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# **WESTERN BALKANS REGIONAL R&D STRATEGY FOR INNOVATION**

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**COUNTRY PAPER SERIES**

**BOSNIA AND HERZEGOVINA**

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## ACRONYMS

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AC-BiH	Automotive cluster Bosnia and Herzegovina
BAIT	Association for Information Technologies in Bosnia and Herzegovina
BAS	Institute for Standardization of Bosnia and Herzegovina
BD	Brčko District
BiH	Bosnia and Herzegovina
BMZ	German Federal Ministry for Economic Cooperation and Development
CDS	Country Development Strategy
CIS	Community Innovation Survey
COST	Cooperation for Science and Technology
CREDO	Competitive Regional Economic Development
EBRD	European Bank for Reconstruction and Development
EC	European Commission
EPO	European Patent Office
ERA	European Research Area
EU	European Union
EUREKA	Intergovernmental organization for pan-European research and development funding and coordination
FBiH	The Federation of Bosnia and Herzegovina
FP6	Framework Program 6
FP7	Framework Program 7
FTE	Full Time Equivalent
FYRM	Former Yugoslav Republic of Macedonia
GDP	Gross Domestic Product
GERD	Gross Expenditures for Research and Development
GIZ	Gesellschaft für Internationale Zusammenarbeit
GTZ	Gesellschaft für Technische Zusammenarbeit
ICT	Information and Communication Technologies
IFIA	International Federation of Investors' Association
IP	Intellectual Property
IPA	Instrument for Pre-Accession Assistance
IPRs	Intellectual Property Rights
MES FBiH	Federal Ministry of Education and Science
MoCA	Ministry of Civil Affairs
MoFTER	Ministry of Foreign Trade and Economic Relations
MVA	Market Value Added
OECD	Organization for Economic Co-operation and Development
ORF	Open Regional Fund
R&D	Research and Development
RDAs	Research and Development Agencies
RDI	Research and Development for Innovation

REDAH	Regional Development Agency for Herzegovina
RS	Republika Srpska
S&T	Science and Technology
SAA	Stabilization and Association Agreement
SARNET	Academic and Research Network of Republic of Srpska
SCORE	Strengthening the Strategic Cooperation between the EU and Western Balkan Region in the field of ICT Research
SMEs	Small and Middle-sized Enterprises
STI	Science, Technology and Innovation
TAM/BAS	Turn-around Management and Business Advisory Services Program BiH
UN	United Nations
VAT	Value Added Tax
WBCs	Western Balkan Countries
WTO	World Trade Organization

## FOREWORD

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The *Country Paper Series* aims to provide for each project beneficiary (Albania, Bosnia and Herzegovina, Croatia, Kosovo<sup>1</sup>, FYR Macedonia, Montenegro and Serbia) a brief profile of the current conditions of the national research system (rather than an exhaustive assessment of the country's national innovation system). Emphasis on selected issues reflected the priorities identified by participants during the implementation of the Technical Assistance.

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

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## EXECUTIVE SUMMARY

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1. This document discusses the main features of the research system in Bosnia and Herzegovina (BiH), its weaknesses and strengths, and recent changes in the policy mix to improve human capital, research, and innovation capabilities.

2. BiH is a small, middle-income country with under-developed capabilities in human capital — especially in science and technology — and low levels of research and development investment (R&D) in both the public and private sectors. The country is among the worst positioned countries in the Western Balkan region in terms of education, research, and innovation, facing numerous development problems and challenges regarding fundamental competences and capacity for growth. The economy was hard hit by the war, and although re-structuring efforts during the post-war led to a few years of economic growth, that growth was driven primarily by domestic demand and stimulated by foreign investment, raw materials, and relatively cheap labor. Currently, the knowledge base of research and technology to foster new sources of competitiveness is extremely under-developed, which hinders the potential for growth.

3. With the complex government structure that prevails, as specified in the 2010-2015 Science, Technology, and Innovation (STI) Strategy, the main weaknesses faced by the country to implement a sound R&D policy relate to the low number of R&D centers, low number of scientists, undesirable funding structure (80 percent funded by government, 10 percent by the private sector, 10 percent by higher education), limited mobility of scientists, high concentration of scientists in specific centers, and low numbers and uncompetitive quality of

scientific publications, along with very limited commercialization of R&D.

4. Yet there is a high level of awareness among the key stakeholders of the importance of investing in R&D and innovation for economic and social development. There is an effort to establish and strengthen R&D and innovation policies and system in the country with the help of international organizations. Steps have been taken in the provision of a Legal Framework for research, technology, and innovation, and improving quality standards in the education system and support Science and Technology (S&T) education (graduates and post-graduates). In terms of the policy agenda, progress has been made in recent years, in particular with the adoption of the Strategy for the Development of Science in BiH 2010-2015 (STI Strategy), the Framework Law on Science (2009), and the Framework Law on Higher Education (2007). Consulting and advisory bodies have been created. Nevertheless, institutional capacity, especially an implementing agency and monitoring mechanisms, has yet to be established. Nor is there a countrywide policy approach for research and innovation. The research system and its governance and policy continue to be highly disorganized and contribute to a perpetual marginalization of R&D.

5. Negotiations towards becoming a World Trade Organization (WTO) member and the signature of the Stabilisation and Association Agreement (SAA) with the EU in June 2008 encourage the country to strengthen its science and innovation system.

6. Based on the findings presented in this report, the top priorities for BiH are to:

**Strengthen the science base of the country**

- Provide universities and R&D institutes with sufficient level of support to increase the quality and quantity of R&D
- Improve employee benefits of researchers including salary levels, and take measures to make research careers attractive for young people.
- Make sure that the promotion/performance regulations for researchers put less emphasis on publications, and promote result-oriented research and research commercialization.
- Strengthen the capacities of key organizations in the national research and innovation system (Institute for Intellectual Property; Agency for Statistics of BiH.) by providing necessary resources and trainings/technical assistance.

**Foster R&D commercialization and business innovation**

- Design and implement policy measures to encourage investments in R&D and innovation capabilities in the business sector.
- Foster research commercialization activities and science-industry linkages.
- Stimulate the development of an Information and Communications Technology (ICT) cluster and provide the cluster with common infrastructure and other tools for joint R&D and innovation.
- Actively use public procurement to promote innovation in the private sector. Consider testing innovative procurement methods for e-government applications.

**Provide sufficient resources for policy implementation and impact evaluation**

- Strengthen the capacities of the ministries designing and implementing R&D and innovation policies, and provide them with the resources and tools to implement strategies and programs effectively.
- Include R&D institutes, companies, and universities in the policy-making, strategy development, and program design processes.
- Improve communication and coordination among universities, R&D institutes, and the private sector companies.
- Increase awareness on Intellectual Property Rights (IPR) protection, and design and implement measures to encourage patenting among firms and R&D institutes/universities.
- Improve legislation and simplify administrative processes related to R&D and innovation.

**Improve coordination among different government levels**

- Establish effective mechanisms to coordinate and harmonize the S&T and innovation policies, strategies, and programs at state, entity, and canton levels.
- Ensure that the laws and regulations related to business, R&D, and innovation are harmonized at different levels of governance in the country.
- Formulate a policy mix that provides complementarity and avoids overlaps between policy instruments at state, entity, and canton levels.

**Build statistical infrastructure to monitor R&D and innovation activities**



- Implement innovation and R&D surveys at the country level.
- Build science and technology statistics following international standards.

## INTRODUCTION

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7. There is growing worldwide awareness of the critical role that innovation plays in economic development. In April, 2009, in Sarajevo, the Western Balkan Countries (WBCs) signed a Ministerial Joint Statement calling for enhanced regional cooperation to promote innovation. The European Union (EU) has been at the forefront of this approach, urging member countries to spend more and better on research and innovation. To support the effort in the Western Balkans, the EU contracted the World Bank in June, 2011, to assist the region in developing a Regional R&D Strategy for Innovation.

8. A two-pronged strategy is emerging, following extensive and multiple consultations with public and private sector representatives. This strategy combines: (i) the advocacy of policy reforms at the all levels to improve the impact of research and innovation on economic growth and job creation for the long term; and, (ii) joint investments in selected regional initiatives that will help alleviate existing bottlenecks in the short-to-medium term. At the all levels, countries will need to substantially enhance Research and Development (R&D) investment on a sustained basis, and transform innovation systems – the research base, public institutions, private sector, market actors, and linkages across them – into more effective, coherent, and competitive systems. In this process, enabling policy frameworks and offering adequate incentives to actors are crucial to stimulate new ideas, their transfer to industry, and private sector investment in risky and long-term projects related to innovation.

9. In the context of the recent economic downturn, many developed countries have increased investment in R&D and have used innovation policy as a counter-cyclical instrument to secure new sources of growth. If WBCs do not emulate such efforts and increase investment in knowledge, the gap – both technological and economic – between WBCs and their future EU partners may increase. To avoid this, governments will, in short, need to spend more and better in research and innovation.

10. This note describes Bosnia Herzegovina's profile in terms of research and development (R&D) capacity, and discusses the main features of the research system, its strengths and weaknesses, recent policy trends, and challenges. The first section details the importance of R&D for innovation and economic development and growth. The second section briefly describes trends in both economic performance, and R&D and innovation in BiH. The third section outlines the governance system for research, the process of policy making, main agencies and actors, and briefly discusses recent strategies for research and innovation in BiH. Section five reports the current policy programs and instruments and other important policy developments. The note concludes with a discussion of remaining challenges in the area of research and development, and identifies potential policy areas suitable to policy collaboration among the WBCs.

## THE IMPORTANCE OF RESEARCH AND DEVELOPMENT (R&D)

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11. The capacities to undertake scientific and applied industrial research, and to transfer, adapt and assimilate new technologies into economic structures and diffuse them into society, are critical to national competitiveness and growth as nearly everyone can perceive from the ferocious pace of technological change in consumer goods alone.

12. Ample and compelling evidence confirms this perception. Several international studies demonstrate that R&D spending increases result in a corresponding increase in productivity, leading to per capita income growth. These increases mutually reinforce each other and lead countries to long-term sustained growth rates. At the country level, R&D explains up to 75 percent of the differences in total factor productivity growth rates, once externalities are taken into consideration.<sup>2</sup> At the firm level, R&D expenditures of enterprises are often correlated to higher sales and productivity growth, as well as propensity to export. Furthermore, product innovation, which results from R&D efforts, leads to employment growth and more qualified and better paid jobs by expanding demand and new business opportunities.<sup>3</sup>

13. The potential impact of investments in research and innovation on productivity growth is even higher for developing countries, given the opportunity for catching up associated with larger investments in innovation.<sup>4</sup> Results from a study using firm-level data for the Western Balkans show that innovative firms grow 15 percent faster in sales and 8 percent faster in labor productivity than non-innovative firms.<sup>5</sup> Firm R&D expenditures significantly contribute to growth in sales by 14 percent and labor productivity by 7 percent. Furthermore, when firm R&D, training, and infrastructure services are compared, R&D is shown to have the highest correlation to sales growth. For neighboring countries, similar evidence is reported.<sup>6</sup> Reaching the Lisbon Agenda target (R&D spending of 3 percent of Gross Domestic Product (GDP)) could generate a permanent increase between 8 and 13 percent in Bulgaria and Romania's export levels, for example.

14. Investing in R&D is necessary not only to enhance firms' innovation capacity but also to "absorb" external technology properly by: screening and identifying technology options; adopting and adapting foreign technology and know-how; and, benefiting from spillover effects from foreign direct investments and from other sources of knowledge transfer. As is well recognized, informal knowledge activities and day-to-day learning are also sources of ideas. Formal R&D is important, however, as it represents a systematic and more effective approach to technological innovation – both radical and incremental innovation – in both the manufacturing and non-manufacturing sectors.

15. Public support of research and innovation is critical particularly in the context of stagnant economies. Public investments in research and innovation consistently have been a priority in economic stimulus packages of OECD economies. In this sense, a growing consensus on the importance of counter-cyclical innovation policies – increasing R&D investment and improving framework conditions – is

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<sup>2</sup> Griliches (1979).

<sup>3</sup> Harrison *et al* (2008).

<sup>4</sup> See Lederman and Maloney (2003) for estimates of social rates of return for R&D.

<sup>5</sup> Seker (2012).

<sup>6</sup> World Bank (2011).

emerging. Finland and South Korea are at the forefront of this approach, increasing public spending on innovation even in the context of tighter fiscal policies.<sup>7</sup>

16. Building an enduring and conducive environment for innovation requires a comprehensive policy agenda and multiple resources, which are often scarce in developing countries. Smart policy design is needed, which requires devising cost-effective and sustainable strategies that will bring results in both the short and long run. Market and coordination failures may hinder progress. The lack of linkages among actors in an innovation system – between public research institutions and the private sector, within and across industries – can prevent innovation investment and business from reaching their growth potential. Failures in financial services and other specialized resources discourage private investment in innovation and new business creation leading to an inefficient allocation of resources. Interventions are therefore needed at different levels and through different mechanisms, in collaboration with the private sector and other relevant decision-makers.

## 1. WHERE THE COUNTRY STANDS

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### Economic Performance and Structure

17. Signing the Dayton Peace Agreement in 1995 established BiH as a sovereign state consisting of two entities; the Federation of BiH (FBiH) and the Republika Srpska (RS). In March 2000, Brčko District (BD) was added as a self-governing administrative unit of FBiH and RS (Figure 1). The FBiH itself is further divided into 10 cantons, which have a high degree of autonomy.

18. BiH is a small (pop. est. 3.7 million in 2011) and upper middle-income country (according to the World Bank Income Classification) that has accomplished a great deal since the mid-1990s. GDP per capita was estimated to \$7,607 in 2011, in constant 2005 international dollars.<sup>8</sup>

19. The post-war economic growth of BiH was based on domestic demand, stimulated by foreign investment, raw materials, and relatively cheap labor. The period between 1997 and 2007 witnessed an important industrial restructuring in terms of reconstruction and modernization of the pre-war industrial base, based on wood-processing, metal-working, textile, and motor-car industries. With the onset of the worldwide financial crisis in 2008-2009, foreign investment reduced considerably, thus exacerbating the problem of the country's low economic competitiveness.

