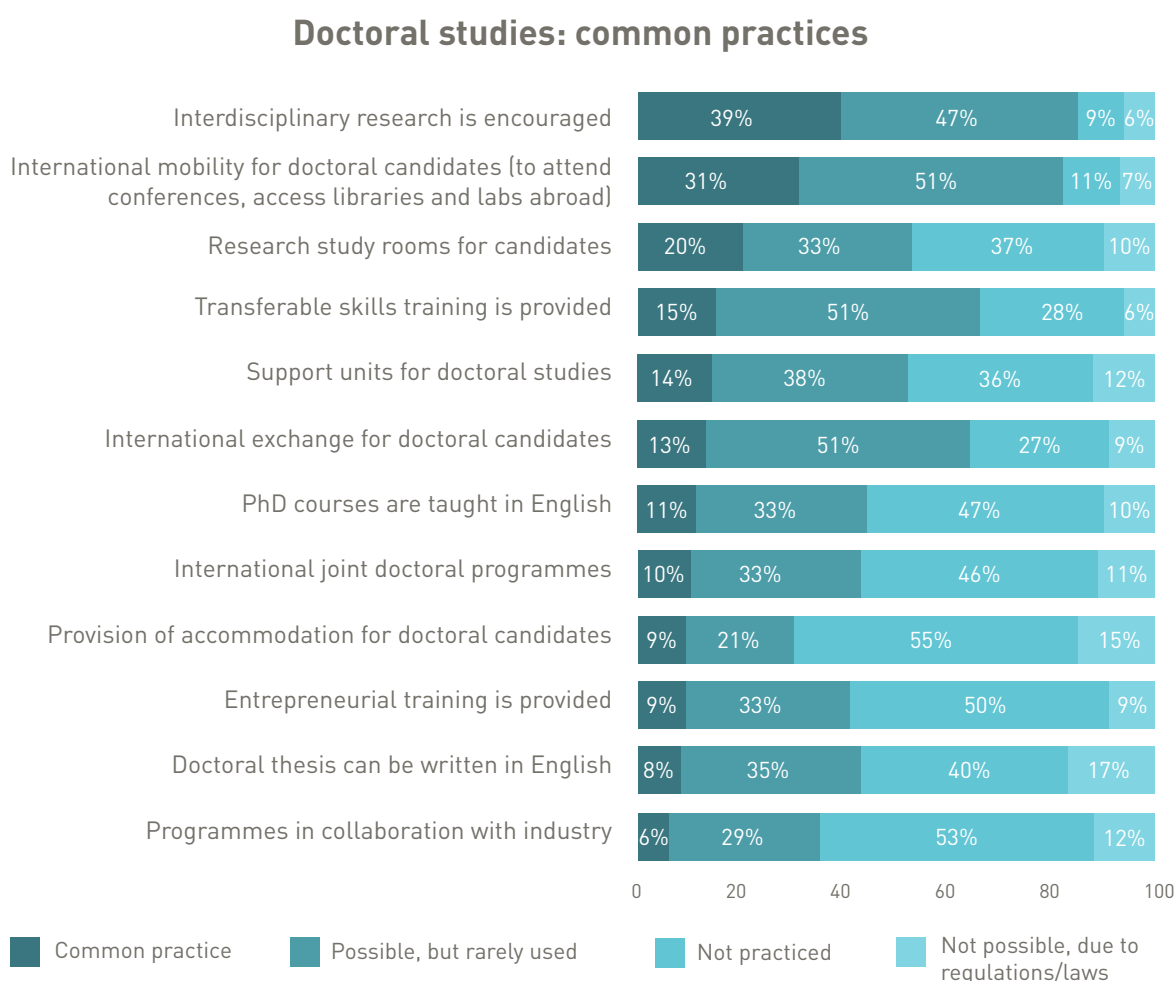
4.2 Doctoral education

Unlike in most EU systems, doctoral education in the WB region has not yet undergone substantial structural change as universities follow the traditional system of supervisor and doctoral candidate, with low participation on the part of the institution. Collaboration on doctorates with external partners is not very common. As an example, only 6% of respondents to Q2 mentioned programmes in collaboration with industry as a common practice in their institution (Figure 5). Although in some systems, national strategies started to emphasise the role of doctoral education and the importance of early-stage researchers, to date there has been little or no change (see country level reports).

PhD candidates depend solely on the goodwill and engagement of their supervisors. This does not ensure access to resources, e.g. laboratories and structured support. Usually PhD candidates would not have access to any kind of transferrable skills training, and enjoy relatively few opportunities for international exposure. Rules and requirements for supervisors exist, but are quite lenient. Basically, every senior faculty member can take up the role of supervisor, usually without any guidance and assessment and there are cases where supervisors are responsible simultaneously for dozens of doctoral candidates. This, of course, impacts the quality.

Some universities have responded by introducing more rigorous requirements and criteria for supervisors, with an aim to improve quality. However, as a result, they may now face a lack of capable supervisors.

Figure 5: Frequency of practices in doctoral studies



Even more problematic is the situation of doctoral candidates who hold positions as so-called 'assistants'; they usually have a high teaching load, often require a prolonged period to finish their doctoral studies, and expect to stay at the same university. 'Academic inbreeding', where individuals stay at the same institution for their entire education and career, is also wide-spread and this lack of challenge and competition does not contribute to research quality. On the other hand, employers and the general public tend to ignore the added value of a doctoral degree for employment, and consequently, most of the PhD holders aim to stay at university.

The lack of recognition and reward for research quality in career progression contributes to brain drain in various respects: in some systems and institutions, the numbers of applicants for doctoral studies have been decreasing substantially. Young people tend to move to other, easier and also often more lucrative and attractive careers. Relatively high local tuition fees are another factor that may deter potential candidates. Many of the best and highest motivated candidates move abroad for their PhD studies, where they find not only better study and research conditions, but also better career and employment prospects, and hence are unlikely to return.

Conclusions

- Outdated system of doctoral education in the WB compared to the EU.
- Poor monitoring of the quality of doctoral education.
- No recognition or social appreciation for the PhD.
- Low employability of PhD holders outside of academia.

5. Capacity of higher education institutions

Success in developing research capacity and strength will depend to a large extent on the general quality and capacity of HEIs. This is not only because they carry out the research – and in some of the systems they are the only research institutions, or have at least the monopoly for inter- and multidisciplinary research – but they are also vital for research collaboration and dissemination at national and international level, and they educate more than the next generation of researchers.

5.1 Education

As with all the EU member states, the WB participate in the Bologna Process, and their HE education systems have undergone related reforms. However, the full benefit of these reforms may not yet have been realised, and less attention has been paid to the quality and relevance of education, due, among other factors, to increased pressure on institutions and academics to engage in internationally competitive research.

The demand is not only for providing better education, but providing it for a larger share of the populations: the number of students registered for first cycle Bachelor studies in the WB has increased rapidly from about 430 000 in 2007-2008 to 590 000 in 2014-2015, an increase of 37% over seven years.¹⁴ This is of course positive, and suggests that HE is perceived to be valuable by the younger generation. But the participation rates are still too low, and transition into employment is a challenge. While the labour market situation and the absence of knowledge intensive industries are the main reason, this is scope for enhancement as regards providing graduates with better skills, and also to raise the awareness for the potential of HE for society and the economy. In particular, business and industry sectors tend not to value university degrees, in particular PhDs.

Conclusions

- Education reforms have received less attention, partly due to the priority given to research, with consequences for the quality and relevance of education.
- HEIs struggle to provide graduates with education and skills that are sought after and valued by the labour market.

¹⁴ From University to Employment: Higher Education Provision and Labour Market Needs in the Western Balkans. Synthesis Report, European Commission, Directorate-General for Education and Culture 2016 https://ec.europa.eu/education/sites/education/files/2016-higher-education-labour-market-balkans_en.pdf

5.2 Internationalisation

International research cooperation is low in the entire region of the WB. With the notable exception of the University of Montenegro, very few institutions have developed strategic documents and policies related to the process of internationalisation. As is the case with the administrative support for research, the international cooperation offices have little strategic capacity. They tend to focus on obtaining Memoranda of Understanding (MoU), but do not subsequently ensure their implementation.

Interviews confirmed that researchers prepare very few international grant proposals, largely because they receive little or no support from their institutions. Most international collaborations are highly personalised and depend exclusively on the efforts and commitment of individual researchers. This limits their impact, and also their scale-up and sustainability prospects.

Around 60% of the institutional leadership who responded to the survey (Q1) reported that researchers are not internationally mobile and, even more concerning, have no international research contacts. Poor command of languages is still a serious obstacle for international collaboration, particularly for older researchers. However, younger staff, who are more mobile, are eager to network, and encounter fewer language barriers.

Conclusions

- International research collaboration is low across the entire region.
- Institutional support for internationally active researchers is low.
- International mobility of young researchers needs to be enhanced in numbers, and properly supported by the institution, as part of a broader research capacity building strategy.

5.3 Technology transfer and knowledge exchange

HEIs and their researchers collaborate very little with industry and the business sector, despite the fact that many, and in particular the younger, researchers indicate that they would welcome more collaboration. One reason is clearly the lack of research intensive industries: most of the formally existing industries were closed down in the transition period and through the privatisation of national industry. The business sector is now dominated by small and medium enterprises (SME), often run by people without a university degree, with little need for research and no appreciation for university education. The few international companies that depend on research tend to bring their own research teams, or rely on research done outside of the region. The fact that neither government nor the general public perceive national research as relevant for society, does not help the situation, and is also hampering the innovation potential and contributing to brain-drain. Academic research is

seen as an activity in its own right rather than as a means to an end. Most WB governments have established policy instruments to encourage public-private partnerships, but these are still lacking volume and diversity.

