ERAWATCH COUNTRY REPORTS 2010: Bosnia and Herzegovina

ERAWATCH Network – Technopolis

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The opinions expressed are those of the authors only and should not be considered as representative of the European Commission’s official position.
Executive Summary

Bosnia and Herzegovina (BiH) is located in the South east Europe, bordering Croatia to the north and south-west, Serbia to the east, and Montenegro to the southeast. The total area is 51,129 km² and population is 3,843,126 (2010).

GDP (million €) in 2009 was 12,268m and GDP (€ per capita) 3,192. In 2009, the country endured recession with real GDP dropping by 2.9% after a 5.7% increase in 2008. The economic downturn was mainly caused by a drop in private domestic consumption, falling investments and a contraction of external demand. Trade slowed drastically, falling from around 94% of GDP in 2008 to approximately 76%. Construction activity and industrial production decreased in 2009 and unemployment picked up. The average unemployment rate in 2009 was very high at 24.1%. According to the Labour Force Survey conducted annually in May, unemployment significantly increased to 27.2% in 2010 from 24.1% in 2009. Measured according to the national registry, the rate was 43.2% in July 2010. Per capita income, measured in purchasing power standards (PPS), was 30% of the EU27 average in 2009, unchanged from a year earlier. As sufficient fiscal space had not been created in the years prior to the crisis and high spending commitments prevailed, public finances came under severe stress when revenues declined in 2009 as a result of the economic contraction, so that the Bosnian authorities had to resort to the international community for external support. The fiscal adjustment measures agreed with the International Monetary Fund (IMF) and the World Bank for the 2009 and 2010 budgets contributed to a consolidation of public finances, while some important structural reforms have been advanced. In 2010 some signs of economic recovery can be noted as the volume of industrial production grew by 1.1% year-on-year in the first eight months and that of exports by 28.8%. Overall, available indicators suggest a mild recovery of the economy in 2010 after the recession of 2009. Investment in research is very limited. Statistics on research and development activities are lacking. No data exist on business, foreign and private non-profit funding. The Entities and cantons fund their specific policies through their own budgets. In the absence of overall statistics for research and development (R&D) activities in BiH, it is difficult to come up with an exact evaluation of public investment in such activities. According to the Strategy Development for Science in BiH 2010-2015 (STI Strategy), BiH invests around 0.07% of its GDP on R&D however, it is estimated that total investment is as high as 0.1 to 0.14% of its GDP (budget, industry and services sector together) which is far below the EU27 average of 1.84%. In 2008 the budget of Republic of Srpska (RS) for R&D was €3.3m or 0.07% of its GDP while in Federation of BiH (FBiH) budget amounted to €2.73m or less than 0.07% of its GDP. In 2009, Canton Sarajevo budget for science amounts to €2.19m, Canton Tuzla €0.04m and Canton Zenica-Doboj €0.03m.

1 Agency for Statistics BiH, 2010
2 Agency for Statistics BiH, 2010
3 Agency for Statistics BiH, 2010
4 GDP per capita in PPS, Eurostat, 2009
5 Budget Canton Sarajevo, 2009
6 Budget Canton Tuzla, 2009
7 Budget Canton Zenica-Doboj, 2009
The current fiscal policy instrument in BiH still do not recognise and support tax incentives for R&D. Zero per cent corporate tax applied on all profits that are re-invested into the development of the company is yet non-existent in the country. 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) foresees 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 and they are entitled to some tax exemptions like all other public and non-profit organisations, but nothing to specifically support R&D.

The only incentives that may support the R&D indirectly are exemption of customs duties and value added tax (VAT) refund. According to the Law on Custom Duties (Official Gazette BiH, no. 57/04), imports of equipment financed by the international donor organisation is exempted from customs duties. The relevant Ministry in RS, FBiH or Canton issue certificates for the import of donated equipment for higher education institutions. These certificates are used to claim the exemption from customs duty and the same applies for the value added tax refund. For value added tax, the tax refund has been in force since 2005 (Official Gazette BiH, no. 09/05). Equipment that has been procured in BiH or abroad for the higher education institutions is entitled for the tax refund.

A major problem in regard to fiscal policies is that no clear incentives that support research in BiH have been created yet. This problem needs to be addressed and comprehensive solution should be proposed.

Human resources in BiH were severely affected by the break-up of former Yugoslavia. War and economic crises adversely affected the human resources and R&D potential. The so called brain drain resulted in the loss of experts who have left to seek new employment opportunities abroad and brain ‘waste’ scientists leaving R&D for better paid jobs in the private or informal sector. R&D jobs continue to be unattractive because of low pay, lack of social status, limited incentives and poor employment opportunities. Thus, BiH have experienced the departure of their most expert and highly qualified young people, which is resulting in a deficit of researchers of middle age.

Nevertheless, much more could be done, particularly since donor assistance to BiH remains very important in the medium run. BiH for example should be eligible to participate in the EU programmes currently reserved for candidate countries such as the European Investment Bank’s Innovation 2000 Initiative. The resources for funding longer-term research or researchers’ mobility are almost non-existent. Donor aid is often short-term, interest in investing in certain key areas, such as S&T infrastructure and modernisation of laboratories, is small. There is an urgent need to better match financial assistance from donors, with the national priorities of BiH.

As far as BiH is concerned, there is an absolute urgency to re-invest in scientific and technological research. Launching an ambitious programme to train Ph.D. students, and thus to educate the young generation of scientists, and building-up the country’s research infrastructures are two most urgent tasks for which State funding, complemented by international funds, is necessary. In parallel, salaries of research scientists, in universities and institutes, have to be increased step by step, so that they would be able to invest at least half of their time in research activities.
Knowledge Triangle

Effectiveness of knowledge triangle policies

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<th>Research policy</th>
<th>Recent policy changes</th>
<th>Assessment of strengths and weaknesses</th>
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<tr>
<td>The Strategy for the Development of Science in BiH – 2010-2015</td>
<td>Cuts in government funding for R&amp;D</td>
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<th>Innovation policy</th>
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<td>SMEs Development strategy for BiH 2009-2011</td>
<td>Universities’ third mission has a low priority</td>
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<th>Education policy</th>
<th>Recent policy changes</th>
<th>Assessment of strengths and weaknesses</th>
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<tr>
<td>Development of an appropriate formula for the allocation of public funds in support of the research activities of the universities</td>
<td>Danger that funding cuts will lead to fall in regional rankings of BiH universities</td>
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<tr>
<th>Other policies</th>
<th>Recent policy changes</th>
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European Research Area

The European Research Area (ERA) is addressed in BiH research policy mostly by encouraging and supporting BiH research organisations to participate in the projects within the ERA. The primary concern of BiH research policy is to intensify the access to international scientific networks and knowledge transfer and exchange.

In that respect, the integration of the BiH research system into the ERA is one of the priorities in the area of international cooperation and as such is actively supported by the Ministry of Civil Affairs (MoCA) and especially its Department for Science and Culture. The active participation of researchers in the ERA is a priority in the STI Strategy as well as in Strategy for the Development of Education 2008-2015.

The MoCA promotes and informs the BiH professional public about the conditions of co-operation and calls for proposals published by the European Commission. To raise awareness, the ministry organised more than 100 public presentations and seminars concerning these calls as well as workshops on methods and conditions for participation in the framework programmes. The ministry took an active part in the formation of the European Research Area (ERA) and the preparation of the 7th Framework Programme (FP7) for European R&D activities.

Assessment of the national policies/measures supporting the strategic ERA objectives (derived from ERA 2020 Vision)

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<th>ERA objectives</th>
<th>Main national policy changes</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Ensure an adequate supply of human resources for research and an open, attractive and competitive single European labour market for male and female researchers</td>
<td>Policy attention is focusing on the re-investment in scientific and technological research and on programme to train Ph.D. students. (+): A large number of higher education institutions; existent scientific and research potential at higher education institutions. (-): A lack of attractiveness for young talents; a lack of transparent recruitment and career progression mechanisms.</td>
</tr>
<tr>
<td>2</td>
<td>Increase public support for research</td>
<td>Proposal to the responsible science ministries in the country to increase STI funding outlined in Strategy development of Science in BiH 2010-2015 document. (-): Funding cuts may negatively impact the proposed targets.</td>
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<tr>
<td>ERA objectives</td>
<td>Main national policy changes</td>
<td>Assessment of strengths and weaknesses</td>
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<tr>
<td>3 Increase European coordination and integration of research funding</td>
<td>Support from the Ministry of Civil Affairs of BiH for the applicants on FP7 proposals.</td>
<td>(+): BiH interest in FP7 is actively supported by network of national contact points. (-): Low budget for support measures as well as weak openness to foreign researchers does not promote and strengthen BiH research.</td>
</tr>
<tr>
<td>4 Enhance research capacity across Europe</td>
<td>Government intends to provide full support to more active participation in the new phase of Framework programme.</td>
<td>(+) BiH interest in FP7 is actively supported by network of national contact points. (-): A lack of resources to support the direct and indirect costs of mobility.</td>
</tr>
<tr>
<td>5 Develop world-class research infrastructures (including e-infrastructures) and ensure access to them</td>
<td>In compliance with the CERIF (the Common European Research Information Format) recommendations, the web application E-CRIS (Current Research Information Systems) for FBiH and RS was developed which offered to all users of COBISS (Co-operative Online Bibliographic Systems and Services) applications the register of research and development providers. The register is essential for research monitoring and evaluation. E-CRIS systems are linked to national COBISS library information systems, thus allowing direct access to the bibliographies of researchers and institutions.</td>
<td>(-) No country research infrastructure (RI) planning. (-) BiH is not a member of the European Strategy Forum on Research Infrastructures (ESFRI). This fact alone e.g., weakens the coordination between the ESFRI roadmap and similar activities at BiH level. This is an important component for a coherent RI policy.</td>
</tr>
<tr>
<td>6 Strengthen research institutions, including notably universities</td>
<td>The establishment of the research institute within the University, as an important way of integrating science and education, and promoting research. Ensuring participation of scientific workers employed in public and private institutes in the teaching process at the higher education institutions.</td>
<td>The sector is regulated through the legislation on research activities and higher education.</td>
</tr>
<tr>
<td>7 Improve framework conditions for private investment in R&amp;D</td>
<td>STI Strategy recommend foresee that by 2015, the business sector invests about 33% of total R&amp;D expenditure.</td>
<td>Difficult economic factors are impacting negatively on business sector R&amp;D.</td>
</tr>
<tr>
<td>8 Promote public-private cooperation and knowledge transfer</td>
<td>STI Strategy promotes the stimulation of research and development cooperation between scientific and research institutions and companies.</td>
<td>(-): Third mission not yet a high priority for BiH universities.</td>
</tr>
<tr>
<td>ERA objectives</td>
<td>Main national policy changes</td>
<td>Assessment of strengths and weaknesses</td>
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<tr>
<td>9 Enhance knowledge circulation across Europe and beyond</td>
<td>Intensified regional cooperation enabling a large number of joint research actions which are interesting for the whole region.</td>
<td>(-) Lower mobility within the region might reduce knowledge exchange in ERA. More active involvement in FP7 needs to be actively supported by a network of national contact points.</td>
</tr>
<tr>
<td>10 Strengthen international cooperation in science and technology and the role and attractiveness of European research in the world</td>
<td>Active participation in the EUREKA and COST programme.</td>
<td>(+) BiH participation in these programmes is actively supported by network of national contact points.</td>
</tr>
<tr>
<td>11 Jointly design and coordinate policies across policy levels and policy areas, notably within the knowledge triangle</td>
<td>Research, higher education and innovation policy is well coordinated in one ministry.</td>
<td>(-) Fragmentation caused by multilevel governance with three levels of authorities for science in BiH: the State, entity and cantonal levels.</td>
</tr>
<tr>
<td>12 Develop and sustain excellence and overall quality of European research</td>
<td>Provision of more active participation of researchers in the relevant European and international programmes, by increasing financial resources intended for mobility.</td>
<td>(-) Passive response of researchers in the relevant European and international programmes.</td>
</tr>
<tr>
<td>13 Promote structural change and specialisation towards a more knowledge-intensive economy</td>
<td>Training of staff at the level of state administration in order to provide for basic advisory services to clients, i.e., scientists, to develop internal regulations, and to promote adequate regulation of the intellectual property rights at the national and international level.</td>
<td>(-) No incentive measures for stimulating the scientific and research work. Efficient and guaranteed stimulation mechanism can be an attractive means of investment into scientific and research work.</td>
</tr>
<tr>
<td>14 Mobilise research to address major societal challenges and contribute to sustainable development</td>
<td>Strengthening of the research infrastructure and regular investment in budgetary funding in order to modernise the existing research facilities and capabilities.</td>
<td>(+) Sustainable development is a target of BiH development policy.</td>
</tr>
<tr>
<td>15 Build mutual trust between science and society and strengthen scientific evidence for policy making</td>
<td>The culture of evaluation and accountability has not yet been developed in BiH research policy. An Action Plan for research evaluation has to be formulated by the relevant ministries in the country.</td>
<td>(-) No assessment of the economic impact of entities (FBiH and RS) investment in R&amp;D has been undertaken.</td>
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1 Introduction