20. Between 1998 and 2008, BiH experienced strong growth, with Gross National Product (GNP) per capita nearly quadrupling and poverty falling from nearly 20 percent to around 14 percent. Despite this strong economic performance, the onset of the global financial crisis in late 2008 has had a negative impact on the economy and the country is now in the midst of a double dip recession.<sup>9</sup> In response to this crisis, the country is now embarking on a new growth model that emphasizes exports amid a period of slow growth and escalating volatility in Europe. This strategy is forcing Bosnia and Herzegovina to

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<sup>7</sup> World Bank (2009).

<sup>8</sup> World Development Indicators (2012).

<sup>9</sup> World Bank (2012). The economy rebounded in 2011 – growing by 1 percent after a deep recession in 2009 caused GDP to contract by 2.9 percent – before returning to recession in 2012. Over the medium term, however, economic growth is projected to gradually increase from 0.5 percent in 2013 to 3.5 percent in 2015. Further information at: World Bank (2013). Group – Bosnia and Herzegovina Partnership Country Program Snapshot, April 2013,

become more competitive, which will require the country to upgrade its physical infrastructure, business environment, and human capital.

21. BiH's industrial performance in R&D is characterized by limited productive and technological capacity and excessive reliance on external knowledge generation. The manufacturing sector represents 13.6 percent of GDP, with manufacturing exports at 14.5 percent of total exports.<sup>10</sup> The small and medium enterprises (SMEs) share of the manufacturing sector is 13 percent and market value added (MVA) in GDP is estimated at 9.3 percent.<sup>11</sup> The share of medium high and high technology exports in total exports is estimated at 21.3 percent.

22. The country continues to rely heavily on Western Europe for trade and credit. Although exports have grown in recent years, particularly base metals and electricity, the expansion of imports into the country as a result of recovering domestic demand and rising international oil and food prices have led to increases in the country's trade deficit.

23. With about 20 percent of all those employed in BiH working in agriculture, the sector remains important for employment and as a socioeconomic buffer, despite a decline in the working-age population in rural areas. Yet the value of the agro-food sector is shrinking as a share of GDP, and BiH's agro-food trade deficit has been growing in recent years. Agriculture's share in BiH's economy decreased from 15.1 percent in 1999 to 9.8 percent in 2007. Although agro-food sector growth has been positive, it has lagged in comparison to overall economic growth.<sup>12</sup>

24. The country applied for WTO membership on May 11, 1999, and accession negotiations are expected to conclude in 2013.<sup>13</sup> As a potential candidate to enter the European Union (EU), BiH signed the Stabilisation and Association Agreement (SAA) with the EU in June, 2008, encouraging BiH "to develop socio-economic policies which include strengthening the role of science in the country and prospects for national economic growth based on domestic knowledge-intensive businesses".<sup>14</sup>

## R&D and Innovation Trends

25. As in other former socialist countries, capabilities in S&T – specifically R&D infrastructure and qualified human capital for R&D – as well as the governance of research and higher education institutions, have suffered an inflexion point with the transition. During the socialist period, investment in S&T was considered essential "productive force" for industrial progress. Prior to the disintegration of former Yugoslavia in 1990s, the BiH research system was prosperous. Estimates indicate that investments in R&D were as high as 1.5 percent of GDP and industry played a significant role, with important industrial companies who had created and developed large research laboratories with several hundred researchers.

26. However, during the country's transition to independence, these areas were largely ignored. Public policy fundamentally focused on economic restructuring through privatization and institutional reforms. Investment in research is now very limited. Statistics on R&D activities are lacking and is difficult to have a BiH estimate of overall R&D investment. As reported by Silajdzic (2012), during the

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<sup>10</sup> Silajdzic (2012).

<sup>11</sup> (ibid).

<sup>12</sup> World Bank (2013).

<sup>13</sup> Deloitte (2012).

socialist period, on average, estimates indicate that Gross Expenditures on R&D (1985-1989) in GDP was 1.85 percent compared to an estimated 0.03 percent in recent years.<sup>15</sup> Restructuring of the innovation system, including the R&D system, was not considered important. As a result, past capabilities for innovation were eroded.

27. The major problems facing the current innovation system are: weak R&D capabilities in both the public and private sector; R&D undertaken at universities having a weak relevance to industry; a marginal government funding, so that research institutes are basically operating as independent research and consulting organizations;<sup>16</sup> and, an absence of links between science and industry as the private sector barely invests in R&D. This context is emphasized by the lack of effective policy measures for innovation or cohesion between industrial and innovation policy.

## R&D Spending

28. Due to the decentralized research system and lack of official collection mechanism for STI statistics, data on R&D expenditure in BiH is not easily available and it is therefore difficult to come up with an exact evaluation of overall public R&D investment. The United Nations Educational, Scientific, and Cultural Organization (UNESCO) estimates that BiH R&D spending averaged 0.02 percent of GDP in the 2003-2007 period whereas other sources estimate current Gross Expenditures for R&D (GERD) between 0.1 and 0.14 percent. This is a much lower share than neighboring Serbia (0.35 percent), Croatia (0.90 percent), and Montenegro (1.10 percent) or the EU-27 average of 1.84 percent in 2008.

29. The RS Institute has also published data on R&D activities. The latest R&D survey presents data for 2011, indicating that gross domestic expenditure on R&D was €13.4 million. The highest share of funds for R&D was spent for “exploration and exploitation of the Earth” (25.7 percent) and “general advancement of knowledge” (23.0 percent). The majority of R&D activities were in applied research (47.2 percent), experimental research (40.6 percent), and fundamental research (12.1 percent).

30. According to RS, there were 898 people, both full-time and part-time, engaged in R&D in 2011 in the RS. The full-time equivalent R&D personnel were 659.7. Out of the total number of employees, researchers have the biggest share (65.9 percent), followed by research associates (13.4 percent), technicians (10.1 percent), other support staff (7.6 percent), and management (3.0 percent). The majority of researchers (75.7 percent) were employed in the higher education sector. The shares of researchers employed by the business sector and government in the same year were 14.5 percent and 9.8 percent, respectively. The largest number of researchers was engaged in the field of engineering and technology (42.6 percent).

## Research Institutions and Infrastructure

31. As of 2010, the bulk of BiH public research is conducted at the universities. During the socialist period, Bosnia-Herzegovina's R&D system consisted of 36 R&D institutes and 22 scientific

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<sup>15</sup> Strategy of science development in BiH 2010-2015.

<sup>16</sup> Silajdzic (2012) and Bartlett *et al.* (2012).

research laboratories, many of which were independent and closely linked to industry. Currently, the R&D system consists of 42 formally registered institutes for science and research activities, mainly within universities. However, these barely perform any research activities, and what links they do have with industry are weak.<sup>17</sup>

32. The country counts with the following number of universities and research institutions:
- 8 public universities, 6 in FBiH and 2 in RS;
  - 9 private universities, 3 in FBiH and 6 in RS;
  - 21 research institutes in RS (15 public with different organization and 6 private) and around 30 in FBiH (20 public and 10 private);
  - 3 Innovation Centers and several Technology Parks;
  - 2 Academies of Arts and Science: Academy of Science and Arts of BiH and Academy of Arts and Science of RS.
33. The largest University in terms of staff is the University of Sarajevo, followed by the University of Banja Luka, the University of East Sarajevo, the University of Tuzla, the University of Mostar, “Dzemal Bijedic” University of Mostar, the University of Zenica, and the University of Bihac. In total, there are 140 schools and 10 art academies, 16 colleges, 4 religious schools, and 4 international studies institutes.
34. The majority of the existing R&D infrastructure is located at public universities, and most of these activities are being conducted in Bosnia and Herzegovina. Yet research institutes currently do not meet the criteria for scientific research activity, particularly in FBiH. Private universities are only engaged in education.
35. The war in the 1990s had a detrimental effect on the R&D infrastructure in the country. Many institutions that were at the forefront of technological development were demolished during this period, and severe budgetary constraints have made it impossible to invest in new equipment. This has left behind institutions that do not have the resources to conduct anything other than theoretical research. This is reflected in the limited number of PhD programs offered at universities in BiH, most of which are in social sciences and humanities.
36. According to the survey and interviews conducted by at 10 research institutions, concerning laboratory facilities, weaknesses related to R&D infrastructure and management were noted regarding the level of authority and resources possessed by the managerial and R&D staff to carry out their duties.<sup>18</sup> In addition, issues were reported in the approach that laboratories’ management took toward investment plans and the overall lifecycles of the labs.

### Human Capital –Graduates in S&T and Researchers- and Brain Drain

37. Strengthening the public research base is not possible without qualified human resources. According to the BiH Statistical Agency, the highly skilled working age population represented only 6.7 percent of the total workforce in 2008. Moreover, the number of graduates in science and engineering in

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<sup>17</sup> Ministry of Science and Technology of RS and Institutes for Scientific Info-ISI.

<sup>18</sup> Elci (2013).

BiH is declining year by year.<sup>19</sup> The total number of students in tertiary education for academic year 2009-10 was 43,928 in RS and 71,610 in FBiH, compared to 27,421 (RS) and 62,546 (FBiH) for 2005-06.

<sup>20</sup> The number of students in Social Science and Humanities fields has remained constant at around 27,000.<sup>21</sup>

38. In total, there were 197 FTE researchers per million inhabitants in 2010, far below Western Balkans (787) and EU-27 (3,166) averages.<sup>22</sup> Of the researchers in BiH, 82.7 percent are employed in higher education, while the rest are spread between the business and non-profit sectors. Most researchers in the field of science were in engineering and technology (37.2 percent).<sup>23</sup> A key challenge, therefore, lies in ensuring the training of a new generation of scientists in BiH universities or abroad, as well as retraining existing scientists in new experimental technologies.

39. There has also been a recent increase in the number of colleges offering degrees in management, which has led to an unfortunate decrease in the number of students interested in R&D. This has resulted in a further drain on the human resources available for R&D. Policies to reduce brain drain or increase mobility of scientists or highly skilled workers are few and without strong financial support or coordination between entities and regions within BiH.

40. The development of human resources for science and technology in BiH is hampered by the following three factors:<sup>24</sup>

- R&D jobs are unattractive in BiH because of low salaries, lack of social security coverage, limited career incentives, and poor employment opportunities.
- BiH has suffered from the departure of its most expert and highly qualified young people. Scientists that stayed in the country left the R&D sector for better-paying jobs in the private sector, which has resulted in a shortage of experienced middle-aged researchers.
- Resources for funding longer-term research or researcher mobility are almost non-existent, and donor assistance is often short-term and small, targeting concrete investments in certain key areas, such as S&T infrastructure and modernization of laboratories.

41. Life-long learning is a new concept, and the majority of private companies do not invest in their own human resources through additional training and courses.

## The Business Sector

42. The productive sector in BiH is highly concentrated in SMEs. The country has limited productive and technological capacity. Technology acquisition is largely from external sources (foreign markets),

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<sup>19</sup> WDI indicators (2012).

<sup>20</sup> Statistical Bulletin, Higher education, Institute of Statistics or RS, no.7, Banja Luka, 2010. Statistical Bulletin, Higher education, Federal office of statistics, Sarajevo, 2010.

<sup>21</sup> *ibid.*

<sup>22</sup> WDI indicators (2012).

<sup>23</sup> IIMS ERAWATCH (2012).

<sup>24</sup> Deloitte (2012).



and primarily concerns embodied technology through machinery and equipment imports. The manufacturing sector represents only 14 percent of GDP.<sup>25</sup>

43. SMEs have a minor role in R&D in BiH, although no official reports or data are available to document their involvement. Estimates for industrial R&D in the Republika Srpska indicate that small companies invest 0.3 percent of their annual income in R&D, while medium-size firms invest 0.63 percent. The RS Institute of Statistics, in cooperation with the RS Ministry of Science and Technology, published data on innovation activities of companies in the period 2006-2008 through a pilot survey following Community Innovation Survey (CIS) methodology. According to the results of the survey, 32.53 percent of companies introduced innovative goods or service in the period covered by the survey. The share of companies that introduced process, organization, and marketing innovations were 41 percent, 31.11 percent, and 32.12 percent, respectively.

44. According to a survey of 117 manufacturing firms in TE and BiH,<sup>26</sup> 9 percent of firms conduct formal R&D, and the ratio R&D to sales was 1.24 percent, well above the RS survey result. Seventy-eight percent of the firms declared themselves to be active in innovation. Lack of collaboration with R&D institutions and lack of access to R&D subsidies were reported as the main obstacles to innovation.

45. In 2009, 30 percent of BiH firms had internationally recognized quality certifications, compared to 19 percent for the whole region of the Western Balkans.<sup>27</sup> The Institute for Standardization of Bosnia and Herzegovina (BAS) proposes a strategy for standardization in BiH, prepares and publishes standards, represents BiH internationally, collects and disseminates information on standards and standardization, and also grants applications and maintains databases on quality certificates. Over the last decade, the number of certificates has rapidly increased, as indicated in Table 1.

**Table 1: ISO 9001**

	2007	2008	2009	2010	2011
<b>Albania</b>	23	43	155	52	164
<b>BiH</b>	<b>652</b>	<b>811</b>	<b>909</b>	<b>944</b>	<b>1119</b>
<b>Croatia</b>	2073	2302	2567	2102	2117
<b>FYR Macedonia</b>	255	271	...	...	...
<b>Montenegro</b>	136	160	157	85	146
<b>Serbia</b>	1987	2091	2733	1790	2868

Source: The ISO Survey of Certifications 2011

46. Before the transition from socialism, the country had an economy with a large industrial sector that was technologically advanced. Companies such as Energoinvest were at the forefronts of their fields and employed a large number of highly trained technical workers (see Box 1). With the aim to gain further insight into business R&D in the country, interviews with four private sector companies, which have R&D capabilities/activities, were conducted during the preparation of this report. Results are summarized in Box 1.

### Box 1: Company Cases

<sup>25</sup> BH Statistical Agency.