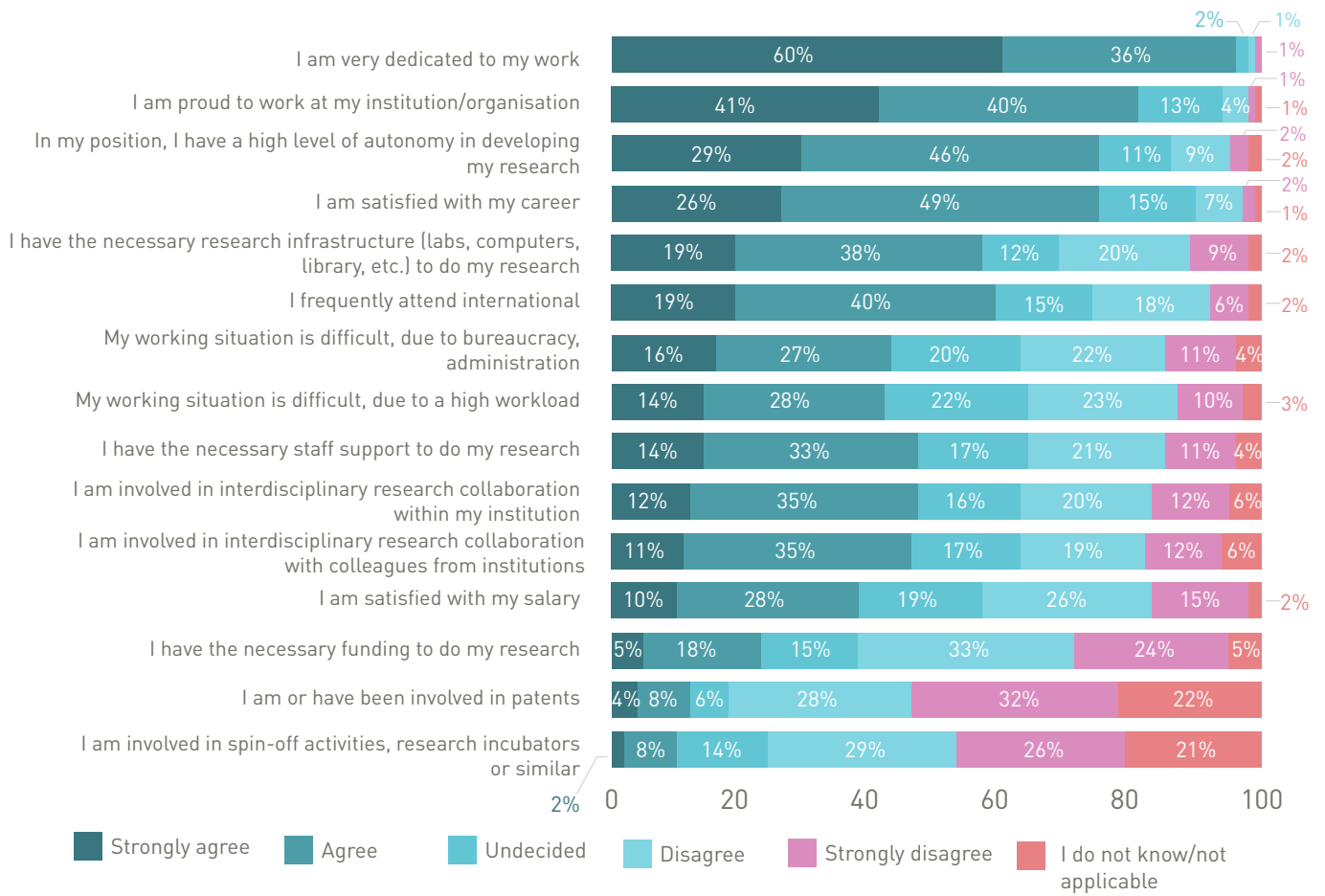
Conclusions

- University-private sector cooperation in research, but also in other areas, is low.
- Research and research skills are not perceived as relevant for the national social and economic development.
- There are very few measures at national and institutional levels for building and supporting industry collaboration.

6. Individual perception of research environment

Figure 6 below, based on results from the Q3 online survey, offers an insightful snapshot into how individual Western Balkan researchers perceive their situation: Respondents seem to be reasonably motivated, the vast majority satisfied with their careers, proud of their institutions, and with a reasonable level of autonomy in their work. This picture at times contrasts with the view expressed in small face-to-face interviews, where a stronger level of dissatisfaction was expressed as well as a desire for change. Taken together the study has confirmed not only the presence of committed, motivated and successful individual researchers, but also identified a number of opportunities for the enhancement of research capacity. This gives reason for optimism, provided that opportunities and potential can be linked. This may require a different approach in different systems, which is explored in more detail in the sections that follow. Regional level recommendations to develop this human potential are to be found at the end of the Executive summary (Recommendations and indicators for monitoring).

Figure 6: Overall perception of the individual research situation (Q3)



Part II - System reports

1. ALBANIA

HE and research system

In the last decade, Albania has benefited from national and regional financial assistance to build research capacity including through the EU CARDS, PHARE and IPA programmes. It has also gone through significant political changes and attempted structural reforms to the R&D sector.

In June 2014, Albania became an EU accession candidate. According to the 2017 EU Progress Report on recent developments regarding research and innovation cooperation,¹⁵ its preparations in the area of science and research are still at an early stage, but there has been some progress in the last year: for example, the software and on-line platform ACRIS (Albanian Current Research Information System), that could be a first step toward Open Access and Open Science approaches, and also the restructuring of the former Agency for Research, Technology and Innovation (ARTI). The new agency NASRI (National Agency for scientific Research and Innovation) defined additional roles and responsibilities for evaluation of research as well as managing the national research databases. But overall, Albania's capacity for technological absorption, and research, development and innovation (RDI) is still low. The Commission recommended that the country should, in particular, "build capacity and increase investment in research in line with ERA priorities", as low investment in research and development is found to be one of the key obstacles.

The table below shows that important official data is lacking for R&I: in 2015 the country had a population of 2.892 million (estimated) and a GDP (2014) of 10.274 billion euros (provisional). AL is not currently reported in EUROSTAT, but according to unofficial figures, its 2015 national investment on R&D was about 0.4 % of GDP.¹⁶

Table 2: Research investment in Albania (Source: Communication on EU Enlargement Policy {COM (2016) 715 final})

Innovation and research (as of 5.10.2016)	2003	2011	2012	2013	2014	2015
Public expenditure on education relative to GDP (%)	3.0	3.2	3.3	3.3	3.3	:
*Gross domestic expenditure on R&D relative to GDP (%)	:	:	:	:	:	0.4 (est.)
Government budget appropriations or outlays on R&D (GBAORD), as a percentage of GDP (%)	:	:	:	:	:	:

¹⁵ Progress Report on recent developments regarding research and innovation cooperation in/with the Western Balkans (Period: June 2016 – June 2017) Albania

¹⁶ Source: Communication on EU Enlargement Policy {COM (2016) 715 final}

Statistics on the number of researchers vary and it has not been possible to have them confirmed by official government sources. Unofficial input from government agencies to this study set the number at ‘around 4 000 but only 10% being active’. A survey of public and academic institutes launched in early 2017 with the support of UNESCO suggests that there are a total of 578 scientific workers in Albania:

- 274 in the Academy of Sciences
- 304 in R&D institutions of ministries

and that “the numbers of personnel in R&D in Albania are about 0.2 per 1 000 population”.¹⁷

It has not been possible to identify a more recent or reliable official information source for FTE researchers, which is a serious drawback for interpreting data on research productivity.

Policy and institutional framework

The main actor of the research system is the Ministry of Education, Sports and Youth.¹⁸ There is no direct line ministry for science. The main implementing agency is the Agency of Scientific Research and Innovation NASRI (formerly known as ARTI) under the Ministry of Education, Sports and Youth.

A number of other ministries also play a role or act as significant stakeholders. These include the Ministry of Energy and Infrastructure, Ministry of Agriculture, Ministry Finance and Economy, Ministry of Tourism and Environment. There are also two Advisory Councils, one for Higher Education and Science, and one for Science Policy and Technological Development.

Since 2007, Albania has made efforts to reform the roles and responsibilities of non-university research institutions (which had a legal and institutional framework separate from that of HE). Under the **Law on Higher Education No 9741** (1 May 2007)¹⁹ and its amendments, responsibility for research was transferred from independent institutes and academies to universities. Between 2007 and 2013, the Academy of Sciences lost its role in administering research institutes, most of which were integrated into universities. New agencies were established, for example, the Agency for Research, Technology and Innovation (ARTI), now the National Agency of Scientific Research and Innovation (NASRI), but they still lack the budgets needed to implement planned measures. A further goal was to establish regional development centres that would promote cooperation and carry out relevant research projects for Albania and the region. Despite support from the government for these profound structural changes, the goals have not been realised and overall research performance remains low.

17 Mapping Exercise - Albania, Albana Zotaj, Geographic Studies Center

18 Before 2017, Ministry of Education and Sports

19 The law regulates the activities of universities and faculties (establishment, governing bodies, recruitment of teaching staff). It also stipulates aligning with the Bologna Process reforms, which Albania joined in 2003, in emphasising mobility of teaching staff and students as well as quality assurance and efficiency of studies.

Albania has adopted a number of more recent relevant strategic documents, legislation and policies.²⁰ These include the **Law 80/2015 of 22.07.2015 "On Higher Education and Scientific Research in Higher Education Institutions in the Republic of Albania"** and the **National Strategy for Science, Technology and Innovation 2009–2015²¹ (STI²²)**. These documents lay out a very ambitious plan which includes a public funding increase to 0.6% of GDP by 2015, the creation of centres of excellence, doubling the number of researchers, and modernisation of doctoral education. So far, little progress has been made and during interviews for this study the research community expressed scepticism as to whether reforms will take place soon.

Research productivity

The largest university by size and absolute productivity is the University of Tirana. Based on relative productivity, the productivity of the Polytechnic University of Tirana is slightly higher, but the numbers for all universities are relatively low with no university producing more than 0.2 papers per year per scientist.

Most of the universities publish in areas of the social sciences, economics, arts and humanities and environmental science, with medicine being the most dominant area only at the University of Medicine in Tirana. This situation is different from the other WB systems, where the most prevalent areas are medicine, engineering and computer sciences.

For the full set of productivity results see Appendix 1.

Funding

Lack of funding was highlighted by all three target groups who responded to the survey questionnaires as being the greatest challenge to realising research capacity. Investment in R&D is very low. As noted above, there was a plan to increase public investment in research from 0.4% in 2015 to 0.6% of GDP by 2016, but this did not occur. Under the new legislation, different agencies are responsible for funding research programmes. This diversification of sources is to be welcomed as it has enabled targeted instruments and associated implementing agencies to emerge and starts the process of developing an broader ecosystem. However, due to the very low budget level, the system still does not function well, and planned programmes cannot be implemented.

²⁰ See https://ec.europa.eu/education/sites/education/files/wbalkans-2017/wbalkans-2017/higher-education-report-albania_en.pdf

²¹ Science, Technology and Innovation National Strategy 2009–2015, Council of Ministers, August 2009 <http://unesdoc.unesco.org/images/0018/001871/187164e.pdf>

²² While this report was being prepared, a new "National Strategy of Science, Technology and Innovation 2017-2022" was released, focusing on reforming the scientific research institutional system, increasing STI investments based on public funds and other alternative sources up to 1% of GDP by 2022, inclusion of Albanian Scientific Diaspora in the strategy, increasing cooperation between the scientific research community and business, and monitoring the quality of scientific research.

Research infrastructure and research capacity

Research infrastructure

Research infrastructure is a significant challenge to improving Albania's research competitiveness. Most universities cannot secure the funding for investment, and lack adequate laboratories and research units. There are a few exceptions, where infrastructure has been partially updated through different international projects, in particular those financed by the EC (TEMPUS, IPA) and the World Bank. The most noticeable improvements in infrastructure took place in the course of the last decade, when EU funds became available. As is common in the region, maintenance of equipment is a greater problem than purchasing it, as institutions have little access to funds for regular service and purchase of consumables.

Research capacity

It was indicated during interviews that most researchers lack the knowledge and skills to apply successfully for international research project grants, such as H2020, where the requirements for project proposals are very stringent, and there are few structures in place to support the researchers. Training sessions for research applications and management would be desirable, which so far very few researchers attended, due to the limited number of courses available, but also due to limited interest, resulting from the generally low support to research and researchers. In the longer term, support units are needed, and their staff would have to be trained properly.

The fact that securing competitive research grants presently has no influence on career progression and salaries, consequently this has a negative impact on the motivation to develop research proposals. This situation could be addressed through revised research metrics.

Research careers

Doctoral education has been experiencing particular difficulties over the past four years, due to the 2009-2015 STI Strategy: the original plan was to establish postgraduate and doctoral schools within the universities with a capacity of 500 doctoral candidates, with a goal to double the number of researchers. However, the evaluation of existing doctoral programmes conducted by the Ministry of Education identified too many weaknesses and irregularities in the system. As a consequence, the ministry closed down all the doctoral studies and set up new requirements for the universities in order to reopen doctoral education. This has not yet taken place with the result that no new doctoral students have been enrolled in the system for four years.