The main objective of the ERAWATCH Analytical Country Reports 2010 is to characterise and assess the evolution of the national policy mixes in the perspective of the Lisbon goals and of the 2020, post-Lisbon Strategy. The assessment will focus on the national R&D investments targets, the efficiency and effectiveness of national policies and investments into R&D, the articulation between research, education and innovation, and on the realisation and better governance of ERA. In doing this, the 15 objectives of the ERA 2020 are articulated.

The report builds on the 2009 report streamlining the structure and updating the 2009 policy assessment in the domains of human resource mobilisation, knowledge demand, knowledge production and science-industry knowledge circulation. The information related to the four ERA pillars covered in the 2009 report is also updated and it is extended in order to cover all six ERA pillars and address the corresponding objectives derived from ERA 2020 Vision.

Given the latest developments, the 2010 Country Report has a stronger focus on the link between research and innovation, reflecting the increased focus of innovation in the policy agenda. The report is not aimed to cover innovation per se, but rather the 'interlinkage' between research and innovation, in terms of their wider governance and policy mix.

2 Performance of the national research and innovation system and assessment of recent policy changes

The aim of this chapter is to assess the performance of the national research system, the 'interlinkages' between research and innovation systems, in terms of their wider governance and policy and the changes that have occurred in 2009 and 2010 in national policy mixes in the perspective of the Lisbon goals. The analysis builds upon elements in the ERAWATCH Country Report 2009, by updating and extending the 2009 policy assessment in the domains of resource mobilisation, knowledge demand, knowledge production and science-industry knowledge circulation. Each section identifies the main societal challenges addressed by the national research and innovation system and assesses the policy measures that address these challenges. The relevant objectives derived from ERA 2020 Vision are articulated in the assessment.

2.1 Structure of the national research and innovation system and its governance

This section gives the main characteristics of the structure of the national research and innovation systems, in terms of their wider governance.
Bosnia and Herzegovina (BiH) is among the smallest countries in Europe with its 3.8 million inhabitants in 2010\(^8\) accounting for less than 1% of the population of the EU27. In 2009, GDP was €12,268m and GDP per capita was €3,192. GDP per inhabitant in BiH, expressed in purchasing power standards, was 31% of the EU average in 2008\(^9\). The average unemployment rate in 2009 was very high at 24.1%. According to the Labour Force Survey conducted annually in May, unemployment significantly increased to 27.2% in 2010 from 24.1% in 2009\(^{10}\). In the absence of overall statistics for research and development (R&D) activities in BiH, it is difficult to come up with an exact evaluation of public investment. According to the STI Strategy, BiH invests around 0.07% of its GDP on R&D however, it is estimated that total investment is as high as 0.1 to 0.14% of its GDP (budget, industry and services sector together) which is far below the EU27 average of 1.84%.

**Main actors and institutions in research governance**

The governance of the BiH research system reflects the constitutional structure of the country as shown in Figure 1.

The Ministry of Civil Affairs of BiH coordinates science policy at the state level as well as international cooperation through its Department for Science and Culture. The Minister of Civil Affairs has at his disposal the Science Council which advises the Minister during the preparation of the annual programmes for scientific research, proposes initiatives for the domestic and international projects, comments on the annual programmes of scientific and research activities, makes internal and external evaluations of the scientific and research activities, etc.

The entities, Republic of Srpska and Federation of BiH with its Cantons, coordinate their own specific policies through the entity/cantonal governments.

The Republic of Srpska R&D system is governed by the Ministry of Science and Technology of RS and it is the main funding channel for research activities in the entity. The policy is administered through the Department of Science and Department of Technology.

The Government of RS on the proposal of the Ministry of Science and Technology of RS forms a Science Council which advises the Minister during the preparation of the annual programmes for scientific research, proposes initiatives regarding domestic and international projects, comments on the annual programmes of scientific and research activities, makes internal and external evaluations of the scientific and research activities, etc.

In the Federation of BiH, the cantonal Ministries of Education, Science, Culture and Sport govern the financing of research activities. The policy is administered through the Department of Higher Education and Science. The Ministry forms a Science Council which advises the Minister on the same issues like as at entity and state level.

Research is primarily conducted in the public sector at the universities.

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\(^8\) Agency for Statistics BiH, 2010  
\(^9\) GDP per capita in PPS, Eurostat, 2009  
\(^{10}\) Agency for Statistics BiH, 2010
**Figure 1: Overview of the governance structure of the BiH research system**


**The institutional role of regions in research governance**

The Nomenclature of Territorial Units for Statistics (NUTS) for BiH does not exist. In fact, under the constitution of BiH, responsibility for S&T policy is allocated to the level of entities (RS and FBiH) and the Brcko District.

**Main research performer groups**

Investment in research is very limited. Statistics on research and development activities are lacking. No data exist on business, foreign and private non-profit funding.

The entities and cantons fund their particular policies through their own budgets.

In the absence of overall statistics for research and development (R&D) activities in BiH, it is difficult to come up with an exact evaluation of public investment in such activities. According to the strategy Development for Science in BiH 2010-2015 (STI Strategy), BiH invests around 0.07% of its GDP on R&D however, it is estimated that, in fact, total investment is as high as 0.1 to 0.14% which, however, is still far below...
the EU27 average of 1.84%. In 2008 the budget of RS for R&D was €3.3 m or 0.07% of its GDP while in FBiH budget amounted to €2.73m or less than 0.07% of its GDP. In 2009, the Canton Sarajevo budget for science amounted to €2.19 m\textsuperscript{11}, Canton Tuzla €0.04m\textsuperscript{12} and Canton Zenica-Doboj €0.03m\textsuperscript{13}.

### 2.2 Resource mobilisation

Since 2000, Europe has made evident progress towards ERA but at the same time it is clear that Europe's overall position in research has not improved, especially regarding R&D intensity, which remains too low. The lower R&D spending in the EU is mainly a result of lower levels of private investment. Europe needs to focus on the impact and composition of research spending and to improve the conditions for private sector R&D investments.

This section will assess the progress towards national R&D targets, with particular focus on private R&D and of recent policy measures and governance changes and the status of key existing measures, taking into account recent government budget data, including Structural Funds. The need for adequate human resources for R&D has been identified as a key challenge since the launch of the Lisbon Strategy in 2000. Hence, the assessment will include also the human resources for R&D. Main assessment criteria are the degree of compliance with national targets and the coherence of policy objectives and policy instruments.

#### 2.2.1 Resource provision for research activities

The aim of this section is to paint a picture of national public research funding and the various funding modes and mechanisms prevalent in the country.

Current R&D levels in the public sector in BiH are too low to maintain a healthy science base. At present, in BiH GERD is estimated at 0.1 to 0.14% of GDP\textsuperscript{14}. Funding of R&D activities is substantially lower than the EU average, 1.84%. The Strategy of Science in BiH proposes that BiH should raise its R&D investment to 1% of GDP by 2015. Increase in financial support from the state, entity and cantons and the ability to attract other funding is a challenge for the country policy makers. The public investments in education, research and innovation (RDI) is not prioritised and budgeted in the framework of multi-annual plans to ensure predictability and long term impact. Figure 2 shows stagnation or a drop in the share of GDP invested in R&D.

\textsuperscript{11} Budget Canton Sarajevo  
\textsuperscript{12} Budget Canton Tuzla  
\textsuperscript{13} Budget Canton Zenica-Doboj  
\textsuperscript{14} Strategy for Development of Science in BiH 2010-2015
The following table shows BiH’s gross expenditure on R&D vis-à-vis the EU27 over the period 1998-2008. The data indicate that current level of gross expenditure on R&D in BiH is far below of the EU since 1998.