<sup>26</sup> See Silajdzic (2007). The study relies on data collected through an extensive firm level survey of 227 firms from the manufacturing industry.

<sup>27</sup> World Development Indicators (2012).

- **ENERGOINVEST** - The company was created 62 years ago and was the biggest firm in the technology and engineering services sector in Yugoslavia, with 42,000 employees and turnover of around 1 billion USD by the late 1980s. It operated as an export-oriented company conducting business in more than 20 countries, from Mexico to Malaysia. It was also a major R&D performer with 30 RDIs developing technologies.
- Today it is the leading company in BiH conducting design and realization of complex plants in the country and abroad in the fields of electric power, hydro civil construction and architecture, automation thermal power and process plants, and communication technologies. The number of employees is around 678. The company operates in various markets both in WBCs and in other parts of the world. Sixty-seven percent of the company is owned by the government and rest was privatized in 1998; 22 percent is owned by investment funds and 11 percent by small shareholders. It still has the technological documents of specific technologies as their IP, which they transfer to companies in other countries. Also, the company keeps in contact with the former employees, the majority of whom live abroad.
- The company works on a low profit margin and income is mainly used to cover salaries and operational costs. Due to financial difficulties and the lack of finance for revitalization of R&D, the company cannot invest in R&D and innovation activities. Management plans to raise funds to establish production facilities and testing laboratories next year, creating jobs for 100 people. The company also requires funds for investing in ICT infrastructure.
- The company collaborates closely with the University of Sarajevo and has recently signed a protocol with the schools of engineering on S&T collaboration. It also contributes to the curricula development activities of the schools and provides internship opportunities to the students. ENERGOINVEST plans to establish a joint R&D institute together with the University of Sarajevo, but does not have sufficient funds. The company has suppliers of secondary equipment in BiH, but the capabilities and qualifications must be upgraded.
- **ICT Companies**
- There is a dynamic ICT sector in BiH. Three ICT companies, which develop innovative products and services, were interviewed in Sarajevo. Companies raised the following as major issues:
- The government funding for R&D and innovation is very limited and is difficult to access due to the high level of bureaucracy.
- The current governance structure of the ministries responsible for S&T and private sector development at state, entity and canton levels negatively affects companies. The main reasons are the complicated structures, non-harmonized policies, and non-compatible laws, regulations, and administrative procedures between different levels of governance.
- Access to finance is a major constraint to the growth and survival of start-ups and SMEs.
- Currently, the government is the major buyer of the ICT products and services. ICT firms in BiH have the capabilities and skills to provide state-of-the-art solutions to the government. However, the public procurement rules do not favor local SMEs.
- An unfavorable business environment, corruption, and the “grey” economy are the major impediments to the private sector investing in innovation.
- Brain drain in the ICT sector is very high due to the incentives provided by other countries, such as Germany, and it is difficult for companies to find qualified staff in the sector.
- Collaboration between universities and the private sector is low. It is necessary to increase collaboration on R&D and curricula development, and have legislation in place to regulate internships.
- Companies express the need for creating an ICT cluster and having a common infrastructure, such as a data center for small ICT companies to use jointly.

Source: Elci, (2013)

## Industry-science Linkages

47. Even though the war destroyed previous strong linkages between business and science, BiH reports moderate collaboration in respect to the universities and industry. According to the Global Competitiveness Report, in 2012, the country ranked 48<sup>th</sup> on this indicator, which compares well with an average rank of 88 for other countries in the Western Balkans and 40 for the EU.<sup>28</sup> However, respondents to the World Bank Policy Questionnaire declared that the links between business and science in BiH are quite limited, especially with respect to R&D and other innovation activities. Some universities in BiH have a few Public Private Partnership (PPP) initiatives to establish specialized firms, but these are mostly stand-alone projects. Some universities also help firms reach out to foreign universities for R&D inputs. However, this agenda belongs primarily to the Ministry of Civil Affairs (MoCA).

48. The government is taking steps to change this. Strategy and policy documents such as the Development of Industrial Policy in FBiH; Development of Industrial Sectoral Strategy of RS; the Strategic Action plan for Development of Education in BiH 2008-2015; and the Strategic Development of SMEs in RS increasingly stress the importance of public-private collaboration for innovation.

49. According to the background study conducted by the World Bank<sup>29</sup>, a survey of 10 leading universities and research institutions in BiH indicated that none of them has a unit for knowledge transfer and research commercialization. Nor do they have employ staff responsible of this activity.<sup>30</sup> The weak absorptive capacity of local industries was considered the most important barrier cited by the organizations involved in knowledge transfer/research commercialization. Four such organizations (Hydro-Engineering Institute of Civil Engineering Faculty Sarajevo, Institute for Genetic Engineering and Biotechnology, IGT R&D Centre of Gas Technology and Institute of Protection, Ecology and Informatics, Banja Luka) out of the 10 declared that they provide external services. These services mainly include contract research, certification, and consultancy to the private sector; and, collaborative R&D, testing, analysis, and training for the public and private sectors in BiH. Although at a lower level, Institute of Protection, Ecology and Informatics in Banja Luka, and IGT R&D Centre of Gas Technology provide services at the regional level to other WBCs, while the Institute for Genetic Engineering and Biotechnology provides contract research to the public sector at the international level.

50. According to the survey, universities and research institutions maintain that participating in the EU Framework Programs and producing scientific publications in referred journals are the most important activities for knowledge transfer and research commercialization.<sup>31</sup> Because local industries lack sufficient capacity in this area, there is an increased interest from government institutions to promote the creation of technology transfer units in state universities.

51. Other barriers for increasing research quality and collaboration with European Research Area (ERA) are:

- Lack of funding and insufficient state support for R&D;
- Lack of modern research infrastructure;
- Limited knowledge and expertise of local researchers, as well as brain drain; and,

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<sup>28</sup> Global Competitiveness Report (2012).

<sup>29</sup> Elci (2013)

<sup>30</sup> At the University of Banja Luka, there is “University Entrepreneurship Center” whose activities include technology transfer.

<sup>31</sup> Elci (2013).

- Lack of legislation and long-term strategies in the area. Policies are being developed to reduce these constraints; and,
- Consultations with stakeholders also indicated that “language” fluency maybe the barrier

52. Among several initiatives at the state level, there are policies improving the quality of university research laboratories and infrastructure; as well as PhD training schemes where the private sector must be involved.

53. The University Sarajevo School of Science and Technology, the University of Banja Luka, and the University of East Sarajevo declared that they have a policy regarding IP ownership in their organizations. In the University Sarajevo School of Science and Technology, the school itself owns the IP rights, whereas the University of East Sarajevo shares the rights with the government. At the University of Banja Luka, the inventor owns all rights of intellectual property. There are no specific incentives provided to researchers to promote protection and commercialization of IP.

### S&T Outputs and Innovation Performance

54. Overall, the country innovation performance is low, by international standards. According to the Global Innovation Index Rank of 2012, BiH is 72 out of 125 countries, below the average of other countries of the region (60). The number of patent applications has decreased from 372 in 2005 to 92 in 2007. On the other hand, the number of resident patents granted increased from 55 to 70 in the same period. In 2010, only one patent was filed by BiH in the United States, while the average of the Western Balkans is 60. The largest numbers of patents applied are those from the pharmaceutical and cosmetic industries, followed by the chemical industry, bio-technology, and medical engineering. These related industries account for over three-quarters of all patent filings. Other important technological fields are civil engineering, architecture and mining, and service users and equipment.

55. The Institute of Statistics, and the Ministry of Science and Technology from the Republic of Srpska, conducted a pilot innovation survey following CIS methodology. Results reported innovation activities from companies for the period 2006 to 2008. The survey identified that, during the survey period, 32.53 percent of companies in this region introduced innovative goods or services; 41.01 percent engaged in process innovation; 31.11 percent had organizational innovations; and, 32.12 percent produced marketing innovations.<sup>32</sup>

56. BiH’s performance for some indicators of the knowledge economy is significantly lower in comparison to Europe and Central Asia (Figure 1). The best indicator performance is in tariff and non-tariff barriers, although the country is still far behind regional averages. Regarding all other indicators, including availability of computers, scientific publications, and patents granted, BiH does not perform well in comparison with the region. From the analysis of the four main pillars of the knowledge economy (Figure 2), it appears that BiH’s economic incentive and institutional regime is the best pillar of the four. The country lags far behind the region’s averages on innovation, ICT, and education.

57. The production of scientific knowledge in the country is modest and the quality of this research ranks among the lowest in the region and in Europe.<sup>33</sup> The total number of BiH scientific publications over the period 1971-2012 in journals covered within the Scopus Database was 4,671. The number of

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<sup>32</sup> Elci (2013).

<sup>33</sup> SCIMAGO Research Group (2012).

scientific articles per million inhabitants was of 16.9 in 2009, extremely low compared to the average of Western Balkans countries (125) and EU-27 (496). A summary of the scientific performance of the country is presented in the Box 1. BiH is the third country from the WBC in publication production. However, while total publications have increased from 98 to 663 in the period 2003-2010, this scientific activity underperforms evolution reported on average for Eastern Europe and EU-27. Publications per thousand-inhabitants have declined in the same period, from 39 to 6.

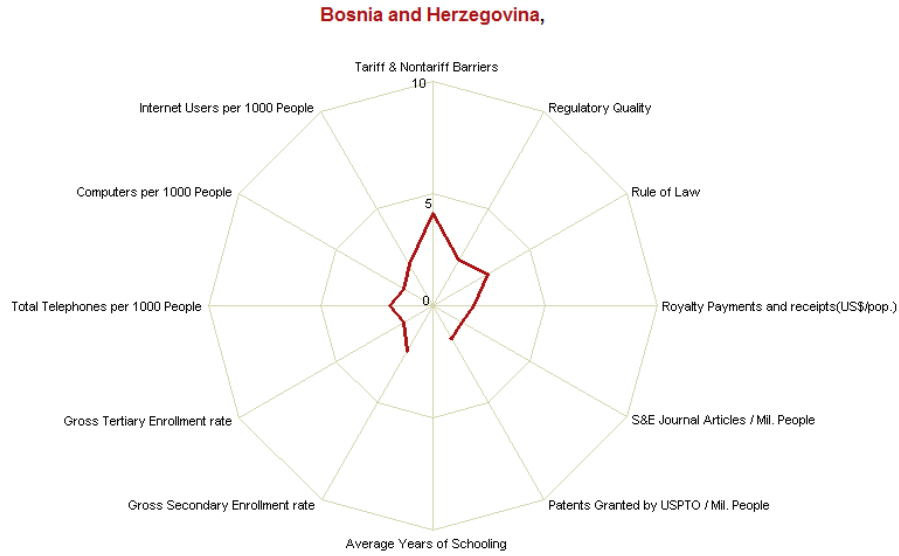
58. In terms of quality of scientific publications, the average citation impact (normalized) for the period 2003-2010 was 0.56, one of the lowest among the WBCs and in the bottom of the Eastern Europe countries, far below the EU-27 average. In addition, the number of citations per document in BiH (2.01) is the lowest in the WBCs and the second worst in Eastern Europe. Higher education institutions produce 51 percent of total publications, while health institutions produce near 38 percent (the highest of the WBCs and higher than the EU-27 and WBC averages). The public sector rate is near 1 percent. The citation percentage is near 60 percent for higher education, almost 30 percent for health, and less than 5 percent for public institutions.

59. For the period considered for the analysis 2003-2010, the most productive institutions in the country (more than 500 documents) are the University of Sarajevo (967 documents) and the Clinical Center University of Sarajevo (672 publications). Researchers affiliated with the University of Sarajevo have published over 60 percent of all publications produced in BiH.<sup>34</sup> As for the scientific areas covered by publications, the main fields include medicine (26.8 percent), engineering (14.1 percent), computer sciences (10.6 percent), social sciences (7.8 percent), and agricultural and biological sciences (5.2 percent). Researchers in BiH co-authored publications mainly with researchers working in regional universities. The University of Zagreb and University of Belgrade are the top two universities in co-publication.

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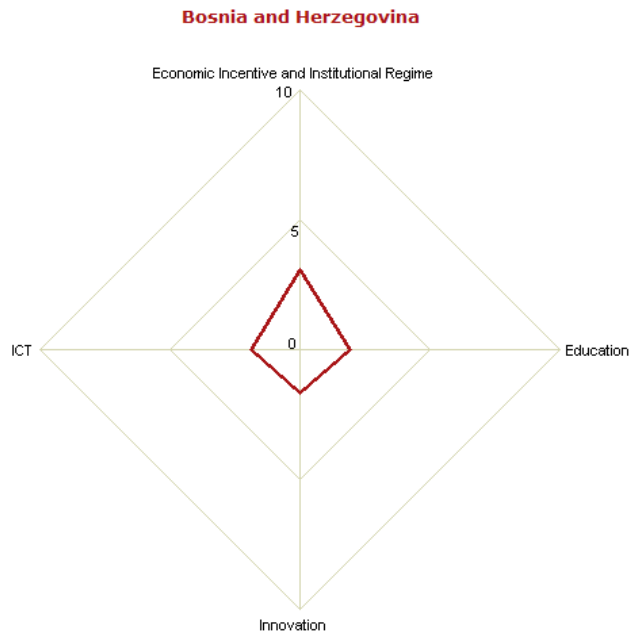
<sup>34</sup> SCIMAGO Research Group (2012).

**Figure 1: Bosnia and Herzegovina performance on key variables in comparison to Europe and Central Asia**



Comparison Group: **Europe and Central Asia**; Type: **weighted**; Year: **most recent (KAM 2012)**

**Figure 2: Knowledge Economy Index Pillars – Bosnia vs. Europe and Central Asia**



Comparison Group: **Europe and Central Asia** Type: **weighted** Year: **most recent (KAM 2012)**

*Source:* Knowledge Assessment Methodology Indicators (KAM 2012) based on World Bank Development Indicators (World Bank, 2012).