Due to the unfavourable conditions (lack of funding and career prospects), young, talented people tend to look for careers outside the research and HE sectors, and young researchers often leave the country to work abroad. This has been highlighted as a significant problem by all survey respondent groups (institutional leadership, deans and researchers).

Internationalisation

On the positive side, feedback from interviews also indicated that some institutions now have a significant number of researchers, who have returned after a period of study and work at foreign institutions. Due to their knowledge, command of foreign languages and contacts they are now contributing to facilitating international cooperation and networking. They also bring with them their working experience at other HE and research institutions, which can help their home institutions to enhance research development and management. Retention and brain circulation would seem to be a focal issue for policy makers in Albania, and in particular how to support returners and international staff to ensure that their presence contributes to transformation and capacity building. The STI 2017-2022 addresses this issue.

Technology transfer and knowledge exchange

Interviews revealed that researchers are largely in favour of collaboration with the private sector and would like to see more support on a structural level. The recent establishment of industry collaboration centres within some universities is very much welcomed. However, the development of a knowledge-based economy remains one of the national challenges in Albania. As national industry is quite weak, enhancing this kind of collaboration across different fields and institutions will require working with SMEs and with civil society organisations.

Summary

- Significant structural reforms have taken place, with universities becoming the main research actors.
- Research infrastructure is outdated and inadequate with little funding available for maintenance and service.
- Although the budget for research has more than doubled since 2005, it is still too low to render significant change to research capacity.
- Research productivity measured at international level is low.
- Positive reform of doctoral education has stalled.
- Institutions do not have the capacity for successfully applying and managing research projects, particularly those from non-national sources.
- There is a growing potential from researchers with international study and work experience, based on their know-how and personal networks, which could be better supported.

Recommendations for Albania

It is suggested that national authorities and policy makers:

- **Fully implement and monitor strategies and legislation designed to reform the R&D&I sector.**

The present status quo, with regulations being passed but not or not fully implemented, brings many uncertainties and hampers proactive approaches of both institutions and individual researchers. Full implementation of national legislation and strategy will certainly allow further alignment of research activities and will support universities to strengthen their research performance and fulfil their designated role as the main research providers for the country.

- **Place high priority on restarting the process of reform of doctoral education.**

The present situation regarding doctoral education has the potential to impact negatively on a generation of potential doctoral students if it is not resolved swiftly.

- **Establish programmes to bring international experience into the national research system, for example, by building links with diaspora researchers (see e.g. the Croatian “Unity through Knowledge Fund”).**

Specific brain circulation programmes may help Albanian researchers to return to the country or help draw on their support from abroad. Ideally, any such programme should include international researchers and senior administrators, for instance, through a fellow in residence programme. Positioned correctly and equipped with the necessary resources, these individuals could contribute significantly to the development of performance and capacity of the HEI, in research but also in other areas. Examples of similar programmes in the region that have been implemented successfully could form the basis for good practice e.g. the “Unity through Knowledge Fund” (UKF) in Croatia.

It is suggested that universities:

- **Establish adequate institutional administrative support for research and skills development of researchers.**

Institutions should create administrative support for research at central level and provide regular training sessions for researchers in order to make them better prepared and more competitive in developing research proposals and managing research projects.

- **Change the requirements for academic promotion to place more emphasis on high quality research.**

Changing the criteria for career advancements will have a positive impact on the quality of publications, supporting increased use of international peer reviewed journals and helping to raise institutional visibility. When taking such a step, institutions and authorities should consider how to avoid “predatory journal” publishing. The experience in the region, for example of BiH and, in particular, Republika Srpska (RS) whose Ministry have compiled and circulated a list of predatory journals and encouraged their researchers not to publish with them, may prove helpful.

2. BOSNIA and HERZEGOVINA

HE and research system

Bosnia and Herzegovina participate in the Stabilisation and Association Process and submitted its application for EU membership in February 2016. According to the 2016 Communication on EU Enlargement Policy, in the last year there was limited progress in the field of research and innovation. The BiH Council for Science was established in December 2016 as an advisory and technical body in the area of science and technology.

According to the 2017 EU Progress Report on recent developments regarding research and innovation cooperation,²³ Bosnia and Herzegovina should in particular improve efforts to strengthen its research and innovation capacity.

In 2015 the country had a population of 3.819 million (estimated) and a GDP of 14.591 billion euros. The country's investment in research and innovation remains low, as the table below shows. BiH is not presently reported in EUROSTAT, and available data for innovation and research is limited.

Table 3: Research investment in Bosnia and Herzegovina (Source: Communication on EU Enlargement Policy {COM (2016) 715 final})

Innovation and research	2003	2011	2012	2013	2014	2015
Public expenditure on education relative to GDP (%)	:	:	:	:	:	:
*Gross domestic expenditure on R&D relative to GDP (%)	:	:	0.27	0.33	0.30	:
Government budget appropriations or outlays on R&D (GBAORD), as a percentage of GDP (%)	:	:	:	:	0.05	:

Policy and institutional framework

The Constitution of BiH defines Bosnia and Herzegovina (BiH) as an independent state consisting of two entities: the Federation of Bosnia and Herzegovina (FBiH) and Republika Srpska (RS). Brcko District (BD) has been established as a separate administrative unit under the sovereignty of Bosnia and Herzegovina, while the Federation of BiH is made up of ten cantons. This means that there are 14 governments in the country – one national, two entity-level, ten cantonal and one of the Brcko District - and 14 different ministries/ departments dealing with HE in the country, including: the state-level Ministry of Civil Affairs of BiH (MCA), two entity level ministries of education (Federal Ministry of Education and Science (FMES) and the Ministry of Education and Culture (RS), ten cantonal ministries of education, and an education department within the Government of Brcko District. Despite a clear desire for change, this complex political situation hampers efforts to improve the environment for R&D.

²³ Progress Report on recent developments regarding research and innovation cooperation in/with the Western Balkans (Period: June 2016 – June 2017) Bosnia and Herzegovina

MCA and FMES have limited responsibilities for HE. MCA coordinates the education policies between other responsible ministries, and is also responsible for international cooperation in areas of HE at the state level, including international exchange and collaboration. The main function of the FMES is to coordinate activities among the ten cantonal ministries of education. Neither the MCA nor the FMES have the constitutional authority to create and implement higher education policies, without consultation with other relevant authorities.

Given the fragmented system (state/entity/canton), the resulting divisions of government, and massive administration, as well as the very poor economic situation, systemic contradictions, poorly defined duties and responsibilities, an over-bureaucratisation of the HE sector is inevitable.

The national level **Strategy for the Development of Science in BiH (2010-2015)**²³ sets out priorities in specific areas. In addition, both the Federation of BiH and Republika Srpska have adopted their own strategy documents. The Federation of BiH has approved the **Strategy of Development of Scientific Research and R&D for 2012-2021** that identifies general development directions in HE, promotion of science, and S&T infrastructure development.²⁵ The National Assembly of Republika Srpska has adopted the **Strategy of Science and Technological Development 2012-2016**, and in April 2017, the **Strategy for Scientific and Technological Development 2017-2021**.

Unlike in the other WB, research institutes play a minor role, and most research activities are performed at universities. But the challenges for research are perceived similarly as elsewhere in the region.

There has been a sharp increase in the number of HEIs in BiH in recent years, most of them teaching oriented with very low, if any, research (see the research productivity results in the section below and in Appendix 1).

The biggest challenge is that neither the government, nor the general public, perceive science as being important – at least according to Q1 survey respondents. Among respondents to the Q2 and Q3 surveys, it comes second, immediately after lack of funding. Research is low on the political and public agendas.

There is a need for reforms that would underpin the importance of research at the national and institutional levels, and also reinforce institutional autonomy and accountability, so as to enable positive change. Some opposition to the new law on science that is currently being prepared was expressed by a number of HEIs as it is perceived to undermine their autonomy and open the door for more influence of politics on the HE system.

24 In January 2018, the new 2018-2020 Strategy on Research was adopted.

25 Strategija Razvoja Nauke U Federaciji Bosne I Hercegovine Za Period 2011–2021. godina -

Policy makers in Republika Srpska report the main obstacle to be the “lack of criteria and standards” for the activity of researchers. Currently, research activity does not bring tangible benefits to academic staff, neither in terms of earning nor academic promotion. Productivity based on publications is very low and publication in 'predatory journals' is a major issue. Therefore, policy makers want to change laws in order to improve the quality of research, for example, by incentivising and rewarding research staff for their research engagement and for publishing in quality publications. Legally speaking, universities are also in the position to make these changes, and policy makers agree that this should be the way to drive the modernisation of HEIs.

A comparable situation is found in the rest of Bosnia and Herzegovina.

Because of the way the governance system works in reality, it is presently very difficult to make changes that would have an impact throughout the university. The central leadership of rectors and vice rectors is relatively weak. Deans, and in particular those in large faculties in terms of student and staff numbers, are quite powerful. This results in different reactions between faculties and departments, according to disciplines: it is particularly those in science and technology, which have a higher number of active and productive researchers and a tradition for international research collaboration, which tend to have a more positive attitude towards reforms. In addition, individual staff differ in attitudes towards reform change – with senior and younger staff usually more in favour of it.

Research productivity

Overall, HEIs in BiH have relatively low research productivity compared to other systems in the region. Their staff is mostly oriented towards teaching, especially in small private universities, with the exception of the International Burch University and the University of Herzegovina. Based on the absolute number of papers, there is a dominance by the public Universities of Sarajevo, Banja Luka, Tuzla and Mostar.

The dominant area for scientific production is medicine, which is one of the top five areas in 11 out of 17 universities. Engineering and computer sciences are also very prevalent research areas, whilst other areas are dominant in the case of smaller universities.

For the full results on research productivity see Appendix 1.

Funding

The present situation for research funding in BiH is similar to the other Western Balkan countries. Research is underfunded, as support from the government(s) is low. There are few, if any, appropriate national funding schemes and these provide only extremely low grants, with no new funding schemes being developed. In 1991, 1.5% of GDP was put into research. Today it is around 0.3% of GDP. An ambitious target of 1% has been set for 2020.

Arguably, the take-up of international, and especially EU schemes, for funding does not currently reflect the national research potential. Besides low levels of motivation, there is also a lack of skills to apply for research grants. Institutions often do not have enough internal funding for co-financing, nor the pre-payments required to start and implement projects. In addition, it must be borne in mind that priorities set nationally in response to industrial needs do not always align with EU priorities, which makes it even more difficult to win EU R&D projects.

Interviewed partners in Republika Srpska commented that most faculties would not have the capacity to lead an international research project, but they would certainly be interested in joining as a partner. There was a positive reaction towards the idea of funding schemes that would enable open competition across the entire WB, researcher mobility, and improved access to journals and books. As the problems are very similar across the country, these suggestions are likely to also find support in other parts of the Federation.

Research infrastructure and research capacity

Research infrastructure

Research infrastructure in BiH is largely outdated, inadequate and unequally distributed across faculties. Rectors who responded to Q1 all agreed that their laboratories did not meet international standards. Less than 10% of Q2 respondents felt they met international standards, while over 20% of researchers responding to Q3 noted that they had no access to laboratories nor to technical support for larger equipment or research support in general.