**Table 1: BiH’s Gross Expenditure on Research and Development, 2004-2004**

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<tr>
<td>EU27</td>
<td>1.79%</td>
<td>1.85%</td>
<td>1.87%</td>
<td>1.86%</td>
<td>1.85%</td>
<td>1.90%</td>
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<tr>
<td>GERD/GDP BiH</td>
<td>n.a.</td>
<td>n.a.</td>
<td>n.a.</td>
<td>0.03%*</td>
<td>0.07%*</td>
<td>0.14%*</td>
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</table>

Source: Eurostat, R&D expenditure, 2010; *Strategy for Development of Science in BiH 2010-2015

BiH has recently developed its legal and institutional framework by adopting the laws on Higher Education (2007) and Science (2009). In parallel, the Strategies on technological and scientific development on the state level were adopted in 2009 which represent a significant step forward. However, the very same documents on R&D have not yet been publicly proclaimed and noticeable. This lack of a clear R&D strategy and policy is mainly responsible for the perpetual marginalisation of research. The countrywide policy approach on R&D has yet to be developed.

Funding is available only from the Government irrespective of the political and administrative level. BiH has a decentralised decision-making and governance system for R&D funding.

The MoCA accounts for a very limited part (€250,000 in 2009) of R&D funding. It provides funding for BiH researchers to submit proposals for FP7, COST and EUREKA projects.

Institutional funding covering salaries, running costs and capital spending institutes/agencies in FBiH and RS does not exist. The only available public research funding is competitive and project-based grants.

The budget for R&D is mainly distributed by the Ministry of Science and Technology of RS in the form of competitive grants. No institutional funding for research institutes is available. According to the Law on Science of RS (Official Gazette of RS 122/07) the institutes work on self-financing basis through project-based activities, feasibility studies etc. The same situation applies in FBiH and its cantons.
There are four main funders in BiH which allocates financial resources via competition-based research grants: at the state level, the Ministry of Civil Affairs of BiH, at the entity level, the Ministry of Science and Technology of RS and the Ministry of Education and Science of FBIH and on the cantonal level, the Ministry of Education, Science, Culture and Sport of Cantons Sarajevo, Tuzla and Zenica-Doboj. Project based funding is the basic channel and the main instrument of all levels of governments in the country for financing running and the operational costs of all research activities at universities and public institutes.

The main financial instruments in support of research in FBIH and RS are as follows:

- competitive grants for conducting basic research, applied research and experimental development;
- competitive grants for supporting young and gifted scholars for the 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 the international scientific conferences and development of scientific cooperation;
- competitive grants for acquisition of research equipment;
- competitive grants for support of scientific and professional association;
- competitive grants for the organisation of scientific events.

The above funding features indicate a relatively slow transformation of R&D towards enterprise-based R&D systems. Yet, during the transition period and until recently, the trend was towards a stronger higher education sector. With continuing recovery and economic growth, long term strategy is that the business enterprise sector takes on added importance.

2.2.2 Evolution of national policy mix geared towards the national R&D investment targets

The responsible ministries in FBIH and RS are not in the possession of data on the gross business enterprise expenditure on research and technological development. Moreover, the statistical agencies in BiH (State and two entity) also does not collect and report the data. As stated before (in section 2.2.1), funds for scientific research activity comes from budget entities resources. The allocation of business enterprises R&D is certainly marginal. This is particularly true in industries where privatised companies and their new owners are not showing interest in R&D investment. Overall, it can be said the public funding dominates the R&D activities in the country.

BiH to this date did not develop any substantial policies/instruments aimed at increasing private R&D investment. The Action Plan of the STI Strategy proposes that the legal and institutional reforms are necessary to create conditions for gradual increase of R&D investment of business sector. The action plan foresees increase of budget for 33%.

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 and 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.

The current fiscal policy instruments in BiH still do not provide tax incentives for R&D. Zero percent corporate tax applied on all profits that are re-invested into the development of the company is not yet law in the country. 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) only foresee 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 and they are entitled to some tax exemptions like all other public and not-for-profit organisations, but there is nothing to support R&D specifically.

The only incentives that may indirectly support R&D are exemptions from custom duties and VAT refunds. According to the Law on Custom Duties (Official Gazette BiH, no. 57/04), imports of equipment financed by an international donor organisation are exempted from customs duties. The relevant Ministry in RS, FBiH or canton issue certificates for the import of donated equipment for higher education institutions. These certificates are used to claim the exemption from customs duty and the same applies for the value added tax refund. For value added tax, the tax refund has been in force since 2005 (Official Gazette BiH, no. 09/05). Equipment that has been procured in BiH or abroad for higher education institutions is entitled to the tax refund.

A major problem in regard to fiscal policies is that no clear incentives that support research in BiH have been created yet. This problem needs to be addressed and a comprehensive solution should be found.

BiH belongs to the group of countries that began creating the legal and institutional frameworks in the area of innovations, as well as motivating small and small and medium enterprises (SMEs), but it still has a long way to go to implement the legal norms and create the national programme for stimulating innovations. Establishment of links between the SMEs and the scientific and research institutions is still at an early stage. There are a few examples of inter-company clusters or networks. An important segment in stimulating the innovations is also a more efficient protection of knowledge and assistance in the transfer of knowledge. The issue of intellectual property protection is imposed as one of the basic issues that have to be resolved at the institutional and legislation level.

Technology centres and science and research parks have been set up. There are three innovation centres in Banja Luka, Zenica and Mostar, developed in the partnership between local authorities and international organisations. Specialised agencies for technology transfer have not been established yet.

The policies in other areas (such as agriculture, competition policy, public administration, transport, housing etc.) do not have a major impact on R&D policy. Also, BiH does not have special programmes or action plan for research from other ministries.

2.2.3 Providing qualified human resources

Human resources in BiH were severely affected by the break-up of former Yugoslavia. War and economic crises adversely affected the human resources and R&D potential. The so called ‘brain drain’ resulted in the loss of experts who left to
seek new employment opportunities abroad and the ‘brain waste’ saw scientists leaving R&D for better paid jobs in the private or informal sector. R&D jobs continue to be unattractive because of low pay, lack of social status, limited incentives and poor employment opportunities. Thus, BiH suffered the departure of its most expert and highly qualified young people, which is now resulting in a shortage of experienced middle aged researchers.

Despite the fact that donor assistance to BiH will remain very important in the medium term, BiH, is not entitled to participate in the EU programmes currently reserved for candidate countries such as the European Investment Bank’s Innovation 2000 Initiative. The resources for funding longer-term research or researcher mobility are almost non-existent. Donor aid is often short-term, interest in investing in certain key areas, such as S&T infrastructure and modernisation of laboratories, is small. There is an urgent need to better match financial assistance from donors with the national priorities of BiH.

Statistical Institute of RS regularly publish bulletins for education sector. According to the most recent published data\textsuperscript{15}, the total number of academic staff that works at the Universities in RS is 2,456. Out of the total 50% are PhD holders and 15% Master degree holders. There are 1,423 permanent (58%) and 1,033 (42%) part time staff. The total number of master and PhD holders as well as specialists year by year increases. There are 173 PhD and 57 MA holders obtained their degrees in 2008. According to the rough estimation of the Ministry of Science and Technology of RS, there are 1.2 researchers per thousand active populations.\textsuperscript{16}

\textit{Federal Office of Statistics} in its publication “FBiH in figures” reports that there are in academic year 2009/2010, graduated 321 PhD and 77 Master degree students. There are 2,716 FTE teaching staff and 3,016 part time staff\textsuperscript{17}.

The universities integrate the teaching and the scientific process with the view of training staff, producing young scientists and developing research, which results in new knowledge and scientific methods. Scientific and research activity in BiH has been dominantly conducted at the universities. Unfortunately, due to various circumstances, primarily lack of financial resources, during the last 15 years the intensity of scientific and research process has been significantly reduced. Since 2003, BiH universities have been engaged in the Bologna Process implementation at the level of undergraduate studies. The first steps have been also made with the view of recognizing the scientific and research work in the form of financial support to scientific development, publishing of works in refereed journals and participation in scientific meetings. However, master and doctoral studies programmes were frequently developed without any fundamental analysis of the infrastructure and human resources potentials and long-term formation of the scientific and research process, without which these programmes are inconceivable in the modern world. The needed support of the state in form of a clear policy and financial support in this area was missing as well.

As far as BiH is concerned, there is an absolute urgency to re-invest in scientific and technological research. Launching an ambitious programme to train PhD students, and thereby to educate the young generation of scientists, and to build-up the country’s research infrastructures are the two most urgent tasks for which state funding, complemented by international funds, is necessary. In parallel, salaries of

\textsuperscript{15} Bilten statistike visokog obrazovanja br.6, Republički zavod za statistiku, Banja Luka, 2009.
\textsuperscript{16} Statistički godišnjak, Republički zavod za statistiku, Banja Luka, 2009.
\textsuperscript{17} Federal Office of Statistics, FBiH in figures, Sarajevo 2010
research scientists in universities and institutes have to be increased step by step so that staff will be able to invest at least half of their time in research activities.

2.3 Knowledge demand

This section will focus on structure of knowledge demand drivers and analysis of recent policy changes.

Structure of knowledge demand drivers

Domestic demand for R&D and for skilled employees is relatively weak, especially compared to the supply of R&D (Radosevic, 2007). There are several reasons for this. One is no doubt the structure of industry, which is dominated by small firms working in traditional industries that do not explore new technologies. Lack of capacity is another factor.

BiH easily has big demand–supply gap, both because of unsophisticated industries and the inability of local demand to make up for limited international co-operation.

Throughout the region, R&D system in BiH has been stabilised in recent years and are gradually recovering from the recession caused by the transition to a market economy. In the new EU Member States, the pace of change is much faster, as these countries are enjoying significant increases in funding of their R&D through EU Structural Funds to which BiH is not eligible.

A decreasing demand for R&D accompanied by a growing number of tertiary graduates (number graduated students increased from 3705 in 2000 to 12199 in 2008) suggests that BiH economy is facing significant structural changes in terms of the demand for knowledge. Once very focused on R&D, demand for knowledge is becoming non-R&D-based. As in other countries of Western Balkan at a similar level of development, R&D system in BiH is dominated by the government and the higher education sector.

Thematic versus generic R&D funding

Apart from the regular R&D budget apportioned by the ministries, they provide also some support schemes about €250,000 in 2008 for project activities in sector of agriculture, forestry and water protection. In 2009, the ministries invested €342,500 in thematic projects in all scientific fields: modern materials, drinking water resources, energy efficiency in civil engineering, sustainable economy, biomass and energy, medicine, science and societal changes.