**Box 2: The State of Scientific Performance in Bosnia and Herzegovina**

- Bosnia and Herzegovina (BiH) is the third country from the WBC in publication productions. Total publications have increased from 98 to 663 in the period 2003-2010, thus this production is still minor in comparison with Eastern Europe and the EU-27. Publications per thousand inhabitants have declined in the same period (from 39 to 6).
- The country presents great variations in the normalized citation index, an indicator of quality of research, peaking 0.69 in 2005 and with just 0.57 in 2010. The average of the period 2003-2010 is 0.56, one of the lowest of the WBCs and in the bottom of the Eastern Europe countries, far below the EU-27 average. In addition, the number of citations per document in BiH (2.01) is the lowest in the WBC and the second worst in Eastern Europe.
- BiH stands out within the WBC in the areas of medicine and social sciences, followed by agricultural and biological sciences. In medicine, the highest number of citations per document average per Scopus area is in Psychology. Less specialized areas are art and humanities, nursing, and neuroscience.
- International collaborations are high in BiH. From 2004 to 2007, the percentage of publications done with international collaborations was above the EU-27 and WBC averages (above 50 percent). During 2008 and 2009, international collaborations dropped under the EU-27 averages (just above 40 percent), and in 2010, collaborations in BiH were slightly higher than the WBC and EU-27 averages (almost 50 percent). International collaborations are conducted mainly with Croatian and Serbian institutions. Within Europe, most collaborations are with Germany and Slovenia, and outside of Europe with the United States.
- Collaborations between the private and higher education sectors are close to the EU-27 averages. For the period 2003 to 2010, 1.22 percent of collaborations were conducted between higher education and private institutions on average in BiH, which is close to the EU-27 average of 1.38 percent and much higher than the WBC average of 0.02 percent. However, there are no collaborative publications between private and governmental institutions, while in the EU, this rate is 0.56 percent on average.

*Source:* SCIMAGO Research group (2012).

60. In 2010, high-technology exports represented 3 percent of all manufactured exports, compared to 4.3 percent for the whole region. According to the Global Innovation Index Rank 2012, BiH ranked 72 in 2012 (among a total of 125 countries). As for other areas, the lack of official statistics is a problem. There are no data on innovation activities of the private sector. As explained by the Agency for Statistics of BiH, the first R&D and innovation surveys will be conducted in 2013 under an Instrument for Pre-Accession Assistance (IPA) project in accordance with the Frascati and Oslo Manuals. The Community Innovation Survey (CIS) will also be implemented for collecting innovation statistics.

61. According to the data provided by the Institute for Industrial Property:<sup>35</sup>

- Between 1992 and 2012, 1,197 patent applications were received by the Institute. The number of Patent Cooperation treaty (PCT) applications was 1,850 in the same period.
- In 2012, the number of national, PCT, and European patent applications were 52, 14, and 261, respectively.
- In the period covering 2004 to 2012, 27,471 requests for the extension of European patents were received.
- In 2012, 759 national trademark applications were submitted. International trademark applications through the Madrid Agreement were 2,988 in the same year.
- In the period 1992-2012, a total of 20,201 national trademark applications and 40,967 international registrations were made.

<sup>35</sup> Elci (2013).

- In 2012, 53 national industrial design applications relating to 184 objects of protection were submitted.
- Between 1993 and 2008, the number of national and foreign industrial design applications were 243 and 365, respectively.

62. The Institute states that the majority of the above applications were made by individual scientists, and institutional applications were quite low. The main reasons are the low awareness of IPR protection, the lack of university/Research, development and innovation (RDI) regulations for promoting patenting, and the low levels of R&D activities of the private sector. The largest numbers of patents applied are those from the pharmaceutical and cosmetic industries, followed by the chemical industry, biotechnology, and medical engineering. These related industries account for over three-quarters of all patent filings. Other important technological fields are civil engineering, architecture and mining, and service users and equipment.

### ICT Infrastructure and Diffusion

63. There were 60 Internet users per 100 people in BiH in 2011, compared to 54 for the Western Balkans and 72 for the EU. As regards mobile cellular subscriptions per 100 people, there were 85 per 100 people in 2011, compared to 106 in the region and 125 in the EU.<sup>36</sup>

64. The Association for Information Technologies in Bosnia & Herzegovina (BAIT) is a voluntary, non-profit association jointly created by 50 private leading companies in the field of ICT from BiH. BAIT members are IT companies whose basic activities are hardware trading, manufacturing and trading software, internet service provision, manufacturing, installation and service of networks, and network applications. BAIT is experienced in engaging in consultation processes with ICT policy makers for the promotion of an information society in BiH.<sup>37</sup>

65. The ICT infrastructure in BiH is not as advanced as the countries in the EU. However, the government has made a concerted effort to change this. The Ministry of Science and Technology of RS is currently working on the establishment of SARNET (Academic and Research Network of Republic of Srpska), which aims at building and developing the ICT infrastructure for higher education and R&D. This will facilitate participation in international projects and businesses dealing with ICT technologies. So far, work on SARNET has been advancing with construction of infrastructure (fiber optic cables) between cities in RS. The second phase of the project foresees expansion of the ICT infrastructure within cities, as well as connection between all universities and research facilities in RS. Three leading ICT companies in the country were interviewed in a background report for this study, with results from these interviews presented in Box 1.

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<sup>36</sup> WDI indicators.

<sup>37</sup> SCORE (2009).



## Intellectual Property Rights (IPR) System

66. BiH has an intellectual property protection ranking of 130, which is higher than the average Western Balkan ranking of 95 but lower than the EU average ranking of 40.<sup>38</sup> The Institute for Intellectual Property of BiH is a state-level institution responsible for all activities related to patent activities at the level of BiH and for cooperation with international patent organizations ((WIPO, European Patent Office (EPO) etc.), and also for patent data collection and processing. It was established in 2000. Its head office is in Mostar, with two branch offices in Sarajevo and Banja Luka. The Institute employs 50 staff, who carry out administrative tasks. Detailed examinations of patents are conducted by the Austrian Patent Office.

67. There is a need to increase the number and qualifications of staff. A number of projects were implemented on capacity building on IPR with the support of the European Commission (EC), United States Assistance for International Development (USAID) and EPO. The Institute is at the stage of signing a protocol with the Turkish Patent Institute for technical assistance and training. An IPA project has just started on IPR enforcement, which aims at building capacities in customs, police, and courts. There are about 20 patent attorneys registered by the Institute. They mainly represent foreign applicants. Their number and qualifications are found sufficient by the Institute.

68. The legal framework for IPR protection (patent law, trademark law, and industrial design law) is in place and is aligned with EU regulations, as noted by the Institute for Industrial Property. The Institute collaborated with the EPO in the establishment of the IT infrastructure in order to be eligible to become a full member of the EPO. There have not been major IPR reforms in BiH since 2003, when BiH signed a cooperative agreement with EPO that enabled the expansion of the European patent applications and patents into BiH. Thus, the European patent applications and patents become protected in BiH. However, there still a need for institutional improvements in this area.

## 2. THE RESEARCH SYSTEM – GOVERNANCE AND ACTORS

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69. The following section explores the nature and organization of BiH's R&D and innovation system—stakeholders, governance, stated strategy, funding and dynamics—with the aim of identifying possible weaknesses and resultant reform possibilities.

### Legal Framework

70. In 2007, BiH developed its legal and institutional framework by adopting laws on higher education; in 2009, the country adopted the Framework Law on Scientific Research Activities and the Coordination of Internal and International Scientific Co-operation in BiH Science. In parallel, the Strategy for the Development of Science in BiH: 2010-2015 on the state level was adopted in 2009, representing a significant step forward. Entity (RS and FBiH) strategies on technological and scientific development were in the public comment phase in July, 2011 and were adopted on July 17, 2012.

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<sup>38</sup> WDI indicators.

71. *Framework Law on Scientific and Research Operations and Coordination of the Inter-entity and International Scientific and Technical Cooperation (2009)*: In May 2009, the Parliamentary Assembly of BiH adopted this law, referred to in this note as the Framework Law on Science. The Framework Law on Science has created a more transparent legal basis for multi-level governance in the country, with a specified role for MoCA at the state level. The Law provides for the creation of a new coordinating body, the Science Council, for which the President and members were elected in April 2010. This body will contribute to the implementation of priority areas in science. The Framework Law also underlines the importance of the need to improve significantly the current S&T information system, including statistical data collection, according to international standards (EUROSTAT, OECD, and UNESCO).

72. *Framework Law on Higher Education in Bosnia and Herzegovina*<sup>39</sup>: This Law, established in 2007, sets out the basis for a reform process in higher education and establishes common standards for the recognition or accreditation of the universities through the Agency for Development of Higher Education and Quality Assurance. It also sets forth the mechanisms for the mutual validation of the university diplomas through the Center for Information and Recognition of Documents.

73. The legal framework for the scientific and research activities of the Federation of BiH consists of the following:

- BiH Framework Law on Scientific and Research Operations and Coordination of the Inter-entity and International Scientific and Technical Cooperation;<sup>40</sup>
- Law on Organization of Scientific and Research Activity in the Territory of the Canton,<sup>41</sup> and,
- Law on Scientific Activity in the Tuzla Canton;<sup>42</sup>
- Law on Scientific Activity in the Zenica-Doboj Canton.<sup>43</sup>

74. Where there is no law on science, the old law on scientific and research activity is still in place.<sup>44</sup>

75. ***The legal framework for STI in Republika Srpska:***

- BiH Framework Law on Scientific and Research Operations and Coordination of the Inter-entity and International Scientific and Technical Cooperation;<sup>45</sup>
- Law on Scientific and Research Activity RS and the Law on Amendments to the Law on Scientific and Research Activity RS as the general political framework for research organizations, institutions and financial support;<sup>46</sup>
- Law for Publishing RS and Law for High Education RS;
- 10 rulebooks on scientific publications, quality control, funding and training.

## Actors in Policy Formulation

76. The R&D system in Bosnia-Herzegovina is highly decentralized and compartmentalized across different ministries. There are seven ministries influencing the design and implementation of R&D policy.

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<sup>39</sup> Official Gazette BH No. 59/07.

<sup>40</sup> Official Gazette of BiH, No. 43/09.

<sup>41</sup> Official Gazette of the Sarajevo Canton, No. 10/04.

<sup>42</sup> Official Gazette of the Tuzla Canton, No. 6/99.

<sup>43</sup> Official Gazette of the Zenica-Doboj Canton, No. 7/99.

<sup>44</sup> Official Gazette of the Socialist Republic of BiH, No. 38/90

<sup>45</sup> Official Gazette of BiH, No. 43/09.

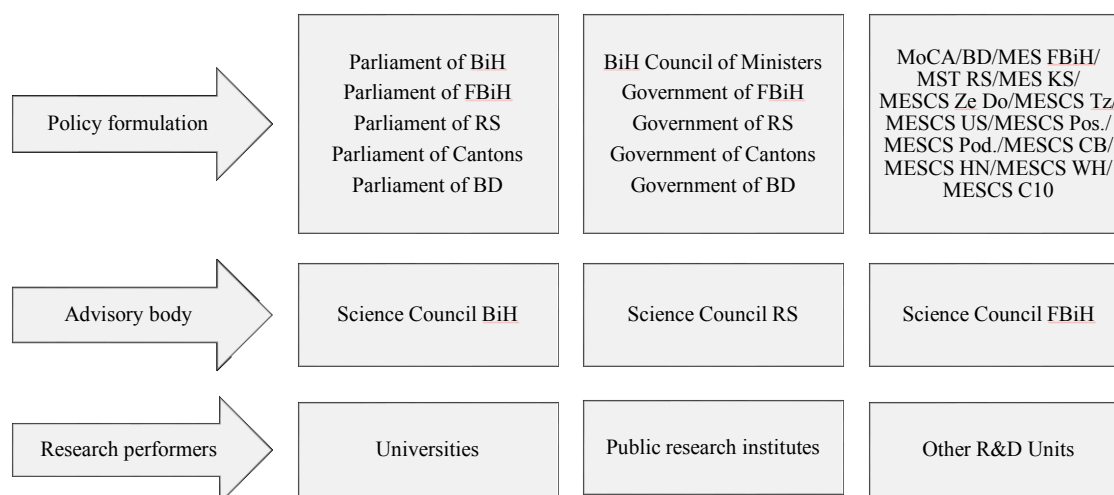
<sup>46</sup> Official Gazette of RS, Nos. 79/07, 112/07 and 13/10.

The overlapping and limited coordination across ministries makes policy coherence and the use of (limited) public resources difficult. The institutions responsible for R&D policy are:

- Ministry of Foreign Trade and Economic Relations of BiH;
- Ministry of Civil Affairs of BiH;
- Ministry of Science and Technology of RS;
- Ministry of Industry, Energy, and Mining of RS;
- Ministry for Education and Science of Federation of BiH;
- Ministry for Development, Entrepreneurship, and Small Crafts of FBiH; and,
- Ministry of Energy, Mining, and Industry of FBiH.

77. While the Constitution defines foreign policy, foreign trade policy, customs, monetary and immigration policies, and the operation of common and international communications facilities as the main policy functions of the BiH national government, other policy areas, including research and innovation, were left to the entities and are not considered national responsibilities. Currently, there are ministries responsible for research and innovation both at entity level and the canton level. MoCA deals with coordination activities in science policy in BIH at the State level (Figure 3).<sup>47</sup>

**Figure 3: R&D policy organization**



78. In FBiH, the *Federal Ministry of Education and Science (MES FBiH)* carries out administrative and other professional duties in STI, which cover development and coordination of scientific and research activity, protection of intellectual property rights, development of science and research institutions, support of basic and applied research activity, development of human resources, support of experimental

<sup>47</sup> Ministries with responsibilities in R&D and innovation are: i) Ministry of Civil Affairs of BiH; ii) Ministry of Education and Science FBiH; iii) Ministry of Science and Technology of RS; iv) Ministry of Education and Science Canton Sarajevo; v) Ministry of Education, Science, Culture and Sport Canton Zenica Dobo; vi) Ministry of Education, Science, Culture and Sport Canton Tuzla; vii) Ministry of Education, Science, Culture and Sport Canton Una Sana; viii) Ministry of Education, Science, Culture and Sport Canton Posavina; ix) Ministry of Education, Science, Culture and Sport Canton Podrinje; x) Ministry of Education, Science, Culture and Sport Canton Central Bosnia; xi) Ministry of Education, Science, Culture and Sport Canton Herzegovina-Neretva; xii) Ministry of Education, Science, Culture and Sport Canton West Herzegovina; xiii) Ministry of Education, Science, Culture and Sport Canton 10.

research on innovations, and development of new technologies. The Federal Ministry is responsible for the creation of the *Science Council FBiH* as an advisory body in implementation of RDI policy.

