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The Country Report 2012 builds on and updates the 2011 edition. The report identifies the structural challenges of the national research and innovation system and assesses the match between the national priorities and the structural challenges, highlighting the latest developments, their dynamics and impact in the overall national context.

The first draft of this report was produced in December 2012 and was focused on developments taking place in the previous twelve months. In particular, it has benefitted from the comments, suggestions and editing of Elisabetta Marinelli from JRC-IPTS. The contributions and comments from Darko Petrušić (Ministry of Science, Montenegro) are also gratefully acknowledged.

The report is currently only published in electronic format and is available on the [ERAWATCH website](#). Comments on this report are welcome and should be addressed to [jrc-ipts-erawatch-helpdesk@ec.europa.eu](mailto:jrc-ipts-erawatch-helpdesk@ec.europa.eu).

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## EXECUTIVE SUMMARY

The research and Innovation policy framework in Montenegro in recent years has been adequately improved or revised to respond to the main challenges and to align with ERA pillars and objectives. This was recognized by European Commission and six months after the opening of negotiations, Chapter 25: Research and Science was opened and provisionally closed in December 2012.

In 2012, Montenegro updated the main policy document on research and innovation, the Strategy of Scientific Research Activity 2012-2016, in order to align it with the Law on Scientific Research Activity from 2010, develop a new instruments of support, define new goals and priorities and redefine goals regarding the R&I investment. In addition, during last few years several other strategic documents related to education on all levels were adopted. Those documents also recognized the importance of research and innovation for the development of society. In the area of economic development, clusters are identified as one of the measures that could boost the development of SMEs and innovations. In 2012 the Strategy for Sustainable Economic Growth in Montenegro through the Introduction of Business Clusters 2012- 2016 was adopted. the Government also confirmed its commitment to the support of R&D sector by setting R&D as one of five priority areas in National Development Plan.

In 2012 the first survey on R&D according to EU standards was conducted. Due to this improvement in national statistics we are able to observe the current level of investment and trace some trends. In 2011 GERD was at the level of 0.41% of GDP or €13.22m, which presents significant inceras in comparison with pervious years despite restricted budget policy. However, R&D performed by business enterprise sector as a share of GERD is 22% which is in absolute terms very modest (€2.26 m).

Montenegrin scientific research institutions participate in Seventh Framework Programme (FP7), European Cooperation in Science and Technology (COST) and EUREKA programmes and NATO-Science for Peace. In addition Montenegro cooperates with IAEA from 2006 and with International Centre for Genetic Engendering and Biotechnology - ICGEB from 2012.

R&D policy mix is mostly aimed on increase of number of researchers, research output, and mobility. However, during the last few years, focus is being moved towards excellence and innovations. Two new measures in this area are: the establishment of the first centre of excellence (in the preparation phase) and of the first Scientific Technological Park (in the implementation phase). In 2012 the most significant call for co-financing of scientific research activities was conducted (worth €5m).

The Higher Education and Research for Innovation and Competitiveness (HERIC) project (financed from the €12m WB loan), besides support of the establishment of the first centre of excellence, will be focused on grants for research institutions with recognized scientific results, fostering communication with diaspora but also to the improvement of the quality of higher education and its financing.

The main challenges that R&D system in Montenegro is still facing are: the increase of scientific output and mobility of researchers, the acceleration of commercialisation of research and deepening of collaboration with the business sector, the promotion of higher levels of private R&D investments as well as the facilitation of innovative start-up companies. Current policy documents recognize those challenges and propose appropriate policy. However, as the majority of these measures, especially those related to innovations, are at the initial phase, their performance may not be assessed at the moment.

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# 1 INTRODUCTION

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Montenegro is a country located in South Eastern Europe covering the area of 13,812 km<sup>2</sup> with total population of 620,029<sup>1</sup> inhabitants that accounts for 0.1% of EU population. It has a coast on the Adriatic Sea to the southwest and is bordered by Croatia to the west, Bosnia and Herzegovina to the northwest, Serbia to the northeast and Albania to the southeast.

Montenegrin Gross Domestic Product (GDP) in 2011 recorded an annual growth of 3,2% and amounted €3,234m. GDP per capita in the same year was €5,211, or 42% of the EU average. After the significant drop by 5.7% in 2009, due to the global financial crises, Montenegrin economy started slightly to recover in 2010, recording an annual growth rate of 2.5%. According to the projections of Government of Montenegro (GoM) it is expected that economy in 2012 will slow its growing part reaching 0.5% of annual growth.