2.4 Knowledge production

The production of scientific and technological knowledge is the core function that a research system must fulfil. While different aspects may be included in the analysis of this function, the assessment provided in this section will focus on the following dimensions: quality of the knowledge production, the exploitability of the knowledge creation and policy measures aiming to improve the knowledge creation.

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19 BiH Agency for Statistics, 2010
2.4.1 Quality and excellence of knowledge production

In 2008, estimated value of BiH’s gross domestic expenditure on R&D (GERD) was 0.07%-0.14% of GDP, well below the average of the EU27 of 1.84%. The main source of R&D funding is the Government. Public budget for R&D decreased in nominal value since 2008. Statistical offices in BiH currently gather no data on BERD and HERD. Such structural features indicate a relatively slow transformation of R&D towards enterprise-based R&D systems. Domestic demand for R&D and for skilled employees is relatively weak. One is no doubt the structure of industry, which is dominated by small firms working in traditional industries that do not exploit new technologies. Lack of capacity is another factor. As a consequence of poor demand for R&D, BiH suffered from severe brain drain. There are also lacks of adequate premises and updated large-scale equipment as well as developed library-information system. The current performance of R&D in BiH is strongly linked to number of scientific publications and scientific papers in the referenced journals per 100,000 inhabitants, number of patents and citations of authors of scientific papers. According to the data from 2001, BiH had 3 times fewer published papers in 2000 in comparison to its figures in 1990 or 5 times fewer than Montenegro, 8 times fewer than FYRO Macedonia, 18 times than Serbia, 42 times than Croatia and 125 times fewer than Slovenia (Fourth International Congress on Peer Review in Biomedical Publication, Barcelona, September 2001). According to STI Strategy, the most published papers internationally are the ones published in medical journals (40%), engineering (20%) and natural science (18%).

Table 2: Number of published papers in BiH per 100,000 inhabitants

<table>
<thead>
<tr>
<th>No. of published papers in BiH per 100,000 inhabitants</th>
<th>1990</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.95</td>
<td>0.61</td>
</tr>
</tbody>
</table>

Source: The Strategy for the Development of Science in BiH – 2010-2015, p.34

Table 3: Number of publications per 1,000,000 inhabitants

<table>
<thead>
<tr>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>No of publications per 1,000,000 inhabitants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2007</td>
</tr>
<tr>
<td>142</td>
<td>163</td>
<td>362</td>
<td>396</td>
<td>94.20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>103.05</td>
</tr>
</tbody>
</table>

Source: The Strategy for the Development of Science in BiH – 2010-2015, p.34

According to data obtained from searches of available databases (SCI- Science Citation Index Expanded, Social Sciences Citation Index, Arts & Humanities Citation Index, Conference Proceedings Citation Index-Science, Conference Proceedings Citation Index-Social Science & Humanities, MEDLINE), there were in absolute figures 595 published papers in 2009 and 498 in 2010.20

According to STI Strategy, the total number of requested patent registration in BiH was 815, published in the Official Gazette however, only 330 were approved. BiH citizens filed 618 applications. Patent protection to BiH territory was approved for 1,280 patents already registered in the countries of European Union. Owners of these patents have paid certain fees for protection of their rights in BiH.

The number of patent applications has been rapidly decreasing lately, and the number of approved patents is relatively low.

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20 Informacija o stanju nauce u Federaciji Bosne i Hercegovine, Mostar, decembar 2010, p.21
Table 4: Number of applications and approved patents in 2005-2007

<table>
<thead>
<tr>
<th>Total data</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patent applications in Institute for Intellectual Property of BiH</td>
<td>372</td>
<td>217</td>
<td>92</td>
</tr>
<tr>
<td>Number of accepted national patents in the National patent office</td>
<td>55</td>
<td>76</td>
<td>70</td>
</tr>
<tr>
<td>Number of awarded patents by EPO *** European patents design in BiH</td>
<td>160</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.4.2 Policy aiming at improving the quality and excellence of knowledge production

There is no effective monitoring and review system in place making full use of output indicators due to weak system for collecting and processing of data. As it is the case for the competitive project funding, the responsible ministries for science in the country adopt the Rulebook on criteria for appointing experts and procedure of assessment of research projects. These Rulebooks prescribe more precisely the criteria for appointing experts (reviewers) by the relevant ministries as well as the procedure of assessment of research projects. The ministries keep a register of experts, for scientific areas, on the basis of references of researchers. The national funding is not allocated through international evaluation procedure. Public funding mechanisms encourage trans-national cooperation but due to small grants offered there is no interest for the scientists from abroad and projects are not subject to external peer review.

2.5 Knowledge circulation

Tackling the challenges that European society faces in the 21st century will require a multi-disciplinary approach and coordinated efforts. Many debates and conferences, e.g. the Lund Declaration recognise that such complex issues cannot be solved by single institutions, technology sectors or MS acting alone. Hence strong interactions within the "knowledge triangle" (education, research and innovation) should be promoted at all levels. Moreover, in the context of increasing globalisation, cross-border flows of knowledge are becoming increasingly important. This section will provide an assessment of the actions at national level aiming to allow an efficient flow of knowledge between different R&D actors and across borders.

2.5.1 Knowledge circulation between the universities, PROs and business sectors

Public–private cooperation is weak in BiH. In spite of this, some first policy documents in RS as well as in FBiH call upon the importance of public–private collaboration (e.g. Development of Industrial Policy in FBiH, Development of Industrial Sectoral Strategy of RS, Strategic action plan for development of education in BiH 2008-2015, Strategic Development of SMEs in RS).

The main forms of research partnerships in BiH are:

- bilateral contracts between public research organisations and enterprises for carrying out ad hoc research projects;
- joint participation by companies and public research organisations in EU Framework Programmes projects;
- financing the study visits of students (most often in the form of scholarships), by firms with an interest in sponsoring the careers of specialists with specific qualifications.
2.5.2 Cross-border knowledge circulation

In June 2003, the EU Thessaloniki Summit approved the „Action plan on science and technology for the countries of West Balkans“. This plan aimed at providing special assistance to the countries in the region, including BiH to increase their participation in the EU’s Research and Technology Development (RTD) Framework Programmes and other European initiatives.

EC funded projects supporting S&T policy formulation and implementation both in the 6th and 7th Framework Programme (FP6 and FP7), e.g. WBCINCO.NET which implements capacity building measures (training, brokerage events, workshops on statistical indicators, etc.), SEE-ERA.NET and SEE-ERA.NET PLUS, which support international research cooperation projects. The SEE-ERA.NET and WBCINCO NET projects, as well as the Steering Platform on Research for the Western Balkan countries launched in June 2006, provide support acting as forums for the exchange of experiences and best practices among the Western Balkan countries, as well as through focused and co-ordinated interventions targeted at European Commission services and the EU Member States.

The Austrian Development Agency (ADA) and the Open Society Fund BiH (OSF BiH) have been active for the past five years in supporting the integration of Bosnia and Herzegovina into the European Research Area by providing assistance for the development of a National Contact Point (NCP) system responsible for the provision of information and advice on participation of BiH researchers in the EU’s 7th Framework Programme (FP7).

According to the evaluation report of the ADA sponsored NCP programme the number of participants from BiH in FP7 has grown, but the quality of the proposals in which BiH researchers are involved has been below the benchmarks of the other Western Balkan countries. The service capacity of the NCP is limited; as the research system is not yet fully competitive and some researchers are not motivated to participate in large-scale complex European projects. The transfer of the NCP to MoCA is a very positive development concerning its reputation and recognition. It is now very important to secure the operational management of the associated activities, such as website and database management, organisation of info-days, workshops, trainings, consulting to public and private sector organisations at the same rate of efficiency, in view of the expected growth in volume and depth. ADA will continue providing assistance for the development of a National Contact Point (NCP) system for period of another three years, 2010-2013.

EC TEMPUS programme provided very significant support to modernisation and reform of higher education system in BiH. Since 1997, TEMPUS financed almost 90 projects with the total budget of €24.8m21 aimed at promoting the cooperation with the EU higher education institutions in the area of curricula development, university management and structural reforms. This programme proved to be extremely efficient both for university human resource development and for strengthening capacities in public administration, civil society and economic reform. In the last TEMPUS IV Call for Applications (first Call in 2008), BiH had more than 60 applications, out of which 9 were successful for funding. It is also important to emphasise that, in the beginning of 2009, the EU announced that a BiH Tempus projects (led by the University of Banja Luka with project partners from University of Zenica, University of Mostar and University „Džemal Bijedić“ Mostar, and with EU

partners from Belgium and Poland) was selected as one of the best among the best 30 projects ever in TEMPUS.

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. The programme launches every two years 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, use of the research results for commercial purposes. On average, every year, 20-30 projects apply to these Calls. Joint Committee for Scientific and Technological Cooperation between BiH and Slovenia evaluates the projects and proposes the best ones for financing.

The field of science is also included in the IPAP - Individual Partner Action Plan that represents one of the Partnership for Peace mechanisms. It is a bilateral mechanism that provides support in defining the needed reforms in the partner countries, designed on a two-year basis and aimed at uniting different cooperation mechanisms through which partner country cooperates with NATO. IPAP improves bilateral assistance coordination received by BiH in the process of Euro-Atlantic integrations.

Apart from the abovementioned, BiH academic community signed numerous bilateral agreements on international cooperation with foreign institutions (mutual agreements between faculties/colleges, universities, institutes etc.) that also cover the field of science and research, as well as joint projects. This type of cooperation agreements mainly is reflected in individual participation of BiH researchers in research activities. The biggest involvement in this segment is visible in biomedical and technical sciences.

2.5.3 Main societal challenges

No particular research areas are prioritised that requires cooperation, either between various national research performers or across borders.

2.6 Overall assessment

The Council of Ministers of BiH by signing the memorandum of understanding (MoU) with the EU on S&T co-operation and the recent membership in COST and the associated status in EUREKA has created a favourable political framework for BiH researchers and research organisations to significantly improve their international collaborations.

The lack of financial sources in the national budget drives the researchers to look for funding sources outside the country. On one side the advancing political framework for international S&T co-operation and on the other side the growing demand for funding push the research community to turn more and more toward opportunities given by the EU’s FP7 and EUREKA/COST. The membership or associated status will not result in automatic benefits, the opportunity must be capitalised. Public services should be significantly improved in order to use effectively these options.