79. In the Federation, the authority has been further transferred to 10 cantons, which have primary responsibility for STI. Cantonal *Ministries for Education, Science, Culture and Sports* implement policy through their Departments for Higher Education and Science. The Ministries have established their own Science Councils with responsibilities similar to those of the national Council, with the main difference being that the Council proposes the budget for scientific activities and organizes the evaluation of scientific projects and programs. Only 3 of the 10 cantons report investment in the STI sector: Sarajevo, Tuzla and Zenica-Doboj. No official data are available for the other cantons.

80. In the RS, the *Department of Science and Department of Technology* under the *Ministry of Science and Technology of RS* is responsible for R&D. It is the main funding channel for research activities in the RS and oversees implementation of the strategy for technology development, incentives, and support to fundamental development, applied research, human resources development, information on the economic aspects of technology development, assignment and acquisition of material rights and production technology, development and enhancement of technology, creation of programs, and agreements on science-technical cooperation in accordance with the Constitution of Bosnia and Herzegovina. The main advisory body is the *Science Council of RS*, which, along with others, supports the Ministry during preparation of annual programs for scientific research, initiates domestic and international projects, and makes internal and external evaluation of the scientific research activities.

81. BiH has limited involvement in research policy through *MoCA*, which is responsible for coordination of activities, cooperation with the state ministries, and representation of the country in international scientific and technical cooperation activities. All other issues relating to STI are left to the states.

82. Ministries responsible for SME development include the following, where the coordination of SME policies at the national level is the responsibility of the Ministry of Foreign Trade and Economic Relations of BiH (MoFTER):

- *BiH Ministry of Foreign Trade and Economic Relations* - MoFTER prepares strategic documents for the country's economic system, business environment, and development and promotion of entrepreneurship;
- *RS Ministry of Industry, Energy and Mining* - the highest level of RS authority responsible for the SME sector. It defines measures of economic and development policy to support different economic activities, monitors the effectiveness of measures of industrial production on targeted sectors and companies (SMEs), and adopts and adapts technical regulations in line with EU legislation. This ministry has a major role in the implementation of the Strategy of the Development of SME in Republic of Srpska 2006-2010;
- *FBiH Ministry for Development, Entrepreneurship and Small Crafts* - responsible for creation and implementation of strategies for development of SMEs in FB&H, support to entrepreneurship development and crafts, technology transfer and development, training and education, etc; and,
- *FBiH Development Ministry of Energy, Mining and Industry* - main actor in charge of creation of legislation regarding industrial activities and development in FB&H.

Other STI stakeholders include the Government of Brčko District, Chambers of Commerce at all levels (national, state, and canton), development agencies, academic community, B&H Academy of Science and Arts in Sarajevo, RS Academy of Science and Arts in Banja Luka, and some ministries. Other policy implementation agencies include the Institute for Standardization of BiH, Institute for Intellectual Property of BiH, Institute of Metrology of BiH, Institute for Accreditation of BiH, Agency of Information Society of RS, and Agency for SMEs of RS.

### Advisory Bodies - Science Councils

84. The main advisory body of the Ministry of Civil Affairs of BiH in the strategic development of science is the Science Council of BiH, appointed by the Council of Ministers of BiH. The Science Council consists of a president and 12 members, of whom four come from FBiH in consultation with the cantons, three from RS, one from Brčko District, and five from the Ministry of Civil Affairs. The composition of the Science Council is finalized by the Ministry of Civil Affairs, taking into account the equal representation of all scientific fields in accordance to the classifications in the Frascati Manual.

85. *The Science Council of BiH* was created in 2010, primarily to serve as an advisory body to MoCA, coordinate science policies, and monitor the implementation of the Strategy for Science Development 2010-2015. The Council prepares and proposes instruments for statistical monitoring of STI and international reporting, and advises in establishing a STI system according to international standards,

86. *The Science Council RS* is the main advisory body in S&T strategy development in the Republic of Srpska. It is appointed by the Government of RS on the recommendation of the Minister of Science and Technology of RS. The Council consists of 15 members, an industry representative and two members from each scientific field. It monitors and evaluates the quality of scientific organizations, proposes the budget for scientific activities, and gives advice on setting up of technology parks. The Ministry of Education and Science FBiH also has a Science Council, which is mainly composed of academics. In addition, the cantonal Ministries of Education, Science, Culture, and Sport set up their own Science Councils.

## 3. POLICY DEVELOPMENT

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### Towards BiH Strategy

87. The R&D strategy in BiH is highly fragmented. The planning for R&D is done at the local, cantonal, and state level with project teams of experts nominated by the each ministry. The lack of accurate statistical data is seen as another major obstacle to the strategy process in BiH.

88. The main strategy document at the BIH level is the Strategy for the Development of Science in BiH (2010-15) (STI strategy). In addition, both RS and FBiH have drafted their strategy documents: Strategy for Technological and Scientific Development 2012-2016 (RS), and the Science Development Strategy 2011-2021 (FBiH). As of July 2012, these strategies were yet to be adopted by the respective

parliaments.<sup>48</sup> The STI strategy shares the vision of the Lisbon Agenda and aims to establish R&D as a key element for long-term development. The Strategy Action Plan outlines steps to increase cooperation between universities, research institutes, and industry, promote greater cooperation and collaboration with the European research network, advocate for the development of research infrastructure and quality to match European standards and increased participation in the EU FP7, as well as other international programs.

89. According to respondents of the World Bank questionnaire, these policy documents often do not translate into implementation on the ground. While various ministries are required to budget funds once a strategy document has been accepted, it is difficult to track whether this has been achieved.

90. In addition to the STI strategy, the BiH Directorate for Economic Planning also stresses R&D in its draft of Country Development Strategy (CDS). CDS establishes priorities for development of a scientific and technological base, along with enhanced cooperation and an appropriate institutional framework for developing research and business infrastructure. However the CDS was not adopted by RS, which proceeded to develop its own strategy for R&D.

91. *The BiH Strategy for Development of Science and Technology 2010-2015* was adopted in December 2009, together with its Action Plan. Sharing the vision of the Lisbon Agenda, the aim of the strategy is to pave the way for a leading role of R&D as one of the main factors for enhanced long-term development of BiH. At the same time, the Strategy aims at promoting stronger networking and joint research between universities, research institutes, and industry; greater participation of researchers and institutions in European research networks and ERA; development of research infrastructure according to international and EU standards; and participation in the activities of the EU FP7 as well as in other international programs. It also sets out concrete goals for increased R&D spending and employment, based on two outcome scenarios – conservative and optimistic – as seen in Table 2.

92. The STI strategy defines nine priority goals for the short-term period:

- Strengthening the Science Department in MoCA;
- Stronger cooperation with the EU, with the aim of using the Instrument for Pre-Accession (IPA) funds for strengthening the scientific research activities in BiH;
- Participation in the activities of FP7 as well as in other international programs;
- Planning funds in the budget of MoCA for co-financing of international projects;
- Establishing a mechanism of collecting statistical data and monitoring scientific activities;
- More intensive cooperation on exchanging information between ministries responsible for science and education;
- Establishment of the Science Council;
- Tax incentives for companies that invest in research activities; and
- Possibility of access to scientific information (scientific journals, data bases, etc.) via the Internet and various electronic systems.

93. Additionally, the STI strategy sets out priorities in specific areas of science and technology, including life science, engineering, medicine, agriculture, social sciences, history, and culture. The Action Plan complementing the STI strategy consists of 79 actions; specifies the stakeholders involved in the implementation; and provides a short description of each action and the expected results. The Science

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<sup>48</sup> IIMS ERAWATCH (2012).

Council of BiH has the task to define the priority areas who will then serve as the basis for all government bodies in the country to prioritize their activities in the future. Implementation of the documents will be monitored through the realization of the priorities; introduction of new methodologies and objectives; as well as following the global trends and new developments in the EU. Meanwhile, the five-year time interval remains open for further improvements and updates.

**Table 2: Projected gross R&D expenditure in BiH in the 2008-2015 period**

Year	Scenario 1				Scenario 2			
	R&D expenditure		Employment in R&D		R&D expenditure		Employment in R&D	
	% GDP	1,000 KM	TOTAL	Scientists	% GDP	1,000 KM	TOTAL	Scientists
2008	0.10	24,846	454	272	0.10	24,846	454	272
2009	0.13	32,822	571	347	0.14	36,239	631	384
2010	0.16	43,361	719	443	0.19	52,857	876	540
2011	0.20	57,285	904	565	0.27	77,099	1,217	761
2012	0.25	75,683	1,138	721	0.37	112,463	1,691	1,071
2013	0.32	99,993	1,432	920	0.52	164,054	2,349	1,509
2014	0.40	132,117	1,802	1,173	0.72	239,321	3,264	2,125
2015	0.50	174,566	2,267	1,496	1.00	349,130	4,534	2,993

Source: STI Strategy 2010-2015.

94. Other Strategy documents with relevance to R&D and innovation are the following:

95. *BiH Strategic Directions for Development of Education with Implementation Plan 2008-2015.*<sup>49</sup>

This long-term development program sets goals to raise the education level; improve the competitiveness of the labor force; increase the efficiency of the education and training system; expand opportunities for adult education and training; and ensure quality and revitalization of research in education. The strategy envisages harmonization of higher education with the European Bologna principles, integration of BiH into the European Higher Education and Research Space, and development of the institutional network for R&D at all higher education institutions. Mid-term objectives include establishment of an Agency for Development of Higher Education and Quality Assurance as well as a Center of Information and Recognition of Documents in the Area of Higher Education.

96. *Country Development Strategy (CDS) 2008-2013.* In early 2010, the BiH Directorate for Economic Planning prepared a draft CDS and Social Inclusion Strategy for public discussion. The document focuses on six strategic areas: macroeconomic stability, competitiveness, employment, sustainable growth, EU integration and social inclusion. In the area of competitiveness, considerable attention is given to the importance of R&D and scientific-technological infrastructure. Priorities are concentrated on: (i) building a modern scientific-technological and business base; (ii) promoting cooperation between research organizations and industry; and (iii) establishing an institutional framework for development of scientific-technological and business infrastructure.<sup>50</sup>

<sup>49</sup> Ministry of Civil Affairs of BiH (2008).

<sup>50</sup> The Strategy has been adopted by the FBiH and Brcko District. RS opted, after a government session, to proceed with creating their own Development Strategy without adopting the CDS. This is currently in preparation, with assistance from the RS Economic Institute.

## Monitoring Policy Evaluation and Statistics

97. BiH has a weak monitoring and evaluation system. There is almost no research activity in research policy evaluation, and the closest thing to an evaluation is an annual report published by relevant ministries that contains information on R&D activities after the fact. External opinions through the European Commission annual progress reports for BiH are another way of evaluating policy impacts.<sup>51</sup>

98. Universities often conduct periodic self-evaluations. However, there is very little information that can be gained from these evaluations. The lack of adequate data is another severe impediment to monitoring results on R&D. There are no publicly available evaluations or reviews of policies regarding the science and technology, including innovation.

## Higher Education Policy

99. Similarly to R&D policy, the authority over higher education rests with the two entities: FBiH and RS. At the State level, no ministry is in charge of higher education. BiH has made progress towards the reform process of higher education by defining a broader common policy framework at country level (Framework Law on Higher Education, see next section), establishing common standards for the recognition or accreditation of the universities through the Agency for Development of Higher Education and Quality Assurance and the mechanisms for the mutual validation of the university diplomas through the Center for Information and Recognition of Documents.

100. BiH has set out a strategy to improve its education system and improve the quality of its human resources as outlined in the Strategic Directions for Development of Education in BiH with Implementation Plan 2008-2015. This strategy document sets targets to raise educational quality by adherence to the Bologna principles, greater integration into the EU higher education and research space and investments in R&D. It also aims to establish an Agency for Development of Higher Education and Quality Assurance as well as a Center of Information and Recognition of Documents in the Area of Higher Education. BiH has also been part of the EU TEMPUS program, which provides funds to reform higher education systems. Nine out of the 60 applications for TEMPUS IV were accepted in 2008. These projects aim to increase the quality of education through cooperation EU higher education institutions.

101. In RS, the *RS Ministry of Education* manages the higher education sector. There are two public universities: the University of Banja Luka and the University of East Sarajevo. Private universities include the Slobomir P University in Slobomir, University Sinergija in Bijeljina, Pan-European University Apelron in Banja Luka, Independent University Banja Luka, University of Business Engineering and Management in Banja Luka, and the University of Business Studies in Banja Luka.

102. In the FBiH, the *FBiH Federal Ministry of Education* has transferred the authority for education to the 10 cantons, so that each canton has its own Ministry of Education, which is also in charge of higher education. Out of 10 cantons, only 5 have universities: Sarajevo, Tuzla, Bihac, Zenica and two universities in Mostar (University Dzemal Bijedic Mostar, and University of Mostar). Four universities in BiH are loose associations of autonomous schools and other institutions (Sarajevo, Bihac, University Dzemal Bijedic Mostar and University of Mostar) and the other four are integrated universities, where in

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<sup>51</sup> IIMS ERAWATCH (2012).



total there are 140 schools and 10 academies. The public universities are the main beneficiaries of research funding given through the competitive grants by the various ministries and cantons.

103. Teaching activity across the country's universities seems to be in a rather critical position. Despite a much more favorable staff-student ratio than in most other European countries, BiH university teachers feel overloaded with lectures while having little time for research. However, the reality is that, in at least one of the BiH universities, the minimum obligatory teaching load for full-time staff is 3 hours per week only. The overload – especially for teachers of a certain seniority level – comes from the fact that they teach simultaneously in several schools of the same university or at a different university, thereby drawing several salaries. In fact, all universities rely extensively on visiting professors, easily resulting in a low research output.