At present, research infrastructure is distributed across many small groups and units, and researchers from different units are often not permitted to use the existing labs. During interviews, individual researchers and institutional leadership stressed that central labs at the university level would be welcome. However, such an approach would be difficult to implement within the existing structure. Researchers also have very limited access to literature and databases, with 12% reporting having no access to libraries and 18% no access to online repositories.

Procurement procedures were noted to be extremely lengthy and not transparent. It is often the case that institutions or individual researchers are not allowed to source and purchase small equipment or accessories themselves, but must use an internal procurement service. It was reported that this can result in a significantly more expensive item being selected, as the cheaper suppliers do not have the capacity or interest to engage in a protracted procurement process.

Research careers

The system of doctoral education follows the traditional “apprenticeship model”, and does not adopt an approach to modernise, as seen in the European Union systems, for example, there is no training available for transferable skills. The selection criteria for doctoral candidates are very weak and young people can enter the system as “assistants” with a heavy teaching load. They can, and usually do, stay in this position for a long time without completing their degree. The majority of them then continue an academic career, again with no strong selection based on achievements and merits, and can subsequently become supervisors, which makes it a closed circle. In addition, there are few, if any, criteria for supervisor selection and no clear roles and responsibilities of either of the stakeholders.

Internationalisation

Internationalisation of research has a very low profile, and there have been very little strategic initiatives at systems and institutional levels. Language barriers prevent many individual researchers, in particular those who are more senior, from being internationally engaged. This exclusion extends to publishing in international English journals. As elsewhere in the region, universities also struggle to supply administrative support to prepare and implement international projects.

Policy makers pointed out that HEIs would actually resist the process of internationalisation. Many researchers agreed with this view as research cooperation would depend entirely on individual efforts and connections, with no support from the institution.

Technology transfer and knowledge exchange

National industry in BiH was, to a large extent, closed down during the economic transition process after the war and suffered during the 2008 global crisis. Economic recovery has been slow. As a result, cooperation between universities and the private sector is at a lower level than pre 1990s, when it, however, tended to be contract research rather than collaborative research.

There is very little systematic technology transfer, although recently some promising good examples can be identified, for example, the organisation of workshops on entrepreneurships and the re-establishment of good collaborations in the pharmaceutical industry.

Summary

- Adequate structural and policy changes that would promote and support research are still lacking.
- Research needs to be better recognised at the national level as being relevant for national/ social development.
- Universities need to be the leading actors in modernising the research and educational system.
- The research system needs to move from a focus on individual research performance to the concept of research groups and the establishment of research centres.
- Skills development is needed to make researchers better prepared to apply successfully for more competitive funding schemes.
- Lack of finance for research activities and research infrastructure is also a significant barrier to engaging in international level research.
- However, there is also an overall lack of available research capacity to undertake research in general.
- Doctoral education needs to be modernised and restructured.

Recommendations for Bosnia-Herzegovina

It is suggested that national authorities and policy makers:

- **Try to further harmonise relevant strategies and policies at the national level to make the research system less fragmented; the anticipated S3 development process could possibly be used to assist in this process.**

The national system is highly fragmented with multiple responsible ministries, agencies and laws dealing with research and HE. This prevents profound and systematic change. More collaboration among relevant authorities and policy makers, for example through the S3 process, could facilitate implementation of similar mechanisms across the country and put more emphasis on public recognition of research.

- **Better define and distribute responsibilities across different ministries with the aim of decreasing bureaucratisation.**

High levels of bureaucratisation across a number of responsible institutions slow down and hamper activities and initiatives, as well as the general development of research and internationalisation. More transparent and simplified rules and procedures would help research systems to develop faster and motivate academic staff to be more proactive in research alongside their teaching.

It is suggested that universities:

- **Change the system of academic promotions by placing more emphasis on research performance.**

The present institutional system does not sufficiently value research activities. Participation of academic staff in research projects and research performance are not sufficiently recognised in academic career advancement.

New criteria for academic careers focusing more on research performance and publishing in high quality international journals would make researchers more competitive.

3. THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA

HE and research system

Since its independence over 25 years ago, the former Yugoslav Republic of Macedonia (MK) has faced a number of political and economic challenges. This situation has had a strong, negative impact on research and development activity. Recent increases in spending on R&D (see below) are therefore a positive sign.

The European Council granted the status of candidate country to the country in December 2005. However, due to a series of problems in the implementation of the Pržino Agreement, accession negotiations have not started.

The economy is poorly diversified and manufacturing industry produces mainly low value-added products. The economy continues to suffer from weaknesses in education curricula, low innovation rates and significant investment gaps, including in public infrastructure, all of which make it less competitive.

The European Commission has noted²⁶ that there is a good level of preparation in the area of science and research. Some progress, although limited, has been made over the last years on research activities.

According to the 2016 EU annual Report on recent developments regarding research and innovation cooperation²⁷ the country should, in particular:

- continue increasing the level of investment in research, in particular in the private sector;
- promote participation in the EU's Horizon 2020 research programme;
- adopt a 2016-2020 programme for HE and scientific research and take actions to strengthen research capacity in line with the European Research Area priorities.

In 2015, the country had a population of 2.069 million (estimated) and a GDP of 9.061 billion euros (provisional). The level of investment in research improved slightly to 0.52 % of GDP in 2014, but this is still significantly below the EU average.

The table below shows the data currently available for innovation and research in the country.

26 Communication on EU Enlargement Policy (COM (2016) 715 final)

27 Progress Report on recent developments regarding research and innovation cooperation in/with the Western Balkans (Period: June 2016 – June 2017) former Yugoslav Republic of Macedonia

Table 4: Research investment in the former Yugoslav Republic of Macedonia (Source: Communication on EU Enlargement Policy {COM (2016) 715 final} and EUROSTAT (2015))

Innovation and research	2003	2011	2012	2013	2014	2015
Public expenditure on education relative to GDP (%)	3.3	3.5	4.0 (provisional)	:	:	:
*Gross domestic expenditure on R&D relative to GDP (%)	0.21	0.22	0.33	0.44	0.51	0.44
Government budget appropriations or outlays on R&D (GBAORD), as a percentage of GDP (%)	:	:	:	:	:	:

Policy and institutional framework

The main documents defining policy on education and research are the 2013 **Law on Higher Education** and the **Law on Scientific and Research Activities**. The current laws and related policy documents were intended to promote the development of partnerships between various stakeholders in R&D&I.²⁸ They also propose an increase in the flow of knowledge between innovation participants and the commercialisation of research through strengthening collaboration and links between universities, businesses, industry and the labour market. However, they have a very limited impact on the R&I systems in the country, as there is still a lack of infrastructure and framework conditions for them to be set up and, also due to the structural weaknesses of the private sector regarding RDI and the lack of cooperation with the HEIs.

Existing research policy and strategy documents show that a number of reform measures to improve research and science in the country were foreseen. These included a plan to increase investments, to assure funding for research targeting the private sector, to promote international cooperation and to define research criteria for the employment of staff in research institutions. Nevertheless, the legal framework is still regarded as far from optimum and the envisaged plans are not perceived to have succeeded.²⁹

Public universities play a more important role than private ones. The state has a number of legal documents that regulate different aspects of the research and development sector. The 2013 law on higher education very much focuses on integrating the university system. The aim of that law was to transform the decentralised model of public universities that is traditional in the region into institutions managed by a central structure and governed by the rector.

Public universities are now centralised, but they lack administrative capacity which is seen as hindering the improvement of research quality. There are burdensome rules on how money taken in by the university can be dispersed which makes project budgets inflexible if circumstances change. As with other countries in the region, funding for research has been at an extremely low level for a decade. Despite the election of a new government in mid-2017, there are few concrete signals that publicly funded research will now have a higher priority. A commitment to developing an S3 is positive, but this is mostly linked to the development of an industrial strategy rather than to HE system reform.

The R&I system and its governance are highly centralised at state level, with the public sector dominant in both R&D funding and performing structures.³⁰ On the performer level, the research activities are concentrated among a few universities and the Macedonian Academy of Sciences and Arts. The largest university, Ss. Cyril and Methodius University (UKIM), comprised 68% of the total research and teaching personnel in the state university sector in the 2012-2013 academic year.

Overall, the majority of those working in the HEIs, from rectors to researchers, feel that the priority given to science and research by the state is too low.³¹

Research productivity

The Ss. Cyril and Methodius University is the largest university in Macedonia and had the largest absolute number of papers produced in 2016. However, based on relative productivity, the University of Information Science and Technology “St. Paul the Apostle” is the most productive university, although the absolute number of papers is relatively small. The only two private universities with productivity in 2016 are South East European University and University American College.

Comparing national results with those of the full WB region (Figure 2) suggests that the country does have good research potential.

The most dominant research areas for almost all universities are engineering and computer science. It should also be noted that the dominant area for Ss. Cyril and Methodius University is medicine.

The full results on productivity can be found in Appendix 1.

Funding

For almost 20 years, research has been insufficiently funded. All responding rectors strongly agreed that research funding is insufficient (Q1), while 66% of deans and heads of unit (Q2) and 90% of researchers agreed strongly or to some extent.

30 WB Inco-net Report ‘The Role of Smart Specialisation in the EU Enlargement and Neighbourhood Policies’ 29.05.2017; Case Study on R&I Policy Framework in the former Yugoslav Republic of Macedonia with regard to Smart Specialisation, *Author: Sasho Josimovski*

30 Source: Interviews

Investment in research and development is 0.51% of GDP. This is actually a significant increase compared to the 0.23% of GDP in 2003. There is very little funding for research from the private sector, and the industrial base was largely destroyed in the course of the economic transition. Some positive signs have emerged recently, for example private sector investments in to the Technology Transfer and Innovation Centre (INNOFEIT) at UKIM. These seem to be linked to the determination of individual deans to help address brain-drain.

The recent policy has been that any significant funding for R&D&I goes to the **Fund for Innovation and Technology Development (FITD)**. The FITD is a state-owned institution that aims to contribute to the overall development of innovation through various financial instruments. The system for evaluating and awarding funds is seen to be objective and based on the approach taken by H2020 and therefore is seen to be satisfactory. However, the fund largely targets private sector enterprises while making provision that some of the grant can be spent on an HEI partner. The FITD has been strongly welcomed by that section of the research community who wish to be involved in innovation. However, a serious constrain remains in the low number of projects that can be supported and the level of support. So far, it has only funded 40 projects for HEIs and 40 for institutes, with 10 000 euros for each two-year project, i.e. 5 000 euros per year.

Much less national budget funding has been available for HEI research projects. It was acknowledged that this has been the case for over ten years, with the last major call in 2010.

During interviews, HEIs reported that EU funds (e.g. TEMPUS, RegPot and regional IPA) have also been very useful. The H2020 funding is hard to secure, but HEIs have had some success. However, there is currently no national system in the country that supports continuity of research project work, i.e. when an EU-funded project has been completed.

Salaries of academic staff are for teaching and cannot be extended to enable them to be used for research activities.

Research infrastructure and research capacity

Both research infrastructure and research capacity are poor. Rectors universally reported (Q1) that their facilities were "insufficient" with no-one indicating that they had research infrastructures at or close to international standards. Only 10% of researchers themselves felt that these research facilities were at 'good national standards', with close to 40% reporting "insufficient" and, more worrying, over 20% stating that they did not have access to facilities at all. Researchers also reported that there is no funding to purchase new equipment, and it is increasingly difficult to maintain old equipment. Researchers also stated that it can be cheaper to outsource testing than to do it in-house.