European Research Area is addressed in BiH research policy mostly through stimulation of BiH research organisations to participate in the projects within the European Research Area. The primary concern of BiH research policy is to intensify
the access to the international scientific networks and knowledge transfer and exchange.

In that respect, the integration of BiH research sphere into the ERA is one of the priorities in the area of international cooperation and as such actively supported by the Ministry of Civil Affairs and especially its Department for Science and Culture. The active participation of researchers in the ERA is called for in the STI Strategy as well as Strategic development of education 2008-2015.

The Ministry of Civil Affairs promotes and informs the BiH professional public about the conditions of co-operation and calls for proposals published by the European Commission. In the light of this, the ministry organised more than 100 public presentations and seminars concerning these calls as well as workshops on methods and conditions for participation in the framework programmes. The ministry took an active part in the formation of the European Research Area (ERA) and the preparation of the 7th Framework Programme (FP7) for European R&D activities.

### Table 5: Summary of main policy related opportunities and risks

<table>
<thead>
<tr>
<th>Domain</th>
<th>Main policy opportunities</th>
<th>Main policy-related risks</th>
</tr>
</thead>
</table>
| Resource mobilisation      | • Intensification of the involvement and participation of BiH scientists in the European science and technology programmes. | • Decrease in the number of capital research equipment units that can be accessed by researchers in BiH.  
• Funding cuts may negatively affect the work of researches. |
| Knowledge demand           | • Improvement and stabilisation of the business environment in relation to those in the neighbouring countries and definition of the „investment products“ in industries that may be more attractive than those in other countries.  
• Development of a systemic framework for accelerated growth of different forms of partnerships between private and public sectors. | • Low level of FDI.  
• Structure of industry, which is dominated by small firms working in traditional industries.  
• Unsophisticated industries and the inability of local demand to make up for limited international co-operation. |
| Knowledge production       | • Increase in participation in European and international programmes.                       | • Low success level in participation in European and international programmes.               |
| Knowledge circulation      | • Stimulation of international cooperation at all levels of scientific and research activity. | • Passive response of scientific and research activities.                                    |

### Table 6: Main barriers to R&D investments and respective policy opportunities and risks

<table>
<thead>
<tr>
<th>Barriers to R&amp;D investment</th>
<th>Opportunities and Risks generated by the policy mix</th>
</tr>
</thead>
</table>
| Lack of government incentives for private R&D. | Targeted policy measures may provide framework conditions for more R&D in the business sector, but there is a risk that the economic crisis endangers the investment in R&D.  
BiH to this date did not develop any substantial policies/instruments aimed at increasing private R&D |
Fiscal policy instruments in BiH still do not provide tax incentives for R&D. Low level of R&D infrastructure as well as lack of attractiveness of research institutions. Low salaries among researchers, and a need for better national funding. Incoming mobility is particularly affected since the importance of international mobility among researchers is very weak.

Zero percent corporate tax applied on all profits that are reinvested into the development of the company is not accompanied by the relevant legislation. Lifelong learning strategy improves skills development of working force, but risk that increasing unemployment may have negative impact on education of scientists and engineers.

3 Interactions between national policies and the European Research Area

3.1 Towards a European labour market for researchers

The Communication Better careers and more mobility: A European Partnership for Researchers proposed by EC in May 2008 aims to accelerate progress in four key areas:

- Open recruitment and portability of grants;
- Meeting the social security and supplementary pension needs of mobile researchers;
- Providing attractive employment and working conditions;
- Enhancing the training, skills and experience of researchers

The Commission has also launched concrete initiatives, such as dedicated information services for researchers, in particular through the activities grouped under the name of EURAXESS – Researchers in Motion. Based on the assessment of the national situation in the four key dimensions detailed above, this section will conclude if national policy efforts are supporting a balanced ‘brain circulation’, with outward mobility levels matching inward mobility levels. High levels of outward mobility coupled with low levels of inward mobility often signal an unattractive national labour market for researchers and unsuitable research infrastructures. This may trigger, despite the policy efforts supporting the mobility the ‘brain drain’ rather than brain circulation.

3.1.1 Stocks and mobility flows of researchers

According to data from Statistical Agency of Bosnia and Herzegovina for 2006/2007, number of population with tertiary education account for around 6-7% in BiH, this is three times lower than European average which exceeds 20%. Lack of students in BiH, especially in natural science and mathematics as well as technical science represents a negative trend in development of human resources in STI.

Mobility of researchers and academic staff is within the competence of the responsible ministry for science in the FBIH, RS and cantons. The responsible Ministry supports mobility of the researchers through the implementation of the bilateral agreements. Academically oriented programmes that support for mobility of
researchers are managed via University offices for international relations. These programmes include: CEEPUS, TEMPUS and Erasmus Mundus - External Cooperation Window.

BiH has no data available on the outwards and inwards mobility. According to the Statistical Office of FBiH\(^{22}\), in 2009, there were 36 PhD graduates in social sciences, 2 in natural science, 19 in technical science, 17 in agricultural science and 19 in medicine. In 2009 in RS, Statistical office of RS reports 5 PhD graduates in natural science, 11 in technical science, 5 in medicine, 2 in biotechnology and 33 in social science.

The conditions for the mobility of researchers in BiH will be improved with the announced visa liberalisation for the BiH citizens, i.e. abolishment of visas for the Schengen area from 15 Dec. 2010. The Ministry of Civil Affairs delegated the University of Sarajevo and Banja Luka to be the Bridgehead Organisation for establishing of the European Researchers Mobility Centre through EURAXESS BiH call for projects under the FP7 People programme. In addition to this, there are other activities aiming at enhancement of the mobility of researchers through CEEPUS, TEMPUS, Erasmus Mundus and other international cooperation programmes.

As reported by the EUA Evaluation report of BiH Universities\(^{23}\), the current structure of academic programmes and examinations makes it almost impossible to study correctly, pass examinations and graduate within the normal timeframe. Curricula are overloaded and based heavily, if not exclusively, on traditional *ex cathedra* teaching and rote learning. Academic courses tend to be too specialised and rigid, with many overlaps and incoherencies, thus denying students the flexibility needed to face the future. There are few examples of interdisciplinarity. Theoretical knowledge predominates over practical learning. Timetabling is poor, resulting in many hours lost for the students, without adequate library or other independent learning facilities. All these mean that there is a generalised and urgent need for a learning-oriented approach across all universities, where the student is at the centre of the process, rather than an accidental element on the periphery.

Data found in various articles and reports on the number of scientists per thousand inhabitants, used as statistical indicator, is unreliable and thus cannot be used for comparison with other countries. With regards to human resources in BiH, critical point of R&D system is incomplete data base of scientist and researchers as well as lack of data on actual number of “active” scientists. As a consequence, no reliable data exist on the levels of inward versus outward flow of researchers. No specific actions are taken at national level to enhance transnational mobility mainly due to the scarce investment in R&D.

### 3.1.2 Providing attractive employment and working conditions

The most frequent challenges for BiH researchers is the lack of R&D infrastructure, attractiveness of research institutions, low salaries among researchers, and a need for better national funding. Incoming mobility is particularly affected by a low awareness of the importance of international mobility among researchers. In contrast, outgoing mobility is influenced by language problems, recognition of qualifications, legal and administrative regulations, social insecurity, and the fact that vacancies tend only to be posted locally.

\(^{22}\) Federal Office of Statistics, 2010

Public research organisations and higher education institutions in BiH so far have not signed the Charter for Researchers.

Promotion of women in science is not specifically articulated in the policy formulation. Specific arrangements exist for young researchers in case of maternity leave, where their status can be extended for the period of their absence from work. Same applies also for women working at higher education: their status is maintained and the leave does not count into re-election time frame. There are no national policy level regulations which would in any way discriminate on the basis of gender.

As in other countries in the Western Balkan region, the problem of brain-drain appeared in the 1990s as a consequence of the general state in the region. Unfortunately, there are no precise data on the number of the BiH scientists and researchers living abroad at present. Also, there are no definite policies to prevent brain-drain of R&D personnel, neither to ensure conditions for the brain-gain (their return to the country).

3.1.3 Open recruitment and portability of grants

Mobility of researchers and academic staff is within the competence of the responsible ministry for science in the FBIH, RS and cantons. The responsible ministry supports mobility of researchers through the implementation of bilateral agreements. Academically oriented programmes that support mobility of researchers are managed via university offices for international relations. These programmes include: CEEPUS, TEMPUS and Erasmus Mundus - External Cooperation Window.

Apart from the abovementioned, BiH academic community signed numerous bilateral agreements on international cooperation with foreign institutions (mutual agreements between faculties/colleges, universities, institutes etc.) that also cover the field of science and research, as well as joint projects. This type of cooperation agreements mainly is reflected in individual participation of BiH researchers in research activities. The biggest involvement in this segment is visible in biomedical and technical sciences.

The conditions for the mobility of researchers in BiH were improved in 2011 when BiH EURAXESS portal was set up. Steps have been taken to raise awareness of the mobility of researchers. First “Researcher’s Mobility Day in BIH” was held on May 27th 2011, at the University of Banja Luka. The event was organised in the scope of BAMONET Project (BiH Researchers’ Mobility Network). Throughout BAMONET Project it is planned to develop network of researcher’s mobility centres within Bosnia and Herzegovina in order to include BIH in the EURAXESS initiative.

As part of this event it was organized round table on “Problems of Researcher’s Mobility” that gathered representatives of EURAXESS centres from BIH, Croatia, Serbia, Montenegro and FYR Macedonia and representatives of academic community. Basic problems connected with mobility of researchers in the Western Balkan countries were discussed.

Participants from the regional EURAXESS centres stressed problems and obstacles in researchers’ mobility from BIH to other countries and within BIH itself. Some of them are following: lack of classes in foreign languages, regulation of absence status in order to achieve mobility, coordination of legislation at national level with regard to doctoral studies, etc. It was also emphasized importance of regional initiatives at the field of scientific researches and regional projects, and significance of relations with scientific researchers at the Western Balkan countries such as efforts in promotion of
FP7 PEOPLE program (Maria Curie scheme), from where could be financed regional mobility (for example, leave of BIH researchers to Croatia, Serbia or some other regional country and vice versa).