## **Business Policy for Competitiveness and Innovation**

104. The MoFTER formulated a SME development strategy for the period 2009-2011. The business advisory service environment in BiH is fairly rich and complex, consisting primarily of business centers and agencies, as well as regional development agencies (RDAs). Several measures in support for SMEs, science-technology parks, and innovative clusters have been put in place at different levels in recent years.

105. The government is, however, taking steps to strengthen industry-science linkages. Strategy and policy documents such as Development of Industrial Policy in FBiH; Development of Industrial Sectoral Strategy of RS; Strategic Action plan for Development of Education in BiH 2008-2015; and Strategic Development of SMEs in RS increasingly stress bilateral agreements between public research institutions and enterprises for carrying out research projects and financing study visits of students through corporate scholarship to increase availability of specialists for industry.

106. The government is also making an effort to increase cooperation and collaboration between firms through technology parks and innovation centers (BIT Centre Tuzla, Technology Park INTERA, Innovation and Entrepreneurship Centre at the UNZE, Zenica, and Innovation Centre in Banja Luka). In addition, BiH has also participated in the Cluster Competitiveness Activity Project (2004-08) and the Automotive Cluster Bosnia and Herzegovina (AC-BiH) led by the German Gesellschaft für Technische Zusammenarbeit (GTZ). These clusters aim to bring firms from various parts of a particular supply chain with economic potential together to create a platform for technological innovation and cooperation.

## **Policy Reforms**

107. There has been almost no activity on the preparation of state/entity strategy documents related to innovation, and this has effectively left BiH in strategic and policy limbo. A unifying policy document should be created to provide a common strategic framework that clearly specifies state goals. The policy will help build foundations for a stable, yet flexible, innovation system aligned with priorities and based on realistic needs. In addition, the unifying innovation policy document should bring together all relevant funding instruments and steer them toward common goals, as well as revisit the operative roles of executive actors. The innovation policy should be developed using a cooperative approach, actively including sectoral stakeholders in the public and private sectors, with an emphasis on effective public consultations.

108. It is hard to distinguish a policy mix for research in BiH. Most of the documents guiding research, innovation and other policies affecting research have been adopted only in the past 2 years, usually with no coordination between them. The bulk of these strategic papers have not yet been translated into specific policy actions, which hampers efforts to distinguish a policy mix in practice. The main reason for the slow implementation of most research-related strategies is the lack of sufficient and thematically coherent financing to underpin them.

109. Recently, there have been two main policy reforms. The first is the Framework Law on Scientific and Research Operations and Coordination of the Inter-entity and International Scientific and Technical Cooperation (2009) and the second Framework Law on Higher Education in Bosnia and Herzegovina (2007). Both these laws address some of the issues around the peculiar nature of the governance structure in BiH.

- Framework Law on Scientific and Research Operations and Coordination of the Inter-entity and International Scientific and Technical Cooperation (2009): This law specifies a role for MoCA to coordinate between different entities. It also called for the creation of a Science Council that will aid coordination and contribute towards strategy and implementation. In addition, the law underlines the importance of improving statistical data-collection in line with international standards.
- The Framework Law on Higher Education in Bosnia and Herzegovina (2007): This law sets out a basis for the reform of higher education by establishing common standards through accreditation of universities.<sup>52</sup> This law provides a legal basis for: (i) the establishment of two new state-level institutions to coordinate and support higher education development, and (ii) the integration of the autonomous schools. The law also confirms BiH's commitment to the Bologna objectives, which include moving towards EU standards through the standardization of degrees, establishment of quality assurance mechanisms, maintenance of addenda to diplomas in order to promote employment, improvement of the freedom of mobility of students and teachers, recognition of study periods spent at other universities or in other countries, and promotion of European cooperation in quality assurance and curricula development. It achieves these goals through an Agency for Development of Higher Education and Quality Assurance and a Center for Information and Recognition of Documents.

110. In addition to these laws at the national level, there are separate laws at the different sub-national levels that govern various aspects of RDI. (These are listed in the Annex.)

## **4. POLICY INSTRUMENTS AND OTHER SUPPORT MECHANISMS**

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### **Research at Public Research Institutions and Universities**

111. The funding system in BiH is not systematic. About 90 percent of the R&D financing happens through independent calls for funding. There are three main funders in BiH that allocate financial resources via competition-based research grants: at the State level, the Ministry of Civil Affairs of BiH

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<sup>52</sup> World Bank (2013).

(MoCA), and at the entities level, the Ministry of Science and Technology of RS and the Ministry of Education and Science of FBiH. These funds are provided through competition-based research grants, which include calls for proposals for FP7, from entity and cantonal ministries of science and education, and the JP Vodoprivreda (Public Enterprise “Water Management” or Sava River Basin), international projects etc. There is not much data on private sector funding of research but it appears to be negligible. However, there is no systematic policy for R&D funding at any level, except some allocations for R&D and innovation projects from public calls.

112. Both entities – RS and FBiH – allocate around 0.07 - 0.10 percent of GDP to science and technology development. In RS, some 3.3 million euros were spent for science and technology in 2008, which did not exceed 0.5 percent of the total budget, or less than 0.1 percent of the GDP. Science and research activities in FBiH are in an even more unfavorable position because there is no separate ministry for science. Instead, science is organized within the Ministry of Education). In FBiH, financial contributions for science and research activities and technology development are less than 0.1 percent of the GDP.

- In 2010, the total budget for public funding of research in BiH by the national, state, and cantonal governments was likely to amount to almost €5.9m in 2010. At the national level, MoCA, through its Department for Science and Culture, had a budget of €76,000 in 2010 for grants that support innovation and technical culture in BiH (2012 and 2013).
- In RS, the financial allocation in 2010 was €2m in actual expenditures, channeled through the “program for scientific and research activities.” The budget for innovation and technology was €0.41m. The total budget for research of the Federal Ministry of Education and Science in 2010 was €1.6m, channeled through the “program for scientific and research activities.” The funding in support of innovation and technology in 2010 was €0.37m (Table 4). More detailed information about funding for specific policy measures can be found in table A3 in the Annex.

113. The Ministry of S&T of Srpska manages the “Program for Young Researchers,” which provides financial support to researchers to pay their full-time participation in research projects, in an effort to increase the number of doctorates in S&T, engineering, and mathematics. For 2012, the program aimed to support six young researchers (four were financed in 2010 and eight in 2011).<sup>53</sup> In 2011, the government of RS approved 13 million euros for the modernization of two public universities, the University of BanjaLuca and the University of East Sarajevo. The project included the provision of state-of-the-art equipment for research and funding of the Research Centre for Biomedicine, Food Technology, and Nutrition.

114. The Ministry of Science and Technology of RS is currently working on the establishment of SARNET (Academic and Research Network of Republic of Srpska), which aims at building and developing the ICT infrastructure for higher education and R&D. This will facilitate participation in international projects and businesses dealing with ICT technologies. So far, SARNET has been advancing via construction of infrastructure (fiber optic cables) between cities in RS. The second phase of the project foresees expansion of the ICT infrastructure within cities as well as connection between all universities and research facilities in RS.

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<sup>53</sup> Deloitte (2012).

115. In 2008, in the framework of the FP6 IST project “Strengthening the Strategic Cooperation Between the EU and Western Balkan Region in the field of ICT Research”,<sup>54</sup> two policy documents emerged: (i) Final Strategic Research Agenda: “ICT Research & Development Priorities for Bosnia-Herzegovina, 2008-2013”; and (ii) a policy paper entitled “Shaping EU-Western Balkan Co-operation in the Field of ICT Research & Development in the Period 2008-2013: Priorities and Recommendations.”

## **R&D and Innovation in the Private Sector**

116. It is difficult to estimate the extent to which the private sector is involved in R&D, given the lack of data. However, it is clear that this capacity has almost been entirely lost during the transition. The industrial sector therefore requires significant support to recover to its former capacity. However, the government offers very few incentives for innovation and investment in R&D. The only incentives available that support R&D investment are provided by the laws on custom duty and VAT refund, and these only do so indirectly.

117. BiH still does not recognize tax incentives for R&D. For example, the country does not offer the zero percent corporate tax applied on all profits that are re-invested into the development of the company. The Law on Corporate Tax in RS (Official Gazette of RS 91/06) and the Law on Corporate Tax in FBiH (Official Gazette of FBiH 97/07 and 14/08) note only incentives to those companies who reinvest into the production part of their activities. Most of the research institutions, as a part of the university structure, are public institutions, which are entitled to some tax exemptions like all other public and not-for-profit organizations. However, this does not specifically relate to R&D.

118. The only incentives that may indirectly support R&D are exemptions of custom duties and VAT refunds. According to the Law on Custom Duties (Official Gazette BiH, no. 57/04), imports of equipment financed by the international donor organization are exempt from customs duties. The relevant Ministry in RS, FBiH, or cantons issue imports certificates of donated equipment for higher education. These certificates are used to claim the exemption from customs duty, and the same applies for the VAT refund, which has been in force since 2005. Equipment procured in BiH or abroad for higher education institutions is entitled to the tax refund.

119. With respect to support for business development and innovation, infrastructure and intermediary organizations have grown in recent years. As of 2012, BiH has 25 business centers funded through international programs that support SMEs with business consulting services. These international programs also support other initiatives to improve the business climate in BiH. However, such initiatives only have an indirect effect on the level of innovation and R&D investment in BiH.

120. A key mechanism for providing business advisory support is through the 25 business centers and agencies that have been formed in recent years, focusing primarily on support to SMEs.<sup>55</sup> The business support centers and agencies typically offer services in business consulting and development; business

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<sup>54</sup> SCORE (2012).

<sup>55</sup> The main documents and policies concerning R&D activities in SMEs are: i) “Strategy of Science Development in Bosnia and Herzegovina 2010 – 2015”; ii) “Strategy of SME Development in Bosnia and Herzegovina 2009 – 2011”; iii) “Strategy of SME Development in the Republic of Srpska 2006 – 2010”; iv) “Development of SME Entrepreneurship in the Federation of B&H”.

planning; access to credit and investment; and market surveys and marketing.<sup>56</sup> The majority of them are based on international donor support.<sup>57</sup>

121. The business incubator network includes 13 incubators.<sup>58</sup> The Association of Inventors RS was established in 2004 in accordance with the Law on Associations and Foundations of RS. It operates as a legal entity and a non-profit association. The Inventors Association of Bosnia and Herzegovina conducts activities related to renewable energy-ecological hydropower plant, energy efficiency, and collection of floating waste from the sea surface. It operates in 67 cities throughout BiH, its 34,617 members have 305 inventions, and it is a member of the International Federation of Inventors' Associations (IFIA).

122. Initiatives focus both on SME development and enhancement of firm competitiveness and innovation include: Competitive Regional Economic Development (CREDO) for the development of SMEs; The World Bank program on Enhancing Small and Medium Enterprise (SME) "Access to Finance";<sup>59</sup> Open Regional Fund for Foreign Trade Promotion in South- East Europe (ORF) - financed by German Federal Ministry for Economic Cooperation and Development (BMZ) and implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ); and the Turn-around Management and Business Advisory Services Program BiH (TAM/BAS) by the European Bank for Reconstruction and Development (EBRD) Strategy (2010 – 2013) to provide advisory services to SMEs in BiH. TAM/BAS aims to reduce the brain drain on human resources by implementing programs that target young entrepreneurs and innovation development.

123. As far as local support measures are concerned, MoCA has been supporting innovators since 2007 under the Support for Innovation and Technical Culture in BIH program. Funds are allocated through public competition. In 2010, a total of €0.76m was allocated. RS also allocates funds for technological development, which includes innovators, meetings, and projects for the development of new technologies and the information society.<sup>60</sup> The Federation Ministry of Education and Science has also been supporting innovators, innovation and technical culture, and the introduction and development of new technologies. Support is implemented through a public call. In the course of 2010, €0.37m was allocated for these purposes (2012 and 2013).

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<sup>56</sup> Center for Social Innovation (2007)

<sup>57</sup> Key support programs by international organizations in business and technology in the past 5-6 years included: World Bank Business Environment Adjustment Credit Project; EBRD Western Balkans SME Finance Facility Project; IFC Private Enterprise Partnership for Southeast Europe; EBRD Business Advisory Service Program; GTZ Program for Economic and Employment Promotion in BiH; EU support to SMEs and Regional Economic Development in BiH; EU Building Export Promotion Capability; EU Program for Enterprise Revitalization; and DFID Post-Privatization Enterprise Restructuring Project.

<sup>58</sup> Business and entrepreneurial centre-incubator "Lipnica" Tuzla, Business incubator in Brčko, Business incubator Jablanica, Business incubator Prijedor, Business incubator Sarajevo, Business incubator Trebinje, Business incubator Zavidovići, Business incubator Zenica, Business incubator Zepce, Business innovation and technology centre Tuzla, International business centre Mostar, NBR business incubator, NGO Krajina-Business incubator Banja Luka.

<sup>59</sup> In 2009 the World Bank pledged a \$70m line of credit for SMEs. The essence of this project is to improve access to finance for SMEs.

<sup>60</sup> The total budget for 2010 was €0.41m broken-down as follows: public call to innovators (€0.06m or 6.3 percent of the total budget), development of new technologies (€0.30m or 86.3 percent of the total budget), and development of the information society (€0.05m or 7.4 percent of the total budget).