There is presently a freeze on further recruitment of researchers due to a lack of national funds. This extends to replacing those who are retiring. Replacements represent around 10% of retirements, and this is due to a national legal restriction on recruitment (the so-called "3% rule") and re-employment (the law on employment). At the same time, the universities are constantly losing younger researchers who go abroad as well as those who move to the private sector. All responding rectors (Q1) said that young and talented people

looked for careers outside of research and the HE sector, and generally the best researchers were leaving the country. It is of concern that they also indicated that those who left did not continue to contribute to national research. Responses from researchers gave a very similar, although slightly more nuanced, picture (Q3).

The fact that universities are integrated should be a strength. However, in practice, this only works if there is sufficient capacity within the rectorate to manage projects and respond in the needed time-scale to requests from the faculties. At present, there is also a serious lack of capacity at the university management level to manage (implement) projects. The project offices do not have enough staff, and often only one single person. Doctoral candidates are used to run projects and the restriction on recruitment makes it very difficult to solve this problem. The lack of administrative capacity to prepare research proposals and manage research projects was universally acknowledged by rectors responding to Q3 and by also by the respondents to Q2. It is interesting to note that 17% of researchers did not agree with these conclusions, although they were in a clear minority compared to some 80% of their colleagues.

Research careers

Doctoral education has not been transformed and synchronised – neither with relevant European trends and recommendations in doctoral education, nor with actual needs in the country for young researchers. A particular constraint is the difficulty of employing young researchers either in the HEI or in private sector business. This acts as a deterrent to young people to take up a research career and contributes to brain-drain. In the long-term, unless more research places can be created in the HEI sector for young researchers this could be a serious obstacle for performing research at a national level.

Technology transfer and knowledge exchange

At present, engagement with the private sector is mainly focused on consulting rather than contract research requiring the use of facilities or equipment. Funding allocated through calls from the National Innovation Fund has been valuable in enabling working with national enterprises. However, only a low percentage of researchers (Q3) indicated that they had been involved in technology transfer activities such as spin-offs or incubation and only 6% indicated that they had any involvement in research related to local development of societal impact. While this is still higher than in other WB countries it is still an extremely low number.

Patenting activity is low and currently purely on a personal level. Only 6% of researchers indicated that they had been involved in patenting (Q3). There is academic recognition for patenting alongside publishing. However, there is a lack of funding for legal protection of research results.

Summary

- A clear change in governmental policy towards funding science and research is required to realise the country potential.
- A chronic lack of national funding for public research in the country for over a decade has held back the research potential, but also encouraged some researchers to move towards more applied research and innovation activity in response to shifting government policy on funding for R&D&I.
- The number of researchers at universities will continue to fall if the restrictions on new employment remain and this will further deplete young and the most talented individuals.
- The universities lack capacity for administrative support to research and recognise and acknowledge the effect of this deficiency.
- A sub-optimal system of pre-financing and delayed final payment is making it difficult for researchers to implement projects.
- New legal and institutional frameworks for evaluating career progression are needed to support and recognise research excellence.

Recommendations for the former Yugoslav Republic of Macedonia

It is suggested that national authorities and policy makers:

- **Make research a stronger pillar of national policy for economic development and ensure regular, predicable and significant funding calls for research projects.**

The unstable political situation has had a negative impact on research for a long time, both in terms of funding and research performance. It is necessary to stabilise the situation in HE and research by defining a research policy that will stimulate and support research activities and drafting and adopting a relevant law. Providing new funding schemes will facilitate research activities as well as help to improve research infrastructure.

- **Enable recruitment of new research (and academic) staff in order to increase research capacity.**

Young and talented researchers are leaving the country because of an uncertain future and low employability. At the same time, the older generation is retiring, and their positions are not continued. Changes to the present law on employment could help reduce the brain drain and help increase research capacity.

It is suggested that universities:

- **Improve institutional capacity for flexible management of research and obtain administrative support.**

The existing HE law integrated the universities. However, universities did not manage to develop administrative support that would enable them to provide the high-quality services needed in centralised institutions. In order to make universities perform better, it is necessary to invest more efforts in establishing adequate support units and to employ skilful administrative staff who are capable of taking on different and new roles, including support to research activities.

4. KOSOVO*³²

HE and research system

On 1 April 2016, the EU-Kosovo Stabilisation and Association Agreement (SAA) entered into force. This is the first contractual relationship between the EU and Kosovo and is a comprehensive framework for closer political dialogue and economic relations.

According to the 2016 EU Commission's Report on recent developments regarding research and innovation cooperation,³¹ in 2015 public spending on research and innovation amounted to only 0.05 % of GDP, out of which only one-fifth was allocated to scientific research and grants. During the 2016-2017 reporting period, there was some progress in the area of research. Based on the report the European Commission has suggested that Kosovo should, again and in particular, "strengthen research and innovation capacity through the reform of HEIs and increased investment in research, both in the public and private sectors".

Kosovo is one of the poorest countries in Europe. In 2015, the country had a population of 1.772 million (provisional) and in 2014 GDP was 3.1 billion euros. According to the World Bank,³² the poverty rate is about 80%, while according to the Kosovo Agency of Statistics, 29.7% of 1.8 million citizens are considered poor. In such a social context, HE is seen as a way to improve career and life opportunities. High study demand - with an average age of 26, the population is very young - has triggered the establishment of numerous private HEIs over a short period of time. However, the quality of the resulting education is variable.

The table below shows the data currently available for innovation and research in Kosovo. N.B. Kosovo is not reported in EUROSTAT.

Table 5: Research investment in Kosovo (Source: Communication on EU Enlargement Policy {COM (2016) 715 final})

Innovation and research	2003	2011	2012	2013	2014	2015
Public expenditure on education relative to GDP (%)	:	4.1	4.0	:	4.4	:
*Gross domestic expenditure on R&D relative to GDP (%)	:	:	:	:	:	:
Government budget appropriations or outlays on R&D (GBAORD), as a percentage of GDP (%)	:	:	:	:	:	:
Percentage of households that have internet access at home (%)	:	57	:	:	:	:

³² This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo Declaration of Independence.

³³ Progress Report on recent developments regarding research and innovation cooperation in/with the Western Balkans (Period: June 2016 – June 2017) Kosovo

³⁴ World Bank Country Programme Snapshot April 2016

According to the 2016 Communication on EU Enlargement Policy, Kosovo has taken limited action to develop its **research and innovation** capacity. The quality of post-graduate programmes is very limited. The budget for research remains insufficient and is still below 0.2 % of GDP. The 2004 **Law on Scientific Research Activities** which stipulates that domestic gross expenditure on research and development (GERD) should stand at 0.7% of GDP is not being properly implemented simply due to a lack of funding. Kosovo also needs to strengthen its administrative capacity for research and innovation.

Policy and institutional framework

At the national level, a number of legal documents as well as strategies have been adopted. The **Law on Higher Education 2011** stipulates that public universities are autonomous in creating measures that will promote research activities outside academia. Despite this law, and until now, there has been little development in this direction.

The **Kosovo National Research Programme 2010-2015** still appears to be the main document facilitating policy-making in the area of R&D. There are 18 policy measures identified, with the aim of encouraging scientific research activities in both public and private sectors.

Finally, the **Kosovo Education Strategic Plan 2017-2021** promotes science and technology development for a modern society and emphasises ICT development as one of the priority topics in the education sector.³⁵

In Kosovo, the main players in the research system are the Ministry of Education, Science and Technology, and the responsible body, the National Research Council. Research is predominantly performed at universities with the top performer being the University of Pristina, the Academy of Sciences and Arts, and a limited number of institutes. The majority of the institutions are teaching based, and while the main national university was previously able to compete with other similar institutions in the region, today it is falling behind in the rankings. Research productivity is extremely low (see below). The HE system is challenged to establish links with the economy and to increase the employability of graduates. Senior management reported that the main problems are perceived to be a lack of funding as well as the absence of a clear strategic framework and delivery mechanism to support research. System level policy and strategy for research, as well as methods of research funding at institutional level, seem to receive less attention at the moment than HE does.

³⁵ The Western Balkans Regional R&D Strategy for Innovation, Country Paper Series Kosovo, World Bank Technical Assistance Project (P123211) October 2013

“Mentality” and “approach” were cited by policy makers in interviews as the main obstacles to establishing stronger research activities. Academic career development in Kosovo tends to focus on teaching because this provides long-term financial security. Being a professor and securing a professor’s salary is a much sought-after achievement. The need for security is linked to the aftermath of the war. In addition, because professors can teach at more than one HEI, they can increase their income by expanding their teaching activities; their contract of employment is officially only related to teaching, with a relatively low number of hours, which leaves considerable time to teach at other institutions. However, while policy makers are concerned about this issue, the majority of rectors, deans and individual researchers, while admitting that overall the teaching/ research balance is not optimal, do not think of additional teaching commitments as a reason for low research performance. Over 50% of the researchers who responded to the study (Q3) and 40% of rectors (Q1) felt strongly that science and research were not given sufficient priority by the state.

There is a strong need for reform, as presently institutions are not in a position to adequately support research and development, and the university and research system is inefficient. A new regulation on HE is expected to improve the situation but its launch has already been pending for several years. The proposed changes are said not to be popular within universities, which still exercise a considerable influence on policy makers.

Research productivity

The largest and most productive university, both by absolute and relative number, is the University of Pristina. Apart from Pristina, the productivity of other universities in Kosovo is negligible. The most dominant research areas for the University of Pristina are medicine, agricultural and biological sciences and environmental science.

Survey responses from individual researchers on the publishing situation (Q3) revealed that at least 50% had not published any papers in the last year. More encouragingly, around 42% of those who responded to the survey had co-authored an ISI journal paper and 12% had individual authorship.

For full data on research productivity see Appendix 1.

Funding

The lack of funding was highlighted by 80% of rectors and researchers as a major problem for the country, and policy makers acknowledged the very low level of budget available for science in Kosovo as the major obstacle to developing research excellence. The total annual research budget for all research in Kosovo is 4.8 million euros and 0.1% of GDP which is the lowest in the region. But even this very low budget is usually not fully dispersed, due to the low number of project funding applications that the ministry receives. Researchers argue that they do not apply since the size of grants available is not sufficient for them to carry out a meaningful research activity.

Funding issues are not limited to levels of funding, but also concern the funding mechanism. Research funding provided by the ministry does not go to the university, but directly to individual researchers for their research projects which are relatively small amounts, insufficient for purchasing or maintaining research equipment. The university and the faculties receive funding only for education and administration which it makes it very difficult for them to approach research in a strategic manner. A budget line for the university would enable it to invest in research infrastructure.

Kosovo has some bi-lateral agreements, for example, with Austria and Turkey. These typically enable annually 15 joint year research projects and 20 PhD students.

Research infrastructure and research capacity

Both research infrastructure and research capacity are very poor. Equipment is old, only a few laboratories are well equipped, but still below European standards. There is little or no access to journals and databases, and there is no institutional support for research. All rectors indicated that research infrastructure was below international standards, and 60% that it was insufficient. Even more concerning, 33% of researchers reported (Q3) that they did not have access to laboratories and only 3% felt their labs were of good national standard. There is very limited access to international research publications: 21% of the Q3 sample reported that they could not access scientific databases.