3.1.4 Meeting the social security and supplementary pension needs of mobile researchers

In May 2011 BiH has set up its EURAXESS portal where regulations are published to facilitate the integration of foreign researchers in the national research labour market, such as social security access, health insurance, compatibility of pension schemes. There are no special tax incentives to facilitate the participation in supplementary pension schemes. In order to protect social security rights of foreigners in BiH and BiH citizens abroad, BiH has signed a number of international agreements on social security. On the basis of reciprocity, bilateral international agreements provide the social security rights of citizens according to their work and residence in one of the contracting countries. The provisions of bilateral agreements include health insurance rights, rights to pension and disability insurance, unemployment rights, rights to child allowance and administrative legal assistance. Also, by signing bilateral agreements between BiH and countries in the region and wider, possibility of portable loans will be defined.

3.1.5 Enhancing the training, skills and experience of European researchers

The first round of development of new degree programs (Masters and PhD) started before development of the necessary quality cultures existed at the universities. The restructuring of the old university degree programs in two cycles begun without the necessary preparation and with lack of appropriate understanding of the logic and philosophy of Bologna principles. As a result, instead of developing new type of programs, the old one were compressed with no appropriate use of the ECTS system, lack of the clear defined learning outcomes, not to say about the newly appeared needs for development of appropriate skills, competency and finally practical employability of the graduates.

The problem for the establishment of the PhD is the lack of appropriate research facilities. The HEIs are at the initial stage of development of doctoral programmes and they rely to a great extent on external support channelled through various individual and joint international projects such as TEMPUS program, Erasmus Mundus.

Guidelines for the development of the Code of Rules for the Doctoral Studies have been adopted in Republika Srpska. The Guidelines give basic principles for the organization of studies: up to 45 ECTS for taught courses and at least 135 ECTS for independent and original scientific research.

There are few doctoral programmes in BiH established by the BiH and EU universities financed by the TEMPUS programme where medium of instruction is English. Also, there is a PhD student mobility financed through programme such as Erasmus Mundus and Erasmus Mundus External Cooperation Window.
3.2 Research infrastructures

Research infrastructures (RIs) are a key instrument in the creation of new knowledge and, by implication, innovation, in bringing together a wide diversity of stakeholders, helping to create a new research environment in which researchers have shared access to scientific facilities. Recently, most EU countries have begun to identify their future national RI needs, budgets and priorities in the so called National Roadmaps for Research Infrastructures. These strategic documents also set out a strategic view on how to guarantee and maintain access to research facilities. Although some countries invest heavily in RIs, none can provide all the required state-of-the-art facilities on a national basis. Several large RIs have already been created in Europe. While optimising the use and development of existing RIs remains important, new infrastructures are needed to respond to the latest research needs and challenges. European Strategic Forum for Research Infrastructures (ESFRI) was established in April 2002 to support a coherent approach to policy-making on RIs in Europe and to act as an incubator for international negotiations on concrete initiatives. This section assesses the research infrastructures national landscape, focusing on the national RI roadmap and national participation in ESFRI.

3.2.1 National Research Infrastructures (RI) roadmap

A roadmap for the building of new infrastructures has been designed in the Strategy for Development of Science in BiH 2010-2015. The document specifies the following actions for improvement of the research infrastructure:

- Increase investments in research equipment, especially in priority scientific areas, as well as in the revitalisation of research infrastructure. To achieve this increase the investment in R&D by 2015 with 1.5% of GDP.

- Enable unlimited access to electronic scientific data bases (Science Direct, EBSCO, etc.). By 2010 to have subscription and access to all major databases.

- Work on internationalisation and raising the quality of domestic scientific journals with the aim of becoming internationally recognised – creating and funding programmes for publishing reference scientific domestic journals. By 2013, to have a journal for each scientific field.

- Strengthen support for the publication of high quality scientific books.

3.2.2 National participation in the ESFRI roadmap. Updates 2009-2010

BiH has no its ESFRI Delegate. No National roadmap has been made yet.

3.3 Strengthening research institutions

The ERA green paper highlights the importance of excellent research institutions engaged in effective public-private cooperation and partnerships, forming the core of research and innovation ‘clusters’, mostly specialised in interdisciplinary areas and attracting a critical mass of human and financial resources. The Universities/research institutions should be embedded in the social and economic life where they are based, while competing and cooperating across Europe and beyond. This section gives an overview of the main features of the national higher education system, assessing its research performance, the level of academic autonomy achieved so far, dominant governing and funding models.
3.3.1 Quality of National Higher Education System

As it is the case with R&D, the authority over higher education is given to the two entities: the Federation of Bosnia and Herzegovina (FBIH) and Republika Srpska (RS). At the State level no ministry is in charge of higher education. In RS a single ministry of education manages the educational sector, including higher education. There are two Universities in RS: the University of Banja Luka and the University of East Sarajevo with 24,598 enrolled students in academic year 2007/2008\(^{24}\). There were in total 5886 graduated students in 2008. Out of these, 4045 graduated in social science, 744 in technical science, 381 in medicine, 156 natural science, 119 biomedical and 81 humanities.\(^{25}\) In the FBIH, the Federal Ministry of Education has transferred the authority of education to the ten cantons, so that each canton has its own ministry of education, which is also in charge of higher education. Out of 10 only 5 cantons have Universities and these are: Sarajevo, Tuzla, Bihac, Zenica and two Universities of Mostar (University “Dzemal Bijedic” Mostar, and University of Mostar) with 71,610 enrolled students in 2009/2010 academic year\(^{26}\). There were in total 10,096 graduated students out of which 321 Master and 77 PhD\(^{27}\). Four Universities in BiH are loose associations of autonomous faculties and other institutions (Sarajevo, Bihac, University “Dzemal Bijedic” Mostar and University of Mostar) and the other four are integrated universities, where in total there are 140 faculties and 10 academies.\(^{28}\) The public universities are the main beneficiaries of research funding given through the competitive grants by the various competent ministries entity and canton. As far as research institutes are concerned there are 21 in RS (15 public and 6 private) and around 30 in FBIH (20 public and 10 private).\(^{29}\)

BiH has made, on one hand, the progress towards the reform process of higher education by defining broader common policy framework at the country level (Framework law on higher education in Bosnia and Herzegovina - Official Gazette of BH No. 59/07), 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 Centre for Information and Recognition of Documents.

Teaching activity across the BiH universities also appears to be in a rather critical position. Despite a much more favourable 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 three hours per week only, the overloading of teachers – especially those above a certain seniority, coming from the fact that they teach simultaneously in other Faculties of the same university or at a different university, thereby drawing several salaries. Indeed, all universities rely extensively on these visiting professors, which is an expensive habit, all the more so as it results in a low research output. OECD norm (OECD/GD (07) 84 Frascati Manual) defines that each university teacher should spend half of his/her working hours in education process (so called. 0.5 FTE - Full Time Equivalent) and

\(^{25}\) ibid
\(^{26}\) Federal Office of Statistics, FBIH in figures, Sarajevo 2010
\(^{27}\) ibid
\(^{28}\) The Strategy for the Development of Science in BiH – 2010-2015
\(^{29}\) ibid
other half (0.5 FTE) as researcher. This condition has been met with around 3% in BiH\textsuperscript{30}.

While each university has an official mission and vision, there is an urgent need for these to be articulated more clearly and to have greater influence on both the long term strategy and the daily work of the institutions. Given the current large numbers of students, the resources available to each university, and the wider social and economic situation, it appears that the universities should concentrate their efforts on education. In parallel, a more realistic approach to research could be developed by fostering centres of excellence, in academic fields central to each university's profile, for the application and transfer of technology and up-to-date international scientific knowledge relevant to BiH social development. The necessary resources – including financial and human resources – are not currently available for more ambitious research operations.

3.3.2 Academic autonomy

Given that, as already mentioned, the public funding of research at the BiH universities is very low, and the current emphasis is, de facto, on teaching activity it is still early to speak about the national university landscape, namely in terms of the broader autonomy in research, in the management of research budgets and on hiring personnel, and on the capacity to autonomously design research agendas and topics of research specialisation.

There are no effective university-wide research strategies in place at the moment, that the current fragmented university structures work against any coherent approach to research management, and that the current capacity is limited to individual activities rather than developing critical mass in a number of defined strategic fields. In terms of broadening the universities’ scientific and academic base and reversing the terrible brain-drain of the last decade, only few Universities appears to have put in place a concrete strategy for its post-graduate students to obtain research experience abroad as part of their PhD studies, and to return to academic positions.

BiH legislation provides limited organisational autonomy to the higher education institutions (HEIs) because it determines the internal governance and management structure of the universities. Detailed legal provisions set up the competencies, responsibilities, and relations between the three key bodies – the governing board, the rector and the senate. The law asks for this to be set in the university statute as the basic document, which regulates the overall functioning of the universities.

The governing boards are composed of internal and external representatives. The governing board is conferred with important and broad competencies including, among others, authorities related to statute of the HEI (in some cases), and other general acts on internal organisation and systematisation of jobs. The board adopts financing and development plans, the annual work plan and respective reports. It is authorised to guide, control and assesses the work of the rector in the area of financial affairs.

The rectors in BiH were granted more authority because they are put in an extremely challenging position due to the restructuring of the universities into integrated institutions. This complex process is highly demanding in many aspects including financing, human resources, culture, and mentality. It is hard to say that there had
been some kind of a preparatory program for the leadership to support the universities in addressing these challenges.

Within the new legal framework the senate of BiH universities has been provided with satisfactory competences for accomplishing their important role in formulating decisions related to all academic issues. The Senate also has authority in adopting the statute of the universities and to thereby contribute to a sound management structure and a balanced distribution of competencies and responsibilities. This is of substantial importance considering that the senate is the most representative body for academics and especially for students, who are to represent in the Senate by no less than 15%.

The position of the faculties in the organisation of the BiH universities is subject of deepest changes in accordance with the new legal regulations abolishing their status of legally and financially independent bodies. The new status of the integrated universities is designed in line with the provisions for full legal personality of the public universities in relation to their overall functioning.

3.3.3 Academic funding

Financing of higher education (HE) in BIH is a central issue as it is in other countries. However, due to the overall organisation of HE in BIH, involving numerous stakeholders at country, entity and cantonal levels - the setting up of a common, or at least, a well harmonized financing policy and practice presents itself as an extremely difficult task. The Framework Law on HE does not address the financing of higher education, thereby leaving this issue to be treated at the level of the individual entities and cantons.

In BiH universities funding system only rely on block funding. The block funding (institutional or general funding) is attributed directly to universities for their institutional tasks. There is no institutional funding allocated to universities for research, this being exclusively devoted to teaching and accordingly calculated predominantly on the basis of the number of students. Public competitive funding is made available through specific instruments (grants competition) directly to individual researchers or research units.