**Box 3: Examples of Innovation Intermediaries**

- *The BIT Center Tuzla*, established in 2005, provides young entrepreneurs with the opportunity to develop their businesses in the domain of ICT, supports their growth, and offers core knowledge in business as well in ICT. Individuals who have an idea or a project, young established companies, or well-established companies that want to expand their markets can apply to BIT Centre. The Center runs an incubator, a training unit, and a research unit in cooperation with the University of Tuzla. University faculty, particularly from the School of Electrical Engineering, help in development and selection of the ICT experts/potential entrepreneurs, support of start-up projects, and train. The Center also provides seed capital. The BIT Center is in the process of setting up a specialized laboratory for education and training in programming and development of microcontrollers.
- *The Innovation Centre Banja Luka* was established in 2010 as a foundation by the Government of RS, the City of Banja Luka, the University of Banja Luka, the University of East Sarajevo, the Norwegian Ministry of Foreign Affairs, and the Athene Prosjektledelse AS. It has an incubator, education and training facilities, and a conference facility.
- *The Entrepreneurship and Innovation Centre of University of Zenica* was established in 2008 as an interdisciplinary working unit stemming from a TEMPUS project on quality management procedures for promoting university/enterprise cooperation. The main activities of the center include promoting innovation and entrepreneurship among students and teaching staff; organizing conferences, consultancies, internships, and fairs; and, establishing links between the university and the job market.
- *The Foundation for Innovation and Technology Development* was established in 2008 as part of the Technology Park in Mostar with the support of the City of Mostar, two universities in Mostar, the government of Herzegovina-Neretva Canton, the FBiH Chamber of Commerce, Chamber of Trade of FBiH, The Regional Development Agency for Herzegovina (REDAH), and a company called ALFA THERM. Its objective is to increase research and innovation among SMEs, to create the pre-conditions for a knowledge-based society by training the local staff, and to assist in the transformation of universities from teaching-based institutions to research and innovation-based institutions.

See Annex 4 for a summary of infrastructure related to science and technology parks, and clusters.

## 5. INTEGRATION TO ERA AND INTERNATIONAL COLLABORATION

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125. According to the survey conducted among 10 research organizations, the most important barriers to R&D infrastructure entities in terms of research collaboration at the international levels were expressed as follows: Poorly developed network of cooperation at international level; lack of national financial support for collaborative activities; lack of quality research infrastructure, and gaps in skills and capabilities between local and EU partners in terms of R&D activities. According to this study, the most important motives for the entities to take part in EU programs were to access research funding and to create new or improved facilities or infrastructure.<sup>61</sup>

126. The lack of financial resources in the budgets at all levels of governments in BIH drives researchers to look for funding sources outside the country. The advancing political framework for international S&T co-operation on the one hand, and the growing demand for funding on the other hand, push the research community to turn more and more toward opportunities provided by the EU's FP7 and EUREKA/COST. The membership, however, will not result in automatic benefits, as the opportunity must be managed to leverage research capabilities.

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<sup>61</sup> Elci (2013).

**Table 3: Research Infrastructure need to enhance Research and Development (R&D) Collaboration**

Barriers at national level	Barriers at WBC level	Barriers at international level
<b>Lack of communication, collaboration among universities</b> <b>Different regulations implemented in different parts of the country</b> <b>Poor networking with the industry</b> <b>Need to better use existing infrastructure and procurement of new resources</b> <b>Lack of financial support for R&amp;D both for public institutes/universities and for SMEs/private sector</b>	Lack of trust and shared interest  Poorly developed network of cooperation among WBCs,  Lack of funds, technical resources and equipment for collaborative R&D	Poorly developed network of cooperation at international level  Lack of national financial support for collaborative activities  Lack of quality research infrastructure  Gap in skills and capabilities between local and EU partners in terms of R&D activities

Source: Elci (2013)

127. The entities indicated that the projects enhanced their reputation and image, and improved their internal knowledge and capabilities, their relationships and networks, and their ability to conduct R&D. The entities also state that they mainly need financial support towards the costs of proposal development to be able to participate in the EU programs. Other needs they have include: help with identifying project partners; advice/feedback on proposal development; advice on project management; advice on contract negotiations; and, help in understanding Framework Program (FP) rules and procedures.

128. The needs and requirements of the entities for increased research and innovation collaboration at national, regional, and international levels are as follows:

**Table 4: Needs to Enhance Research and Development (R&D) Collaboration**

Needs in BiH	Needs at WBC level	Needs at international level
<b>Investment in building capacities of researchers</b> <b>Regulations to stimulate collaboration between research entities</b> <b>Training and technical assistance on preparing R&amp;D projects</b> <b>New infrastructure to be able to conduct quality research</b>	Agreement between governments for research collaboration  Establishment of formal networks among R&D entities in the region  Creation of joint research teams among R&D entities in the region  Establishment of a regional center for coordination of collaboration activities	Providing training and technical assistance on accessing EU funds

Source: Elci (2013).

129. BiH has been promoting a European oriented science policy and has been promoting and assisting in the establishment of international cooperative efforts, in particular integration into ERA. The active participation of researchers in ERA is also mentioned in the STI Strategy. MoCA promotes and informs the BiH professional public about the conditions of cooperation and calls for proposals published by the European Commission. In this regard, the Ministry has played an active role in the promotion of ERA and the preparation of FP7 for European R&D activities.

130. At the international level, the BiH scientific community has maintained links with partners abroad. BiH has signed several international cooperation treaties with individual countries to increase cooperation in areas such as higher education, equivalence of degrees, sharing of research and financing. In addition, it is also a part of several programs such as CEEPUS, TEMPUS and ERASMUS MUNDUS which support the mobility of researchers. BiH has created a EURAXESS Centre that provides online access to information and services to the academic community in the country.<sup>62</sup> EU programs, such as TEMPUS, have also contributed to cooperation with European universities. In the Fifth and Sixth Framework Programs (FP6 & FP7) of the European Union, BiH institutions participated in the project consortia as partner members.

131. Nonetheless, it is perceived that BiH has a low degree of internationalization and participation in international collaborative networks, including integration into ERA and participation in the Framework Programs. Since January 2009, BiH has status as an associate country in FP7. The experience shows that despite very strict criteria and competitive calls, there is a critical mass of researchers who are able and willing to implement very demanding and complex projects. BiH presented 12 calls for competitive funding under FP7 in 2010, and 155 proposals for the FP7 period 2007-2010 in total. The success rate, or share of proposals that received funding, averaged 15 percent for the period and 42 percent for 2010, significantly higher than the average ratio for the South East Europe (SEE) economies (28 percent). Strengthening international cooperation and establishing the BiH status in the FP7 represent important challenges for the development of BiH research policy (2012).

132. Research institutions from BiH participate in 16 actions of the program COST (Cooperation in Science and Technology) and two EUREKA program projects. Preparation of another two applications is underway. Examples of participation in international programs for R&D include:

- Since May 2009, BiH is a full member of the COST, an inter-governmental framework for European Cooperation in Science and Technology. The program provides a platform for BiH to cooperate on a particular project and exchange expertise with European scientists, allowing for coordination of nationally funded research on a pan-European level.
- BiH has National Information Point (NIP) status in EUREKA, a pan-European network for market-oriented, industrial R&D. With this status, BiH can participate in EUREKA projects through a network of, as well as prepare for full membership in EUREKA. Also, the NIP status provides BiH industry and research institutes with easy interface with EUREKA and facilitates participation in projects.
- The Cooperation Agreement between BiH and Slovenia on promotion of cooperation activities in the areas of science and technology is an example of successful bilateral activities. Every two years, the program offers competitive grants for co-financing of joint research projects. Project criteria are: importance of research results for economic and social development of BiH, scientific value and/or research applicability, potential opportunities for participation in EU research projects, and use of the research results for commercial purposes. On average, 20-30 projects apply to these calls every year. The Joint Committee for Scientific and Technological

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<sup>62</sup> This is a free tool that is also open to foreign researchers who are interested in visiting research agencies in the country and for researchers in BiH to access information about programs and opportunities in BiH and elsewhere in Europe. The Centre also provides information on jobs in research.



Cooperation between BiH and Slovenia evaluates the projects and proposes the best ones for financing

## 6. CONCLUSION

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133. Progress has been made in recent years in BiH in the areas of science, technology and innovation and development of the country's R&D policy, in particular with the adoption of the Strategy for the Development of Science in BiH 2010-2015 (STI Strategy), the Framework Law on Science (2009), and the Framework Law on Higher Education (2007). Yet several issues remain to be addressed in order to implement objectives.

134. BiH's separate (state/entity/canton) policies create perpetual marginalization of research; a countrywide policy approach to R&D has yet to be developed. A key restraint is that the levels of R&D expenditure in BiH in the business, public, and higher education sectors are too low for the country to maintain a healthy science base. Key stakeholders have a high level of awareness of the importance of investing in R&D and innovation for economic and social development. There is an effort to establish and strengthen R&D and innovation policies and system in the country with the help of international organizations.

135. The main challenges in R&D policy implementation, as specified in the 2010-2015 STI Strategy, include the low number of R&D centers, low number of scientists, sub-optimal funding structure (80 percent government, 10 percent private sector, 10 percent higher education), limited mobility of scientists and high concentration of scientists in the entity centers, and the low level and uncompetitive quality of scientific publications, along with very limited commercialization of R&D.

136. Based on the findings presented in this report, the top priorities for BiH are to build a statistical infrastructure to monitor R&D and innovation activities; improve coordination among different government levels; provide sufficient resources for policy implementation and impact evaluation; and strengthen the science base of the country, fostering R&D commercialization and business innovation.

## REFERENCES

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- Bartlett, W., M. Cicic, and B. Culahovic. 2012. Institutions, Innovation and Knowledge Transfer in Bosnia and Herzegovina. *The Journal of Knowledge Economy and Knowledge Management*, Vol. VII, pp. 199-224, Spring, 2012.
- Center for Social Innovation (2007) Innovation Infrastructure in the Western Balkan Countries: [http://www.see-era.net/attach/InnovationInfrastructuresinWBC\\_see-science.euReport\\_version2.pdf](http://www.see-era.net/attach/InnovationInfrastructuresinWBC_see-science.euReport_version2.pdf)
- Deloitte. 2012. The Researchers Report 2012. Country Profile: Bosnia and Herzegovina.
- Elci, S. 2013. The State of Research Capabilities, Infrastructure and Technology Transfer in Bosnia and Herzegovina. Background Report for Regional Strategy on Research and Development for Innovation. Forthcoming publication by the World Bank.
- European Commission. 2012. Commission Staff Working Document: “Bosnia and Herzegovina 2012 Progress Report” Accompanying the document “Communication from the Commission to the European Parliament and the Council. Enlargement Strategy and Main Challenges 2012-2013.” COM (2012) 600 final, Brussels, October 10, 2012.
- European Communities. 2010 *ERAWATCH Research Inventory Report for: Bosnia & Herzegovina*.
- European Union. 2010. *Technopolis Report - Manual on Science Technology and Innovation Statistics in Bosnia and Herzegovina*
- Global Competitiveness Report (2012).
- Griliches, Z. 1979. Issues in Assessing the Contribution of Research and Development to Productivity Growth. *The Bell Journal of Economics*. Vol. 10, No. 1 (Spring, 1979), pp. 92-116.
- Harrison, R., Jaumandreu, J., Mairesse, J., and Peters, B. 2008. *Does Innovation Stimulate Employment? A Firm-Level Analysis Using Comparable Micro-Data from Four European Countries*. NBER Working Paper No. 14216.
- IIMS ERAWATCH (2012).
- Lederman, D. and Maloney, W. F. 2003. *R&D and Development*. World Bank Policy Research Working Paper No. 3024.
- Ministry of Civil Affairs of Bosnia and Herzegovina. 2008. *Development of Education in Bosnia and Herzegovina* State Report. Available at: [http://www.ibe.unesco.org/National\\_Reports/ICE\\_2008/bosniaher\\_NR08.pdf](http://www.ibe.unesco.org/National_Reports/ICE_2008/bosniaher_NR08.pdf)
- Ministry of Civil Affairs of Bosnia and Herzegovina. 2009. *Bosnia and Herzegovina Strategy of Development of Science 2010-2015*. (Not available in English). Available at: [http://www.mcp.gov.ba/zakoni\\_akti/strategije/?id=1251](http://www.mcp.gov.ba/zakoni_akti/strategije/?id=1251)
- Pro Inno Europe/ Inno Policy Trendchart. 2011. Mini Country Report/Bosnia and Herzegovina.
- Rahimic, Z., and Kozo, A. 2012. Building and Development of the Knowledge Based Economy in Bosnia and Herzegovina. *Interdisciplinary Management Research V*, pp. 111-122.

- Rivera Leon, L. & A. Reid 2010. *Participation of South-East European countries in the competitive funding programs for research in the European Commission*. Technopolis Group report to UNESCO-BRESCE
- SCIMAGO Research Group. 2012. *The State of Scientific Performance in the Western Balkan Countries*. Background Paper for Western Balkans Regional R&D Strategy for Innovation Technical Assistance.
- SCORE. 2009. *Strengthening the Strategic Cooperation Between the EU and Western Balkan Region in the field of ICT Research*. SCORE-045384.
- Seker, M. 2012. *An Evaluation of Innovation Activities in West Balkans*. Background Paper for Western Balkans Regional R&D Strategy for Innovation Technical Assistance Project.
- Silajdzic, S. 2012. Knowledge Transfer and IP Management at Universities and Public Research Institutes in Bosnia-Herzegovina. Presentation at the Expert Workshop “Knowledge Transfer Study 2010-2012,” Tirana, June 13, 2012.
- Statistical Bulletin, Higher education, Institute of Statistics or RS, no.7, Banja Luka, 2010. Statistical Bulletin, Higher education, Federal office of statistics, Sarajevo, 2010.
- World Bank. 2009. *Croatia’s EU Convergence Report: Reaching and Sustaining Higher Rates of Economic Growth*. Report No. 48879- HR.
- UNESCO. 2006. *Guidelines for a Science and Research Policy in BiH*. UNESCO Office in Venice. Available at: <http://unesdoc.unesco.org/images/0014/001478/147820e.pdf>
- World Bank. 2011. “World Development Report.” World Bank, Knowledge Assessment Methodology (KAM). Available at: <http://www.worldbank.org/kam>
- World Bank. 2012. World Bank Questionnaire on Research, Development and Innovation (RDI) Policies. Background study to the Mainstreaming of the Western Balkans Regional R&D Strategy for Innovation. World Bank, 2012.
- World Bank. 2013. Group – Bosnia and Herzegovina Partnership Country Program Snapshot, April 2013, Washington, D.C.
- World Development Indicators. 2012. World Development Indicators Database, the World Bank.