In common with other economies in the region, one of the largest barriers to research excellence is the lack of capacity in the research community to secure and manage research projects, for example, in preparing EU project proposals and managing EU-funded projects. It should be noted that slightly over half the researchers who responded to the Q3 survey felt there was insufficient support for preparing project proposals and managing research projects. Research collaborations as well as contract research and consulting have traditionally been based on private contacts outside of the institutional system.

Research careers

The lack of qualified researchers is a strong barrier to improving the quality of research. There is presently no clear national framework for assessment of research. It is the university rather than the ministry that assesses publications, and the assessment is used to enable career progression. Researchers returning from abroad bring good skills with them, but are unable to use them due to the lack of infrastructure and facilities. Interviews revealed that enthusiasm and engagement of younger researchers are seen as a threat by the older, more established academics.

Internationalisation

The situation for international collaboration has improved. Kosovo used to have problems in engaging with all EU initiatives, due to its status, but this is generally no longer the case. Kosovo institutions cannot be the lead partner in H2020 projects due to a government decision for budgetary reasons, but they can participate as partners. There is good cooperation with Albania, but generally, collaboration in the region is limited, due to the political situation.

Many of the younger academic staff obtain degrees abroad, which help them to establish international networks and cooperation.

The main barriers to increasing international and regional cooperation appear to be motivating researchers to apply to calls. Finding project partners is challenging and researchers rely on personal networks to find potential partners. There is no structured and strategic attempt at institutional level to use returning researchers for building institutional networks or to stimulate interdisciplinary collaboration.

Technology transfer and knowledge exchange

Engagement in technology transfer and knowledge exchange activities is very low. 74% of researchers reported never having been involved in international industry collaboration, and only 10% commonly work with domestic industry (Q3).

Some institutions are trying to improve the situation with a focus on securing more research funding. For example, the University of Pristina has recently established an office for sponsored research, following a US model. The new office will focus mainly on securing EU grant money, as there is not a strong economy to enable public-private partnerships. In parallel, an initiative known as “Venture UP” will support technology transfer and, in particular, spin-offs and start-up activities. Alumni are supporting this latter initiative. This will require changes to the internal bylaws on technology transfer activity by faculty employees to regulate claims to ownership of research results. It may also prove to be a very novel experience as only 8% of researchers claimed to have any previous experience with spin-offs.

Summary

- Investment in research is extremely low, even in a regional comparison.
- System-level research priorities are not clearly defined, which prevents individuals or research teams from designing a long-term research strategy.
- The teaching load leaves little time for research.
- The current methods of assessing and promoting university researchers do not provide incentives for excellent research.
- The lack of funding makes it difficult to carry out meaningful research activities.
- Collaborative working and publishing is not common.
- Access to contemporary literature and journals is poor

Recommendations for Kosovo

It is suggested that national authorities and policy makers:

- **Explore possibilities to support research by increasing national funding.**

Policy makers are aware that in recent years the public investment in R&D has fallen below the levels required by national legislation. They are urged to increase the investment rather than to amend the legislation.

- **Incentivise younger HEIs focusing predominantly on teaching to strive for excellent research.**

The country has a significant proportion of young people who require education and this justifies the need to open new educational institutions. Some of these institutions, particularly those with a new generation of young researchers, have the potential to develop into strong research performers. Research funding should be allocated to support selective, performance-based development and not spread over all HEIs.

- **Improve access to databases and journals.**

For a long time, and due to very limited resources, Kosovo HEIs have been faced with extremely limited access to contemporary literature and journals. The few attempts to change this were short-term interventions in the system.

It is suggested that universities:

- **Develop mechanisms for limiting the teaching load of academic staff (also at other HEIs) and reward research performance.**

In their search for financial security, many academics work at more than one HE institution, which further weakens the research performance. Up to now the system has been too lenient regarding evaluation criteria, and university level assessments were more targeted to enabling academic progression than requiring transparent and recognisable international criteria of research performance. HEIs should improve the criteria for academic career promotions on research performance.

5. MONTENEGRO

HE and research system

The European Council granted the status of candidate country to Montenegro in December 2010. Accession negotiations were opened in June 2012. Chapter 25 “Science and Research” was provisionally closed in December 2012.

According to the 2017 EU Progress Report on recent developments regarding research and innovation cooperation,³⁶ considerable efforts are required to increase the level of investment in research and innovation, particularly from the private sector. Investment in research is modest. In 2014, total investment in research and development amounted to 0.36 % of GDP (rising to 0.38% in 2015), and of this only 0.14 % came from the private sector. The 2017 progress report recommends that in the next year Montenegro should in particular:

- focus efforts on increasing participation in the EU’s Horizon 2020 Programme;
- continue to streamline efforts to increase investment in research, in particular through stimulating investment by the private sector.

In 2014 the country had a population of 0.622 million and a GDP of 3.624 billion euros.³⁷

The table below shows the data currently available for research and innovation in Montenegro. (N.B. no further data is available from EUROSTAT).

Table 6: research investment in Montenegro (Source: Communication on EU Enlargement Policy {COM (2016) 715 final} and EUROSTAT “”)*

Innovation and research	2003	2011	2012	2013	2014	2015
Public expenditure on education relative to GDP (%)	:	:	:	:	:	:
Gross domestic expenditure on R&D relative to GDP (%)	0.80	0.32	:	0.38	0.36	0.38
Government budget appropriations or outlays on R&D (GBAORD), as a percentage of GDP (%)	:	:	:	:	:	:

³⁶ Progress Report on recent developments regarding research and innovation cooperation in/with the Western Balkans (Period: June 2016 – June 2017) Montenegro

³⁷ World Bank Country Programme Snapshot April 2016

Policy and institutional framework

Policy

Montenegro has undertaken a comprehensive series of reforms related to HEI and research in recent years.³⁸ In June 2017, the **Law on Amendments to the Law on Higher Education** was adopted, with the main goals being to improve the link between education and the labour market in order to curb unemployment. At the University of Montenegro, **Rules for Doctoral Studies** were adopted (February 2015), which are clearly structured and have an emphasis on research. This was followed by the establishment of the **Centre for Doctoral Studies** and the **Doctoral Studies Committee**, established with the aim of harmonisation and advancement of doctoral studies; in addition, **plagiarism software** has been introduced. The short-term effects of these measures are reducing the number of PhD students, but the long-term effects (together with national scholarships for excellence) will likely be the sustainable funding of PhD candidates and young researchers, and new jobs for young PhDs. Another ongoing project aims to reform **doctoral studies at the University of Montenegro (UoM)** in line with the Bologna Process and Salzburg Principles.

Another relevant strategic document is the **Strategy for Scientific and Research Activity of Montenegro (2008-2016)**³⁹, which stipulates that science and education should be one of the thematic priorities for the annual national budget planning. A new strategy (2017-2020) and associated action plan were published in December 2017, after work for this report had been completed. It focuses on excellence, strengthening research capacities and research professions, technology transfer and science-economy synergies and internationalisation.

The **Roadmap for Research Infrastructure in Montenegro**, adopted by the Council for Scientific-Research Activity in September 2015, analyses the potential of new infrastructural projects in the field of research and innovation. The council also adopted the **National Roadmap for the European Research Area (ERA)** in April 2016⁴⁰ that describes the current situation in Montenegro in R&D&I, as well as the manner in which Montenegro will contribute to the further implementation of individual ERA priorities.

Finally, the **Strategy of Innovation Activity (2016-2020)** and the associated Action Plan include more realistic targets for an increase in national and private expenditure by 2020 (0.6% of GDP in overall national R&D spending and 0.3% of GDP for private investment). This activity is forming the basis for development of a Smart Specialisation Strategy. Although Montenegro is not yet part of the JRC-led pilot for the wider region, it has applied successfully for support from JRC in December 2017 and made a commitment to develop a strategy as part of its candidature process and anticipated use of EU Structural Funds.

Montenegro applied in 2017 to the European Commission's Policy Support Facility (PSF), for help with the development of a start-up support ecosystem. The support was approved and PSF will take place in 2018.

38 https://ec.europa.eu/education/sites/education/files/wbalkans-2017/wbalkans-2017/higher-education-report-montenegro_en.pdf

39 Strategy for Scientific and Research Activity of Montenegro (2008-2016), Ministry of Education and Science, Podgorica, May 2008

40 National Roadmap on the European Research Area, April 2016, https://era.gv.at/object/document/2763/attach/ME_ERA_Roadmap.pdf

Despite this rather modern framework and recent reforms, it is worth noting that most rectors and researchers from Montenegro who responded to this study (Q1 and Q3) feel that “research is not given sufficiently high priority by the state” and that “there is no national strategy, which would provide a clear framework”. Science and research are also mentioned as having generally weak recognition outside academia.

Institutional framework

Montenegro is a very small country with one large national university, two private universities and five private faculties. The main players in the research system are the ministries, while research is performed mainly at universities and the Academy of Sciences and Arts. As in most other Western Balkan countries, the Academy is perceived as a mostly conservative institution that could not keep pace with all the changes in the system and with today’s research requirements.

There are two ministries, one for education, including HE, and the other for science. This is probably not an ideal solution, given that the HE system is relatively small, and issues of learning and teaching and research are usually related in various aspects. Universities and other HE institutions find themselves frequently caught between the two bodies.

The University of Montenegro has implemented a number of structural changes. It is now centralised, and faculties are no longer legal entities. Research support and monitoring take place institution-wide, through dedicated structures for different kinds of evaluation of research activities and academic promotion. While leadership of the public university is now able to influence research agendas, it also indicated that the ministry, given also the absence of a national research agency, still has reasonably strong influence and faculties/ departments/ institutes as well as individual professors/ researchers still enjoy considerable autonomy and decision-making power (Q1).

Research productivity

There is an evident dominance of the University of Montenegro by all indicators, however the relative productivity even for this university is relatively low with 0.35 papers per scientist per year. Dominant research areas for the University of Montenegro are engineering, computer science and agricultural and biological sciences.

For the full set of results on research productivity see Appendix 1.

Funding

The GDP investment in R&D in 2016 was 0.38%. A lack of funding is the main reason for outdated research infrastructures and insufficient human resources. All respondents to Q1 highlighted the lack of funding as a major barrier for developing research capacity as did 80% of researchers (Q3). Deans and vice deans focused less on the too low investment (Q2) and in interviews pointed to the fact that the system needs more than just funding, but also improved methods for allocating funds.

The University of Montenegro has recently started to administer and distribute its own budget for research, and this is a positive sign. However, procurement procedures, as everywhere in the region, are challenging. Procurement is perceived to be a major obstacle as it is often undertaken by an external agency or group with little experience or time to implement. The associated procedure can be so long-drawn-out that the research project has officially finished before the procurement process is completed or the equipment is no longer available to purchase.

Salaries are very much focused on teaching, with teaching covering 70% of salaries, and research only 30%, according to the agreement with the university. Research would need to be given more weight within the academic career. There is also an obvious generation gap.

Research infrastructure

While the University of Montenegro has undergone significant changes and become more integrated, research infrastructure is still unequally distributed and differently maintained across disciplines. A big step forward in using equipment in a more efficient way is the recent establishment of a register of all equipment. At the same time, the Ministry of Science is putting serious efforts into making the country and its researchers eligible to access big international labs and research polygons, such as CERN and EMBL. While this is interesting and ambitious initiative, it should not be seen as blueprint for capacity building for Montenegro or the region.

Over 50% of researchers (Q3) feel that their research infrastructure is insufficient. But there is less agreement as to the difficulties of researchers to access equipment owned by other research groups; only 11% of researchers felt strongly that this was the case. Of greater concern are the 20% of researchers who stated that they had no access to research laboratories and the 25% who stated that access to laboratories was insufficient.