3.4 Knowledge transfer

The importance of knowledge dissemination and exploitation in boosting competitiveness and contributing to the effectiveness of public research has been increasingly recognised by EC and EU Member States. Following the publication of the ERA Green Paper in April 2007, the EC Communication "Improving knowledge transfer between research institutions and industry across Europe" was issued, highlighting the importance of the effective knowledge transfer between those who do research, particularly HEIs and PROs, and those who transform it into products and services, namely the industry/SMEs.

Several Member States have taken initiatives to promote and facilitate knowledge transfer (for instance new laws, IPR regimes, guidelines or model contracts) and many others are planning to intensify their efforts in this direction. However, these initiatives are often designed with a national perspective, and fail to address the transnational dimension of knowledge transfer. This section will assess the national policy efforts aimed to promote the national and transnational public-private knowledge transfer.
3.4.1 Intellectual Property (IP) Policies

The following institutes exist within the innovation system of BIH:

- Institute for Intellectual Property of Bosnia and Herzegovina;
- Institute for Standardisation of Bosnia and Herzegovina (BAS);
- Institute for Metrology of Bosnia and Herzegovina.

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 organisations (the World Intellectual Property Organization-WIPO and European Patent Organisation-EPO, etc.), and also for patent data collection and processing.

In 2003, BIH signed a cooperation agreement with EPO, which enabled the expansion of the European patent applications and patents into BiH. The European patent applications and patents thereby become protected in BIH as patents which belong to EPO and its 30 member states.

As Table 4 (Section 2.4.1.) shows the number of applications for protection of patent rights and patents granted protection has recently reduced.

The largest number of patents applied is 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. MoCA has been supporting innovators since 2007 under the “Support for Innovation and Technical Culture in BIH” programme. Funds are allocated through public competition. In 2009, a total of €0.07m was allocated. RS also allocates budget funds for technological development which includes innovators, meetings and projects for the development of new technologies and the information society. The total budget for 2008 was €0.65m broken-down as follows: public call to innovators (€0.04m or 6.3% of the total budget), development of new technologies (€0.60m or 86.3% of the total budget) and development of the information society (€0.05m or 7.4% of the total budget). The Federation Ministry of Education and Science have also been supporting innovators, innovativeness and technical culture, and the introduction and development of new technologies over many years. Support is implemented through a public call. In the course of 2009, around €0.05m was allocated for these purposes.

The currently available data on patents for BIH under the WIPO database are as follows.

| Table 7: WIPO Patent statistics for BiH, currently available |
|--------------------|-----------------|
| Patent Application Filings | BiH |
| Total number of patent applications (1985-2007) | NOI! Aggregate data for all countries in the World_TOTAL No. |
| by resident and non-resident | |
| Patent applications by patent office (1883-2008) | Yes |
| by resident and non-resident | |

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31 Manual on STI Statistics in BiH, Technopolis Group, 2010
The STI Strategy proposes an action plan for development of innovation centres, technology transfer centres, intellectual property rights, commercialisation and application of scientific patents. The recommendations are:

- At the level of BiH, introduce standard innovation indicators at all levels of government.
- Provide measures in order to stimulate the creation of new products, technologies, processes and services, or substantial improvements of existing ones, in accordance with market needs.
• Establish cooperation of ministries responsible for science and technology with other ministries with a view of promoting the overall innovation capacity, horizontally at all levels i.e., state, entity, cantonal.

• Establish coordination between the ministries responsible for science from the State level (MoCA) to the entity and cantonal ministries with the aim of promoting innovation activities.

• Within the ministries responsible for science, establish commissions for monitoring and supporting innovation activities in specific areas and industries.

• At the ministries responsible for science, establish a Register of Innovation Activities, especially with data on high-tech companies (those that invest more than seven per cent of expenditures annually in research and development) and medium-technology companies (those that invest between three and seven per cent of expenditure on annually in research and development). Only registered firms can be beneficiaries of the state, entity and cantonal support measures and budget for the development of innovation activities.

• Improve the protection of intellectual property rights by adoption of appropriate legal acts and providing funds for these purposes.

• Support the increase of the number of recognised patents in research institutions and enterprises, their licensing and commercialisation, as a means of economic development. Three to five per cent of funds for R&D activity should be directed to commercialisation of scientific ideas.

• With targeted and synchronised actions by all government levels, revitalise human resources potential and infrastructure as a basis for development of RTDI system.

• Create preconditions and provide continuous support for the establishment of modern innovation centres and technological parks, and establishment of functional networks throughout Bosnia and Herzegovina with clearly defined responsibilities of key actors (universities, local and regional communities, state, professional associations, private sector etc.).

• Promote public-private partnership.

• Provision of a stable source of financing and ensure the progressive increase of investments in the field of science, technology and innovation at the government levels, private industry / business sector, with the ultimate goal of meeting the criteria set by the Lisbon strategy.

• Encourage industrial research and development, cooperation between industry and research, and commercialisation of research and innovation results.

• Encourage cooperation, partnership and active participation of local institutions in European research programmes.

• Nurturing public opinion on the importance of investment in science, innovation and technology in the overall social and economic progress of the country.

• Organise programmes for development of leadership and managerial skills in science.
3.4.2 Other policy measures aiming to promote public-private knowledge transfer

As BiH is still striving to establish functioning R&D systems there has been no specific measures, schemes, initiatives, programmes, laws, technology transfer office etc. to foster the creation of university spin offs. Since no reliable data exist on mobility of reserachers there is no evidence which can support presence of inter-sectoral mobility i.e., mobility between public and private institutes.

Overall, preparations in the area of industry and SMEs remain at an early stage. Bosnia and Herzegovina has to develop a comprehensive industrial strategy and to implement the State level strategy for SMEs. BiH has a status of potential candidate country and thus, the European Regional Development Fund (ERDF) is not available to support promotion interaction between research institutions and SME.

Involvement of private sectors in the governance bodies of HEIs and PROs is marginal, usually one representative from private sector within a body of 10 to 15 appointed members, with low impact on the development of an institution in question.

3.5 Cooperation, coordination and opening up national research programmes within ERA

The articulation between the R&D Framework Programmes, the Structural Funds and the Competitiveness and Innovation Programme is still underdeveloped in terms of coordination, synergies, efficiency and simplification. The policy fragmentation at EU and national level, and between EU and national policies can hinder the build of up critical masses of research excellence, leads to the duplication of efforts, sub-optimal impacts of the different instruments and unnecessary administrative overheads. Differences between research selection procedures and criteria can also be an obstacle to the overall spread of excellence. This section will assess the effectiveness of national policy efforts aiming to improve the coordination of policies and policy instruments across the EU, all part of the drive to create an integrated ERA.

3.5.1 National participation in intergovernmental organisations and schemes

Data from the NCP BiH reports that in FP6, there were 89 applications submitted by 24 BiH institutions (in all cases as partners) which participated/participate in 44 projects. Thematic priorities were: environment, integrated water management, waste management and health.

The selected BiH participants were involved in projects under the following FP6 Instruments: SSA (20 projects), STREP (7 projects), IP (3 projects), CA (2 projects).

From the CORDIS FP7 Database, BiH institutions are participating in 17 projects within FP7. At present, there is no available information on the number of submitted applications for FP7 with BiH participation.
Since May 2009, BiH is a full member of the COST and within the EUREKA BiH has the status of National Information Point.

3.5.2 Bi- and multilateral agreements with other ERA countries

Concerning the scientific and educational co-operation with other countries from the region as well as with other European countries, it can be said that Bosnia and Herzegovina only have an active on going bilateral programme in scientific research with Slovenia. All other forms of activities (joint workshops, conferences, scholarships, student exchanges) within the bilateral cooperation are focused on education and that mostly on the basis of direct inter-institutional agreements.

In June 2003, the EU Thessaloniki Summit approved the „Action plan on science and technology for the countries of West Balkans“. This plan aimed at providing special assistance to the countries in the region, including BiH to increase their participation in the EU's Research and Technology Development (RTD) Framework Programmes and other European initiatives.

EC funded projects supporting S&T policy formulation and implementation both in the 6th and 7th Framework Programme (FP6 and FP7), e.g. WBCINCO.NET which implements capacity building measures (training, brokerage events, workshops on statistical indicators, etc.), SEE-ERA.NET and SEE-ERA.NET PLUS, which support international research cooperation projects. The SEE-ERA.NET and WBCINCO.NET projects, as well as the Steering Platform on Research for the Western Balkan countries launched in June 2006, provide support acting as forums for the exchange of experiences and best practices among the Western Balkan countries, as well as through focused and co-ordinated interventions targeted at European Commission services and the EU Member States.

The Austrian Development Agency (ADA) and the Open Society Fund BiH (OSF BiH) have been active for the past five years in supporting the integration of Bosnia and Herzegovina into the European Research Area by providing assistance for the development of a National Contact Point (NCP) system responsible for the provision of information and advice on participation of BiH researchers in the EU's 7th Framework Programme (FP7).

According to the evaluation report of the ADA sponsored National Contact Point (NCP) programme the number of participants from BiH in FP7 has grown, but the quality of the proposals in which BiH researchers are involved has been below the benchmarks of the other Western Balkan countries. The service capacity of the NCP is limited; as the research system is not yet fully competitive and not all researchers are motivated to participate in large-scale complex European projects. The transfer of the NCP to MoCA is a very positive development concerning its reputation and recognition. It is now very important to secure the operational management of the associated activities, such as website and database management, organisation of info-days, workshops, trainings, consulting to public and private sector organisations at the same rate of efficiency, in view of the expected growth in volume and depth. ADA will continue providing assistance for the development of a National Contact Point system for period of another three years, 2010-2013.

EC TEMPUS programme provided very significant support to modernisation and reform of higher education system in BiH. Since 1997, TEMPUS financed almost 90 projects with the total budget of €24.8m32 aimed at promoting the cooperation with the

EU higher education institutions in the area of curricula development, university management and structural reforms. This programme proved to be extremely efficient both for university human resource development and for strengthening capacities in public administration, civil society and economic reform. In the last TEMPUS IV Call for Applications (first Call in 2008), BiH had more than 60 applications, out of which 9 were successful for funding. It is also important to emphasise that, in the beginning of 2009, the EU announced that a BiH TEMPUS projects (led by the University of Banja Luka with project partners from University of Zenica, University of Mostar and University „Džemal Bijedić“ Mostar, and with EU partners from Belgium and Poland) was selected as one of the best among the best 30 projects ever in TEMPUS.