#### **Related websites**

- <http://www.proinno-europe.eu/inno-policy-trendchart/repository/country-specific-trends>
- [http://www.regjeringen.no/en/dep/ud/selected-topics/peace-and-reconciliation-efforts/western\\_balkans/herd\\_program.html?id=605441](http://www.regjeringen.no/en/dep/ud/selected-topics/peace-and-reconciliation-efforts/western_balkans/herd_program.html?id=605441)
- <http://www.sintef.no/Home/Technology-and-Society/Innovation-and-Industrial-development/BIT-Tuzla/>
- [http://www.technopolis-group.com/cms.cgi/site/group/belgium\\_group/project\\_sheets/bih.htm](http://www.technopolis-group.com/cms.cgi/site/group/belgium_group/project_sheets/bih.htm)
- <http://www.unesco.org/fileadmin/MULTIMEDIA/FIELD/Venice/pdf/events/SEE%20Countries%20Participation%20in%20EC%20Research%20Programs%20L.pdf>
- [http://www.wto.org/english/thewto\\_e/acc\\_e/a1\\_bosnie\\_e.htm](http://www.wto.org/english/thewto_e/acc_e/a1_bosnie_e.htm)



## ANNEX

Table A 1: Bosnia and Herzegovina Country Profile

	BOSNIA & HERZEGOVINA	WESTERN BALKANS <sup>63</sup>	EU-27
<b>ECONOMY &amp; BUSINESS ENVIRONMENT</b>			
<b>GDP (2010)</b>	€12,570 million	€15,523 million	€12,279,401 million
<b>GDP per Capita (2011)</b>	€3,271	€4,454	€23,400
<b>Population (2011)</b>	3,843,183	22,832,917	502,404,702
<b>Exports to GDP ratio (2010)</b>	20.2%	19.2% <sup>64</sup>	-
<b>Imports to GDP ratio (2010)</b>	42.0%	40.3% <sup>65</sup>	-
<b>Trade to GDP ratio (2010)</b>	62.2%	60.5% <sup>66</sup>	-
<b>Net Foreign Direct Investment, % GDP (2011)</b>	1.99 (inflows)	4.92 (inflows)	2.86 (outflows)
<b>RESEARCH &amp; DEVELOPMENT</b>			
<b>Gross Domestic Expenditure on R&amp;D, % GDP (2009)</b>	0.02	0.33 <sup>67</sup>	2.03
<b>Royalties &amp; License Fees, Payments (2011)</b>	US\$4,604,167	US\$478,430,557 <sup>68</sup>	US\$102,690,853,615
<b>Royalties &amp; License Fees, Receipts (2011)</b>	US\$12,827,696	US\$116,338,084 <sup>69</sup>	US\$ 74,337,729,545
<b>Researchers<sup>70</sup> per Million population (2010)</b>	197	787 <sup>71</sup>	3,166 <sup>72</sup>
<b>University-Industry Collaboration Rank 2012 (of 144 countries)</b>	48	88 <sup>73</sup>	40 <sup>74</sup>
<b>INNOVATION CAPACITY &amp; INFRASTRUCTURE</b>			
<b>Percentage of Enterprises with Internationally Recognized Quality Certification (2009)</b>	30.1	19.3 <sup>75</sup>	-
<b>Percentage of Firms Using Technology Licensed from Foreign Companies (2009)</b>	25.3	25.7	-
<b>Intellectual Property Protection Ranking 2012 (of 144 countries)</b>	130	95 <sup>76</sup>	40 <sup>77</sup>
<b>Internet Users per 100 People (2011)</b>	60	54 <sup>78</sup>	72
<b>Mobile Cellular Subscriptions per 100 People (2011)</b>	85	106	125

<sup>63</sup> Western Balkans: Albania, Bosnia and Herzegovina, Croatia, Kosovo (This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo Declaration of Independence), Macedonia, Montenegro, and Serbia

<sup>64</sup> Excluding Kosovo (This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo Declaration of Independence.)

<sup>65</sup> Ibid

<sup>66</sup> Ibid

<sup>67</sup> Average of UNESCO's available data for Albania, Bosnia and Herzegovina, Croatia, Serbia and FYR Macedonia for 2008-08.

<sup>68</sup> Sum of World Development Indicators' available data for Albania, Bosnia and Herzegovina, Macedonia FYR, Serbia and Croatia for 2011.

<sup>69</sup> Sum of World Development Indicators' available data for Albania, Bosnia and Herzegovina, Macedonia FYR, Serbia and Croatia for 2011.

<sup>70</sup> Full-time equivalents – one person-year for example 30% time spent on R&D would count as 0.3 FTE.

<sup>71</sup> Average of UNESCO's data on Albania, Bosnia & Herzegovina, Croatia, Macedonia, and Serbia.

<sup>72</sup> World Bank calculations

<sup>73</sup> Average of Global Competitiveness Report ranks for Albania, Bosnia, Croatia, FYR Macedonia, Montenegro, and Serbia.

<sup>74</sup> Average of Global Competitiveness Report data on EU 27 countries

<sup>75</sup> Average of Enterprise Survey data on Albania, Bosnia, Croatia, Kosovo, FYR Macedonia, Montenegro, and Serbia.

<sup>76</sup> Average of Global Competitiveness Report ranks for Albania, Bosnia, Croatia, FYR Macedonia, Montenegro, and Serbia.

<sup>77</sup> Average of ranks of the EU 27

<sup>78</sup> Average of World Development Indicators data on internet users per 100 people in Albania, Bosnia & Herzegovina, Croatia, FYR Macedonia, Montenegro, and Serbia.

**Table A 2: Innovation Measures**

Innovation Measures	Bosnia and Herzegovina	Western Balkans	European Union
Number of Utility Patents Filed in the US (2010)	1	55	73,549
Scientific & Technical Journal Articles per Million Population (2009)	16.9	125 <sup>79</sup>	500
High-technology Exports, % Manufactured Exports (2010)	3	4.3 <sup>80</sup>	-
Global Innovation Index Rank 2012 (of 125 countries)	72	60 <sup>81</sup>	24 <sup>82</sup>
Trademark Applications per Million Population <sup>83</sup> (2010)	1,034	1,832 <sup>84</sup>	130 <sup>85</sup>

*Source:* World Development Indicators, Bosnia and Herzegovina.

<sup>79</sup> Average of World Development Indicators data on Albania, Bosnia, Croatia, Kosovo, Macedonia, Montenegro and Serbia.

<sup>80</sup> Average of World Development Indicators' available data for Albania, Bosnia and Herzegovina, and Croatia for 2010.

<sup>81</sup> Average of ranks of 6 Western Balkan countries – Albania, Bosnia and Herzegovina, Croatia, Macedonia, Montenegro and Serbia.

<sup>82</sup> Average of ranks of the EU 27

<sup>83</sup> World Intellectual Property Organization

<sup>84</sup> Average of World Development Indicators data on Albania, Bosnia, Croatia, Macedonia, Montenegro and Serbia.

<sup>85</sup> Total trademark applications per million population in the EU 27 from World Development Indicators.

**Table A 3: Broad share of available budgets by main categories of research and innovation measures**

Broad category of research and innovation policy measure	Approximate total annual budget for 2010 (in euro)	Commentary
1. Governance & horizontal research and innovation policies	€5.9m (program for scientific and research activities” in RS and FBiH) Subcategories: Competitive grants for conducting basic research, applied research and experimental development Competitive grants for supporting young and gifted scholars in their science and research activity (awarding scholarships for postgraduate and PhD studies, technical preparation of master and PhD thesis) Competitive grants for publishing scientific and research publications and journals Competitive grants for participation in international scientific conferences and development of scientific cooperation Competitive grants for acquisition of research equipment Direct grants for support of scientific and professional associations Competitive grants for the organization of scientific events Competitive grants for innovators Projects for development of new technologies Project for development of information society	The “program for scientific and research activities” in RS and FBiH is launched and administered by the responsible ministry of science at the entity/cantonal level. The €5.9m represents the total amount of actual public expenditure for R&D in BiH (State, entities, cantons) Actual public expenditure Private/structural funds are not available With the onset of the economic crisis, the R&D budget in 2010 has declined by 30% in comparison to 2008 investment
2. Research and Technologies	€0.78m Subcategories: Competitive grants for innovators Projects for development of new technologies Project for development of information society Competitive grants for acquisition of research equipment Direct grants for support of scientific and professional associations Competitive grants for publishing scientific and research publications and journals Competitive grants for participation in international scientific conferences and development of scientific cooperation	Part of “program for scientific and research activities” in RS and FBiH Actual public expenditure Private/structural funds are not available
3. Human Resources (education and skills)	€2.2m (part of “program for scientific and research activities” in RS and FBiH) Competitive grants for conducting basic research, applied research and experimental development Competitive grants for supporting young and gifted scholars in their science and research activity (awarding scholarships for postgraduate and PhD studies, technical preparation of master and PhD thesis) Competitive grants for participation in international scientific conferences and development of scientific cooperation	Part of “program for scientific and research activities” in RS and FBiH Actual public expenditure Private/structural funds are not available
4. Promote and sustain the creation and growth of innovative enterprises	€0.73m (part of “program for scientific and research activities” in RS and FBiH) Subcategories: Competitive grants for acquisition of research equipment Direct grants for support of scientific and professional associations Competitive grants for publishing scientific and research publications and journals Competitive grants for participation in international scientific conferences and development of scientific cooperation	Part of “program for scientific and research activities” in RS and FBiH Actual public expenditure Private/structural funds are not available
5. Markets and innovation culture	€0.1m (Support for promotion of innovation culture MoCA, Federal Ministry of Education and Science, Ministry of Science and Technology of RS)	Part of “program for scientific and research activities” in RS and FBiH Actual public expenditure Private/structural funds are not available

Source: Pro Inno Europe/ Inno Policy Trendchart (2011) Mini Country Report/Bosnia

## ANNEX 2

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### Legal Framework

The legal framework of the scientific and research activity of the Federation of BiH:

- (i) BiH Framework Law on Scientific and Research Operations and Coordination of the Inter-entity and International Scientific and Technical Cooperation (Official Gazette of BiH, No. 43/09);
- (ii) Law on Organization of Scientific and Research Activity in the Territory of the Canton (Official Gazette of the Sarajevo Canton, No. 10/04);
- (iii) Law on Scientific Activity in the Tuzla Canton (Official Gazette of the Tuzla Canton, No. 6/99);
- (iv) Law on Scientific Activity in the Zenica-Doboj Canton (Official Gazette of the Zenica-Doboj Canton, No. 7/99).

Where there is no law on science, the old law on scientific and research activity is still in place (Official Gazette of the Socialist Republic of BiH, No. 38/90).

The legal framework for STI in Republika Srpska:

- (i) BiH Framework Law on Scientific and Research Operations and Coordination of the Inter-entity and International Scientific and Technical Cooperation (Official Gazette of BiH, No. 43/09);
- (ii) Law on Scientific and Research Activity and the Law on Amendments to the Law on Scientific and Research Activity (Official Gazette of RS, Nos. 79/07, 112/07 and 13/10) as the general political framework for research organizations, institutions and financial support;
- (iii) 10 rulebooks on scientific publications, quality control, funding and training.

## ANNEX 3

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In 2008, the FBiH government created a new program, the Information on Development and Limitations in Establishment and Work of Technology Parks in FBiH. It was noted that Technology Park Mostar and Science Park Tuzla operate in FBiH as companies with limited liabilities, while the establishment of Technology Park Zenica is in its final phase. The government emphasized the importance of the science-technology parks as instruments for integration of different socio-economic and political factors, and gave its support to reconstruction and development of the BiH economy. It was also confirmed that the Ministry of Development, Entrepreneurship and Crafts and the Ministry of Education and Science of FBiH would continue their efforts to establish science technology parks within their fields.

The Law on Science and Research Activity of Republic of Srpska defines the options and procedures for establishment of science technology parks, and defines their goals. RS actively works on establishment of an Innovation Center Banja Luka, a university entrepreneurship center and a technology park that will be set up in accordance with European and global experience in the field. In 2008, the Institute of Statistics of RS, in cooperation with the Ministry of Science and Technology of RS, conducted the first pilot



innovation survey for RS. The report “Innovation Activities in RS 2006-2008” was published in 2009 with data on investment in innovation. The above mentioned Science Law also defines the procedures for establishment of science technology parks and the goals of their work.

According to the STI Strategy, development of science-technology parks in BiH requires several strategic decisions: park locations, definition of state assistance in setting up the parks, acquisition of equipment, and legal framework in accordance with best practice. In order to create better synergy, the STI Strategy proposes to establish science parks in Sarajevo with a focus on information technologies, electronics, biomedicine; in Tuzla with a focus on chemicals, IT, and energy; and, in Mostar, focusing on processing of colored metals, agribusiness, and energy efficiency/renewable energy. In addition, there will be a technology park in Zenica emphasizing new materials, metal, and wood processing, as well as the Innovation Center Banja Luka with a focus on agroindustry, ICT technologies, electronics, energy, and tourism.

### *Clusters*

United States Assistance for International Development (USAID), through the Cluster Competitiveness Activity Project, conducted a four-year program (2004-2008) to assist businesses in sectors with large potential for economic development in BiH: wood processing and forestry, and tourism. The goal was to: increase overall revenues, exports, profits, and employment of the BiH wood processing and tourism sectors; and achieve institutionalized sustainability of joint action for individual company competitiveness for these two sectors.

The other major cluster development program in BiH is the Automotive Cluster Bosnia and Herzegovina (AC-BiH), led by the German Gesellschaft für Technische Zusammenarbeit (GTZ). It focuses on supporting a growing automotive component cluster, comprising companies from the entire country. The AC-BiH brings together the competences of its members along the supply chain and acts as a platform and motor for technological innovations, national and international co-operation, marketing, and distribution.

There are also a number of active clusters at the regional level in BiH, including wood processing and renewable energy industries. Examples may be the DRVO-PD cluster in the Prijedor and Banja Luka region (wood processing, encompassing R&D and innovations in wood design), or the SOLAR Group in Banja Luka region (renewable energy industry).