As with other countries, maintenance costs of research infrastructure were highlighted as a serious issue. Equipment that has been purchased stops being used because there are no funds to cover servicing, replacement parts or consumables.

Lack of access to journals and scientific databases is an impediment, not only for research, but also for teaching based on research. 20% of researchers indicated that they had no access to scientific databases such as the Web of Knowledge (Q3) and 47% stated that access was inadequate.

Research careers

Career progression

During interviews, it was frequently stated that human resources are one of the biggest challenges for research development. Senior staff often raised the issue that the demands on them are too high, for example, the criteria for the selection of supervisors (see below). Younger staff are more motivated to meet the new criteria, and they believe they could do much better if they were given the chance. For this they require institutional support. However, there is only a very limited number of new posts, and selection is not sufficiently merit-based. This is a vicious circle and a solution has yet to be found.

Doctoral education

Montenegro produces a small number of PhD holders and, as outlined above, emphasis is being placed on doctoral education and major reforms are taking place. Presently, the university is challenged with a very small intake of doctoral students as interest is very small. This is a situation quite different to that in the majority of European universities. Partially it is because of the relatively high fees, but partially due to the working conditions and career development prospects. PhDs are hardly recognised outside academia, and candidates find it difficult to obtain employment in the private sector due to the low-tech nature of the economy. Society, in principle, does not see a doctoral degree as an added value for employment. The creation of new knowledge is not seen as one of the merits and tasks of HE. The situation is quite similar to that in other WB countries.

At the same time, young researchers and potential doctoral candidates are leaving the country, opting for institutions that provide them with better research conditions and training. Researchers responding to the study (Q3) indicated that they felt that young talented people look for careers outside of the research and HE sectors (66%), young researchers (54%) and also the best researchers are leaving the country (51%), some on scholarships. The PSF initiative of 2018 may help to address this issue and encourage more young PhDs to stay and start their own business.

In addition, there is a lack of qualified supervisors. When the University of Montenegro raised the minimum requirements for supervisors, a significant number of supervisors became ineligible and there is now a shortage of supervisors. Doctoral candidates, on the other hand, are struggling with the enhanced publishing requirements. In other words, the threshold has become very high, and it will require some time for a full adjustment.

Internationalisation

Interview partners at institutions and ministries expressed a strong interest in international and regional collaboration. They pointed to existing ties with institutions and individual researchers in neighbouring countries. Many of the academic staff also gained their degrees in one of those countries (most often in Croatia or Serbia). Some younger academic staff stated that they found international cooperation very stimulating and positive, whereas many of their senior colleagues would be less engaged.

All the stakeholders, but researchers in particular, recognised that international collaboration is also important for addressing the lack of expensive infrastructure. International and regional cooperation enables access to laboratories and equipment that is not available at home institutions.

They all identified a need for more organised and reliable administrative support for internationalisation. For the time being, there is almost no support, and long-drawn-out processes make procedures lengthy and slow down the research activity. 60% of researchers (Q3) felt that there is no or insufficient administrative support (e.g. to help prepare research proposals, manage research projects, etc.). This was a view echoed by rectors responding to Q1. Pre- and co-financing are obstacles to participation in international grant programmes.

Technology transfer and knowledge exchange

As elsewhere in the region, most of Montenegro's industry was destroyed by the economic changes, and it has not been easy to recover, which has a negative impact on universities. This in turn holds back the development of a modern innovation ecosystem in which universities play a key role. University leadership and researchers are aware of and interested in the benefits of collaboration with industry and other outside partners. A large number of respondents emphasised the third mission of universities (service to society, in addition to research and education) and their readiness to embrace an expanded mission. Up to now, however, this has developed slowly, and the majority of activities are performed privately, not institutionally. 75% of researchers reported that they had never collaborated with an international company and 50% that they had never collaborated with a national enterprise (Q3).

Several good examples of triple helix technology transfer initiatives exist including the BIO-ICT Centre of Excellence (CoE), but they are the exceptions. The CoE is the first Centre of Excellence in Montenegro, implemented as a three-year research programme at the University of Montenegro, led by the Faculty of Electrical Engineering, and financed by the Ministry of Science of Montenegro through a World Bank loan from June 2014. Other partners are three leading Montenegrin research institutions: Biotechnical Faculty, Institute for Marine Biology, Institute of Public Health; two international universities, St. Petersburg Scientific Research Centre for Ecological Safety and Centre for TeleInfrastruktur (CTIF), and two local enterprises. The CoE reflects the research strengths revealed by the study of research productivity (see Annex 1). An innovation centre has been established in Niksic, a science-technology park is planned for 2018.

Summary

- A significant number of reforms have been made, and they are progressing well and in line with EU standards.
- The coordination of funding methods between ministries and HEIs still needs to be improved.
- Research and academic careers need systematic improvement: researchers are struggling on how to enhance research productivity; senior researchers tend to resist change; there are currently not enough qualified research supervisors; and young people are leaving for better conditions elsewhere.
- More technical support for research and skilled administrative staff is required.
- Reform of doctoral education must be continued, in consideration of European and international good practice.
- The universities need to be better prepared for collaboration with industry, on the structural and operational levels.
- Interdisciplinary research should be promoted. CoE ICT BIO is a good example of how vigorous collaboration among different fields could be.

Recommendations for Montenegro

It is suggested that national authorities and policy makers:

- **Find ways to further align and coordinate the two ministries (education and science) to benefit the whole system of HE and R&D.**

At a national level, the majority of relevant strategic documents and policies have been developed and the recent 2017-21 Strategy is strongly welcomed. However, in a small HE and research system, as is the case in Montenegro, the existence of two separate ministries might be challenging at times. Closer collaboration could be beneficial for HEIs, and research per se.

- **Relevance of knowledge exchange and technology transfer should continue to be emphasised in policy papers, e.g. the new 2017-21 Strategy, and institutions should receive additional support for such activities.**

Although the industrial structure is still rather weak, universities and, in particular researchers from science and technical fields, show a strong inclination towards applied research and collaboration with industry. If receiving adequate attention and support, technology transfer and knowledge exchange might develop faster. The BIO-ICT Centre of Excellence may provide a good model for replication.

It is suggested that universities:

- **Provide more administrative support for research and researchers and, simultaneously, decrease the level of bureaucratisation.**

Universities have already performed some structural changes and improved the basis for research. But moving from the decentralised model to a more centralised one, they have not yet developed adequate administrative support by opening central units with sufficiently qualified staff.

- **Modernise doctoral education to help attract more talent.**

Doctoral education has already gone through some structural changes and it has been supported by strategic documents and policies. Nevertheless, it still needs to be better fitted to existing research capacity and, at the same time, to be more oriented to attract young talents. If this does not take place, the brain drain will be amplified, and the national research system will be more seriously affected by a lack of qualified human resources to carry out research.

6. SERBIA

HE and research system

The European Council granted Serbia the status of candidate country in 2012. By the close of December 2017, it had opened ten chapters in the accession process and provisionally closed two, including those on education and research & science.

According to the 2016 EU Progress Report on recent developments regarding research and innovation cooperation⁴¹, although Serbia has a relatively good scientific base, the level of investment in research is less than 1% of GDP and cooperation between the public and private sector is weak and not systematic. In this annual report the Commission suggested that Serbia should in particular:

- adopt the action plan to implement the report 'Research for Innovation: Strategy on Scientific and Technological Development of the Republic of Serbia for the period 2016–2020', and the science and research infrastructure road-map;
- foster cooperation between industry and academia and increase the level of investment in research.

Serbia is the largest of the Western Balkan countries. In 2015 the country had a population of 7.114 million and a GDP of 33.491 billion euros (provisional).

The table below shows the data currently available for innovation and research in Serbia.

Table 7: Research investment in Serbia (Source: Communication on EU Enlargement Policy {COM (2016) 715 final} and EUROSTAT “”)*

Innovation and research	2003	2011	2012	2013	2014	2015*	2016*
Public expenditure on education relative to GDP (%)	4.3	4.5	4.5	4.3	4.2	:	
Gross domestic expenditure on R&D relative to GDP (%)	0.34	0.72	0.91	0.73	0.77	0.87	0.89*
Government budget appropriations or outlays on R&D (GBAORD), as a percentage of GDP (%)	:	0.45	0.45	0.42	0.43	:	
Percentage of households who have internet access at home (%)	:	41.2	47.5	55.8	62.8	63.8	

⁴¹ Progress Report on recent developments regarding research and innovation cooperation in/with the Western Balkans (Period: June 2016 – June 2017) Serbia

Policy and institutional framework

In the last decade Serbia has made good progress in the area of research and innovation. On the national level, legal regulations for research, science, and innovation were adopted as well as some relevant strategic documents. The country has committed to develop a Smart Specialisation Strategy with a target date of the end of 2018. The EU's Joint Research Centre (JRC) is supporting this process through a pilot study with Moldova and Ukraine.⁴² The country also now has a minister for innovation (without portfolio). A **Law on Innovation** was adopted in 2005 as well as a **Law on Scientific Research**. The **Strategy of Scientific and Technological Development of the Republic of Serbia for the period 2010-2015** was adopted in February 2010 and the **Strategy on Research for Innovation, Strategy on Scientific and Technological Development of the Republic of Serbia for the period 2016 – 2020**⁴³ in March 2016. The strategy further defines priority R&D areas as well as seven thematic issues. These may change as the S3 is developed.

The main priorities of the **European Research Area** roadmap were incorporated in the new strategy for scientific and technological development in March 2016. At the same time, several amendments were adopted to the **Law on Scientific Research**, enabling a more targeted approach to public funding of research institutions. However, interview partners generally agreed that to date, the new strategy has not been actively implemented.

The amended law on research will introduce a “3rd stream” mission for all HEIs; this will, for example, enable them to play a more central role in research commercialisation by taking an equity stake in a university spin-off. Since November 2016, public and private universities have been involved in the formulation of this law through consultation, and a consensus has emerged. Despite these positive steps, researchers characterised both government and public interest in research as low, in particular for the social sciences. Those interviewed also indicated that the national and institutional level regulation of research does not currently promote research excellence or transfer, nor commercialisation of research results.

In September 2017 a new law on education was passed. This has not been well received by many HEIs who claim that it will prevent the progress of the HE sector.⁴⁴

The main players in the research system in Serbia are the Ministry of Science, Education and Technological Development (MoSETD), the Serbian Academy of Science and Arts, as well as universities and research institutes. Although some research is also carried out in the private sector, most research activities are performed at the universities and institutes. However, the governance of HEIs is currently primarily formulated for education, not for research.

Serbia managed to merge relevant ministries (education and science), and this has enabled better communication and cooperation between different sectors. The country has a long association with the EU Framework Programmes (FP6, FP7 and H2020). In addition, by signing a MoU with the Joint Research Centre (JRC) in 2010, some new possibilities were opened up for cooperation in research and technology.

42 <https://ec.europa.eu/jrc/en/news/jrc-6th-annual-forum-eu-strategy-danube-region>

43 <http://www.mpn.gov.rs/wp-content/uploads/2015/08/Strategija-engleski-jezik.pdf>

44 Source: Interviews

In Serbian HEIs, the rectorate level has relatively low influence on the faculties, who as legal entities, have significant autonomy and independence. Policy makers have no right to impose priority research fields on the HEIs, which remain free to define their own fields of interest. According to the study undertaken for this report there is presently an ongoing struggle between policy makers, who want stronger control over HEIs, and the universities, who wish to retain their traditional autonomy.