3.5.3 Other instruments of cooperation and coordination between national R&D programmes

Due to its very recent association to the 7th Framework Programme (January 2009), BiH has not yet been included in the existing initiatives such as ERA-NET, participation in initiatives undertaken under Art. 185 of the Treaty of Lisbon, participation in activities undertaken through frameworks supported by the European Science Foundation (ESF), participation in European public-private partnerships, European Technology Platforms (ETF) and Joint Technology Initiatives (JTI) or the JP initiative (“Towards joint programming in research: Working together to tackle common challenges more effectively”).

3.5.4 Opening up of national R&D programmes

No mobility schemes particularly targeting researchers from third countries exists.

3.6 International science and technology cooperation

In 2008, the European Commission proposed the Strategic European Framework for International Science and Technology Cooperation to strengthen science and technology cooperation with non-EU countries. The strategy identifies general principles which should underpin European cooperation with the rest of the world and proposed specific orientations for action to: 1) strengthen the international dimension of ERA through FPs and to foster strategic cooperation with key third countries through geographic and thematic targeting; 2) improve the framework conditions for international cooperation in S&T and for the promotion of European technologies worldwide. Having in view these aspects, the following section will analyse how national policy measures reflect the need to strengthen the international cooperation in S&T.

3.6.1 International cooperation

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. The programme launches every two years 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, use of the research results for commercial purposes. On average, every year, 20-30 projects apply to these Calls. Joint Committee for Scientific and Technological
Cooperation between BiH and Slovenia evaluates the projects and proposes the best ones for financing.

The field of science is also included in the IPAP - Individual Partner Action Plan that represents one of the Partnership for Peace mechanisms. It is a bilateral mechanism that provides support in defining of the needed reforms in the partner countries, designed on two-year basis and aimed at uniting different cooperation mechanisms through which partner country cooperates with NATO. IPAP improves bilateral assistance coordination received by BiH in the process of Euro-Atlantic integrations.

3.6.2 Mobility schemes for researchers from third countries

Apart from the abovementioned, BiH academic community signed numerous bilateral agreements on international cooperation with foreign institutions (mutual agreements between faculties/colleges, universities, institutes etc.) that also cover the field of science and research, as well as joint projects. This type of cooperation agreements mainly is reflected in individual participation of BiH researchers in research activities. The biggest involvement in this segment is visible in biomedical and technical sciences.

There are no mobility schemes particularly targeting researchers from third countries.

4 Conclusions

4.1 Effectiveness of the knowledge triangle

Table 8: Effectiveness of knowledge triangle policies

<table>
<thead>
<tr>
<th></th>
<th>Recent policy changes</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research policy</td>
<td>The Strategy for the Development of Science in BiH – 2010-2015</td>
<td>Cuts in government funding for R&amp;D</td>
</tr>
<tr>
<td>Innovation policy</td>
<td>SMEs Development strategy for BiH 2009-2011</td>
<td>Universities’ third mission has a low priority</td>
</tr>
<tr>
<td>Education policy</td>
<td>Development of an appropriate formula for the allocation of public funds in support of the research activities of the universities</td>
<td>Danger that funding cuts will lead to fall in regional rankings of BiH universities</td>
</tr>
<tr>
<td>Other policies</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
</tbody>
</table>
### 4.1.1 ERA 2020 objectives - a summary

**Table 9: Assessment of the national policies/measures supporting the strategic ERA objectives (derived from ERA 2020 Vision)**

<table>
<thead>
<tr>
<th>ERA objectives</th>
<th>Main national policy changes</th>
<th>Assessment of strengths and weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 <strong>Ensure an adequate supply of human resources for research and an open, attractive and competitive single European labour market for male and female researchers</strong></td>
<td>Policy attention is focusing on the re-investment in scientific and technological research and on programme to train Ph.D. students.</td>
<td>(+): A large number of higher education institutions; existent scientific and research potential at higher education institutions. (-): A lack of attractiveness for young talents; a lack of transparent recruitment and career progression mechanisms.</td>
</tr>
<tr>
<td>2 <strong>Increase public support for research</strong></td>
<td>Proposal to the responsible science ministries in the country to increase STI funding outlined in Strategy development of Science in BiH 2010-2015 document.</td>
<td>(-): Funding cuts may negatively impact the proposed targets.</td>
</tr>
<tr>
<td>3 <strong>Increase European coordination and integration of research funding</strong></td>
<td>Support from the Ministry of Civil Affairs of BiH for the applicants on FP7 proposals.</td>
<td>(+): BiH interest in FP7 is actively supported by network of national contact points. (-): Low budget for support measures as well as weak openness to foreign researchers does not promote and strengthen BiH research.</td>
</tr>
<tr>
<td>4 <strong>Enhance research capacity across Europe</strong></td>
<td>Government intends to provide full support to more active participation in the new phase of Framework programme.</td>
<td>(+) BiH interest in FP7 is actively supported by network of national contact points. (-): A lack of resources to support the direct and indirect costs of mobility.</td>
</tr>
<tr>
<td>5 <strong>Develop world-class research infrastructures (including e-infrastructures) and ensure access to them</strong></td>
<td>In compliance with the CERIF (the Common European Research Information Format) recommendations, the web application E-CRIS (Current Research Information Systems) for FBiH and RS was developed which offered to all users of COBISS (Co-operative Online Bibliographic Systems and Services) applications the register of research and development providers. The register is essential for research monitoring and evaluation. E-CRIS systems are linked to national COBISS library information systems, thus allowing direct access to the bibliographies of researchers and institutions.</td>
<td>(-) No country research infrastructure (RI) planning. (-) BiH is not a member of the European Strategy Forum on Research Infrastructures (ESFRI). This fact alone e.g., weakens the coordination between the ESFRI roadmap and similar activities at BiH level. This is an important component for a coherent RI policy.</td>
</tr>
<tr>
<td>ERA objectives</td>
<td>Main national policy changes</td>
<td>Assessment of strengths and weaknesses</td>
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<tr>
<td>----------------</td>
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<td>----------------------------------------</td>
</tr>
<tr>
<td>6 Strengthen research institutions, including notably universities</td>
<td>The establishment of the research institute within the University, as an important way of integrating science and education, and promotion research. Ensuring participation of scientific workers employed in public and private institutes in the teaching process at the higher education institutions.</td>
<td>The sector is regulated through the legislation on research activities and higher education.</td>
</tr>
<tr>
<td>7 Improve framework conditions for private investment in R&amp;D</td>
<td>STI Strategy recommend foresee that by 2015, the business sector invests about 33% of total R&amp;D expenditure.</td>
<td>Difficult economic factors are impacting negatively on business sector R&amp;D.</td>
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<tr>
<td>8 Promote public-private cooperation and knowledge transfer</td>
<td>STI Strategy promotes the stimulation of research and development cooperation between scientific and research institutions and companies.</td>
<td>(-): Third mission not yet a high priority for BiH universities.</td>
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<td>9 Enhance knowledge circulation across Europe and beyond</td>
<td>Intensified regional cooperation enabling a large number of joint research actions which are interesting for the whole region.</td>
<td>(-) Lower mobility within the region might reduce knowledge exchange in ERA. More active involvement in FP7 needs to be actively supported by a network of national contact points.</td>
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<td>10 Strengthen international cooperation in science and technology and the role and attractiveness of European research in the world</td>
<td>Active participation in the EUREKA and COST programme.</td>
<td>(+) BiH participation in these programmes is actively supported by network of national contact points.</td>
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<td>11 Jointly design and coordinate policies across policy levels and policy areas, notably within the knowledge triangle</td>
<td>Research, higher education and innovation policy is well coordinated in one ministry.</td>
<td>(-) Fragmentation caused by multilevel governance with three levels of authorities for science in BiH: the State, entity and cantonal levels.</td>
</tr>
<tr>
<td>12 Develop and sustain excellence and overall quality of European research</td>
<td>Provision of more active participation of researchers in the relevant European and international programmes, by increasing financial resources intended for mobility.</td>
<td>(-) Passive response of researchers in the relevant European and international programmes.</td>
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<tr>
<td>13 Promote structural change and specialisation towards a more knowledge-intensive economy</td>
<td>Training of staff at the level of state administration in order to provide for basic advisory services to clients, i.e., scientists, to develop internal regulations, and to promote adequate regulation of the intellectual property rights at the national and international level.</td>
<td>(-) No incentive measures for stimulating the scientific and research work. Efficient and guaranteed stimulation mechanism can be an attractive means of investment into scientific and research work.</td>
</tr>
</tbody>
</table>
The European Research Area (ERA) is addressed in BiH research policy mostly by encouraging and supporting BiH research organisations to participate in the projects within the ERA. The primary concern of BiH research policy is to intensify the access to international scientific networks and knowledge transfer and exchange.

In that respect, the integration of the BiH research system into the ERA is one of the priorities in the area of international cooperation and as such is actively supported by the Ministry of Civil Affairs (MoCA) and especially its Department for Science and Culture. The active participation of researchers in the ERA is a priority in the STI Strategy as well as in Strategy for the Development of Education 2008-2015.
References


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List of Abbreviations

ADA The Austrian Development Agency
BAS Institute for Standardisation of Bosnia and Herzegovina
BD Brcko District
BERD Business Expenditure on Research and Development
BiH Bosnia and Herzegovina
CERIF Common European Research Information Format
COBISS Co-operative Online Bibliographic Systems and Services
CRIS Current Research Information Systems
EPO European Patent Organisation
ERA The European Research Area
ERDF European Regional Development Fund
ESFRI European Strategic Forum for Research Infrastructures
FBIH Federation of BiH
FP7 7th Framework Programme
FTE Full time equivalent
GERD General Expenditure on Research and Development
HE Higher education
HEIs Higher education institutions
IMF International Monetary Fund
IP Intellectual property
IPAP Individual Partner Action Plan - NATO Partnership for Peace mechanisms
KT Knowledge Transfer
MEDLINE Medical Literature Analysis and Retrieval System Online
MoCA Ministry of Civil Affairs of BiH
NCP National Contact Point
OSF BiH Open Society Fund BiH
PPS Purchasing power standards
PRO Public research organisations
R&D Research and development
RDI Research development and innovation
RS Republic of Srpska
RTDI Research and technology development
S&T Science and technology
SCI Science Citation Index
SMEs Small and medium enterprises
STI Strategy Strategy for development of science in BiH 2010 - 2015
VAT Value added tax
WIPO The World Intellectual Property Organization