Fragmentation of the HE system, i.e. the lack of integration at Serbian universities, remains a challenge to creating a critical research mass. Interestingly, most of the representatives interviewed for this study (central leadership, deans and researchers) did not principally question the current weak central governance with relatively high levels of autonomy for faculties and individual academics. The best illustration of how foreign the idea of central governance and funding is, and how this impacts research, is the attitude expressed during the interviews towards more pooling of research equipment and facilities: several researchers confirmed that, while not obliged to share infrastructure use, informally most faculties or institutes would do so. But this does not include the case of very expensive equipment, as their faculty had to pay for its purchase and maintenance.

The present systems of monitoring and evaluating research at both ministry and University levels is perceived by researchers to be poor. Although researchers need to report annually on published papers, the system is not public and transparent, and anonymity inhibits improvement. However, a database for the researchers to report on their published papers has been established, and, once implemented, will make research outputs public. This transparency of performance should be a catalyst for improved performance.

Research productivity

The larger Serbian universities (Belgrade, Novi Sad, Niš and Kragujevac) have better relative performance, with the exception of Singidunum University, which is also the only private university in the top five universities. There is an evident dominance of the University of Belgrade, both due to size and relative production of papers.

The most dominant area for all universities is engineering which is ranked in the top five research areas among all universities as well as computer science which is the dominant area in eight out of 11 universities. It should be noted that the largest universities have dominant research production in the fields of medicine, engineering and chemistry.

Funding

The present budget for science in Serbia is rather low, and very little money is available to upgrade or maintain research infrastructures. Total national investment in research was 0.89% of GDP (2016). Overall, two-thirds of the budget for HE (which includes research activity) comes from national sources, and the last third from external sources. However, most of this budget is used for education and not research, for example, there are no grants for excellent research.

Policy makers who were interviewed for this study cited the low national budget for research and the way it is presently allocated at national level as a major impediment to developing research excellence. The present method of selecting projects for financing is not very competitive and results in a 95% success rate for applicants. A new model of financing is being developed with the assistance of the World Bank. This would improve the competitive funding process and signify that the research budget would no longer be thinly spread across a large number of researchers.

In contrast to other systems in the region, rectors do not see funding as being a very strong issue: 17% of respondents to Q1 indicated that they did not feel that the present funding was 'insufficient'. The picture was different for researchers with around 90% feeling that funding for research was insufficient (Q3). There is no clear explanation for this. It could indicate that university leadership in the prevailing governance structure is relatively distant from the research organisation, also because they do not handle the budgets.

Deans and vice-deans at the University of Belgrade see funding and funding-related issues to be the main barriers to achieving research excellence. It ties in with survey results where nearly 75% highlighted insufficient research funding (Q2). The university has attempted to participate in EU calls but has had less success in H2020 than in FP7, and the enthusiasm of individual researchers to participate in calls seems to have decreased. The same was reported in interviews at the University of Novi Sad despite the local success of the ANTARES project. The present non-integrated structure of the universities and the legal independence of the faculties can make it difficult to provide matched/in-kind funding in a way that is acceptable to the EU; e.g. the University must sign the grant agreement, but a faculty as a legal autonomous entity is actually the originator of the proposal and the intended beneficiary of the funds. This was reported to have become a greater issue in H2020 than in FP7 for Serbian faculties, although it does not affect all disciplines to the same degree; for some faculties - particularly those not needing equipment for research, such as Law - the legal autonomy can be beneficial as they can more easily provide their own funds and engage successfully in cross-border projects.

A need for "internal pre-financing" or "up-front financing" under some EU funding instruments is also a major problem in Serbia. Although many EU schemes now cover 100% of costs, they cannot be claimed in advance of a purchase, only claimed back at a later date. This results in a need for institutions to seek internal funds to cover their costs until they can be claimed back on a grant. Incidents have been reported of individual researchers who had purchased tickets and covered accommodation from their own funds for a mobility action due to the fact that costs can only be claimed back once the mobility action is completed. This is particularly problematic for younger researchers on very low grants and salaries and at times proves impossible.

In the past, more 'appropriate' funding calls, for example, those directed towards fundamental research, were available at the national level via IPA funds. However, these are now being redirected towards very different issues (society, roads, bridges, etc.), and there is no replacement national stream to support fundamental research.

Research infrastructure and research capacity

Research infrastructure

In the last decade noticeable improvements have been made, partially due to EU actions. Interestingly, while IPA and FP's such as the PF7 REGPOT brought objectively a much higher investment, researchers and institutional leadership tend to mention more often TEMPUS and Erasmus+. Research infrastructure in Serbia is better than in other countries in the WB. In some fields of research, there are quite well-equipped laboratories, good enough to perform high quality research at EU level. Unfortunately, these are still more the exception than the rule. Only a small number of researchers indicated that they had access to facilities and infrastructure that was at international level, and over 60% of researchers indicated that their research facilities were not adequate (Q3). There are no funds allocated for maintenance and service. The current law on procurement is reported to cause significant delays.

Research capacity

Most Serbian researchers feel that they lack the capacity (skills and time) to prepare strong research proposals. Training could be useful to become acquainted with the application processes, but more staff would also be needed to support project management and implementation. Most faculties do not have research support for services such as project application and management and 60% of researchers said that they lacked adequate support for project preparation and implementation (Q3), and nearly as many senior HEI managers confirmed this situation (Q1). Given limited numbers of applications and projects to manage, support units would make sense if allocated at central level which, however, might pose problems with the current institutional governance structure. In addition, there is currently a governmental restriction on the hiring of new staff.

Research careers

The system of doctoral education is not yet sufficiently modernised. Major reform steps have been taken, but are regarded as slow and low in impact, in view of the time and resources invested. Up until now, no doctoral schools have been created, the prevalent system is still the doctoral candidate-supervisor approach, with low or no involvement of the institution. Only a relatively small number of doctoral candidates are employed at the university, but at lower than national average salaries, and with a relatively high teaching load which affects the time to complete their doctoral degree.

Internationalisation

Serbia has made important inroads in advancing international cooperation. It is active in various European research organisations (e.g. CERN) and participates in European research programmes (e.g. FP programmes, HORIZON 2020, COST, EUREKA). EU programmes such as ERASMUS, COST and CEEPUS do not fund research, but are important as they enable researchers to travel, and therefore expand and strengthen their networks. Bilateral international cooperation was also cited as being important in Serbia (e.g. with Norway). Serbian researchers are also trying informally to benefit from ties with international researchers of Serbian origin (research diaspora) and to establish collaboration with them or to attract them to participate more actively in Serbian research.

As in other Western Balkan economies, brain drain also poses challenges to the system and the institutions. Within the research community (Q3), 78% felt that the best researchers and 71% that young researchers are leaving the country. Responses regarding brain drain were even stronger from university management (Q1). Many of the best students leave for countries where they can find funding to do their research. Young researchers at Serbian institutions suffer from a poorly organised research placement system, which provides no guarantee on whether they will have project money for the next year; at present they are informed at the end of December whether they will continue to be employed on the 1st of January of the following year. A change in this system would introduce more certainty to the situation and might encourage more young researchers to remain in Serbia. But this only one form of brain drain. Within the researcher community (Q3) 75% of respondents felt that young talented people look for careers outside of the research and HE sectors.

Technology transfer and knowledge exchange

There are a number of activities that have been devised to improve the system and to create better ties with industry and the business sector. In Belgrade, four faculties have well-established “Innovation Centres” for working with businesses and supporting PhD employment, as well as a Centre for Technology Transfer at the central university level. However, given the relative size of the university there is still a lack of technology transfer results (patenting, licensing of technology and creation of spinoff companies) suggesting that the activity still lacks support from the research base as well as a critical mass of skills.

Funding for third stream activities including collaborative and contract research is relatively good through IPA financing. The Innovation Fund has a scheme to support contract research, and some companies are willing to pay directly.

But responses from Serbian researchers indicate – similar to the other WB systems – low collaboration with national and international industry (Q3). Interviews confirmed that relations, where existent, are often driven by individuals, and limited to some technology disciplines. In addition, research adsorption capacity in Serbia is very limited. Most enterprises, and in particular SME, have a low interest in research, and in HE in general. International industry active in Serbia tend to use its own researchers, or conduct research abroad.

Summary

- Research funding is too low, and not allocated in a fashion that would allow for multiannual planning (on a year-to-year basis, and at very short notice).
- Due to governance system, and their limited autonomy, universities are not in the position to deliver a more strategic contribution to national research.
- Research equipment cannot be accessed by all researchers of the HEI. There is relatively low inter-faculty cooperation.
- Procurement procedures can inhibit research as they can slow down the implementation process.
- Pre-financing of projects is a major obstacle.
- More research support services are needed.
- Doctoral education is outdated and as such not efficient and cannot assure good quality doctoral education.
- Brain drain is on-going.

Recommendations for Serbia

It is suggested that national authorities and policy makers:

- **Address the lack of access to research infrastructures and low levels of collaborative research with enterprises by promoting a policy of “Open Access” to research infrastructure and consider making future funding for equipment and research facilities contingent on adoption of an HEI level open access policy.**

Many issues raised by researchers in Serbia relate to lack of funding for investment in research infrastructure, but also to a lack of access to equipment and facilities owned by other legal entities (faculties, research institutes) at their own institutions. The problem of how to raise sufficient funding to repair and maintain their facilities has also been highlighted. High-profile investments such as the BioSense/ANTARES project in Novi Sad are only of benefit to the small number of researchers, which is close to the entity, but not to the wider research community.

An open access policy to research infrastructure (equipment and facilities) could help to overcome these problems and create real benefits for the entire research community. It would also allow enhancing the governance approaches, without addressing in the first instance the highly sensitive issues of centralisation, integration and autonomy of faculties.

Open access to facilities is promoted by the European Commission, and Serbia is closely involved in the regional Working Group on Open Science (WGOS) (led by the Regional Cooperation Council). The Ministry for Science in Serbia has started to audit its equipment to avoid further duplication of purchases and this is a first move towards encouraging sharing of existing facilities. Serbia could look towards the good practice of Lithuania (Kaunas Technical University “Open Access”) and Poland (“Ancillary Use of Research Infrastructure”) in promoting open access as a practical way to maintain and repair existing facilities as well as a strategic way to improve their impact on research activity in both HEIs and enterprises.

It is suggested that universities:

- **Develop mechanisms for more efficient use of available infrastructure at the university level and beyond and, therefore, facilitate more collaboration within departments and among researchers across the university, more open innovation as well as ways to generate funds for repair and maintenance.**

Joint usage of the existing equipment, as well as joint purchase of new equipment, would have a positive cost-benefit impact on research as well as stimulating collaboration among researchers and the commercial sector. Introducing mechanisms to increase sharing of facilities is an important step towards an open access policy and to engaging in open innovation.

This is likely to require changes in the governance model, so as to enable university central leadership to introduce and exercise more efficient management towards the faculties and institutions which, under the current regulations, are autonomous legal constituents.

- **Modernise doctoral education and match it better to research capacity of HE institutions.**

A proper reform of doctoral education, aligned with European trends, would attract and retain more young people, allowing them to contribute better to the research performance of the university, and to be prepared for careers in research and other employment sectors. It would also help to mitigate academic brain drain.