According to the newest data collected by MONSTAT, total expenditures on research and development (GERD)<sup>2</sup> was, in 2011, at the level of 0.41% of GDP (€13,22m), which is significantly below the EU average of 2.03%. The main source for funding of research and development (R&D) activities in Montenegro is the government budget, which accounts for 50% of GERD. Expenditures realized by higher education make 26% of all R&D expenses in the country, while R&D performed by business enterprise sector as a share of GERD is 22%. The lowest share in total expenditures on R&D is realized by non-profit research organizations, 2% of GERD.

The research community is made of 46 licensed scientific research institutions, out of which 32 faculties (public and private), 8 institutes (public and private) and 6 other scientific research institutions. 2,303 professionals are employed in the R&D sector<sup>3</sup>, which accounts for 0.8% of the total labor force (80.9% of EU average). From this total number 1,699 are researchers, 281 technicians and other equivalent staff and 323 other supporting staff. Research community consist of 641.9 researchers (FTE), out of which 322 are female. The highest number of researchers was employed in the higher education sector (59.4%), Government sector (32%), business sector (8%) and private non-profit sector (0.6%). The significant increase in the number of professionals employed in R&D sector and researchers compared to 2008 (1,462 R&D professionals and 313 researchers) is mainly consequence of the improvement of the data collection process, which is currently done in accordance with EU methodology.

Research infrastructure was significantly developed in last several years, especially in the area of information and communications technologies (ICT). A basis of this infrastructure is Montenegrin Research and Academic Network (MREN), which enables all scientific research institutions to be connected among themselves and with the institutions involved in European Association of Academic Networks (GEANT). There is also an information-system on scientific research activities in Montenegro (E-CRIS.CG) A digital national library is being created. Montenegro has also developed research infrastructure in the following areas: biomedical and life sciences (especially agriculture, public health, facilities for Hydrograph and Seismological examination, chemistry and microbiology of waters and marine waters, as well as the infrastructure for marine biology research), computation and data treatment (especially in the field of power engineering, telecommunications, electronic devices, computer engineering and technologies) and materials science (which involves research laboratories and site testing,

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<sup>1</sup> Source: MONSTAT, Census 2011

<sup>2</sup> Source: MONSTAT, results of the Survey "Research and Development in 2011", published on 24.01.2013.

<sup>3</sup> Source: MONSTAT, results of the Survey "Research and Development in 2011", published on 24.01.2013.

materials testing, microscopy).

According to the MONSTAT data<sup>4</sup>, 1,051 scientific papers were published in 2011, out of which 546 in Montenegro and 504 abroad. The total number of scientific papers published in journals from the Web of Science list is 173, from the following fields: engineering and technology (74), natural science (36), medicine (28), social sciences (24), agricultural sciences (9) and humanities (2). According to the SCImago Journal and Country Ranking of 226 countries in 2011, Montenegro was ranked at 204th place by the H-index and at 196th place by citations per document. According to the Science Citation Index Expanded, in 2008 they were 93 scientific publications and 149 scientific papers per million populations in Montenegro. According to the data from Intellectual Property Office of Montenegro, since its establishment in 2008, 767 patents were registered, out of which only 27 are by domestic authors. The significant increase in the number of registered patents may be observed. However, the implementation of the patents in the practice is very low.

The Montenegrin economy is mainly service oriented, 59.4% of GDP is created in the service sector. Industry makes only 11.4% of GDP, agriculture 7.9% and construction 4.9%. Another feature of Montenegrin economy is low number of big companies. Out of total number of companies around 90% are SMEs. The big industrial companies such as Aluminium Plant in Podgorica and Steel Factory in Nikšić are facing financial problems during the last several years, due to which their R&D activities are very modest. Sectors that are seen as driving forces for the future economic development are tourism, agriculture, food production and food processing as well as energy sector.

The Parliament of Montenegro, the main legislative body, has a Committee for Education, Science, Culture and Sports (CESCS). CESCS considers bills, drafts of other regulations and general acts and other issues referring to: pre-school, primary, special and secondary education; higher education; science; scientific - research activities; culture; arts; technical culture; international scientific, educational, cultural and technical cooperation; protection of scientific, cultural, artistic and historical values; sport and physical culture. The Ministry of Science, is the principal administrative body responsible for planning, funding and monitoring the entire science system. The highest advisory body for the entire scientific research system in Montenegro is the Council for Science and Research Activities (CSRA). It consists of 11 members, four from the government and seven from the research community.

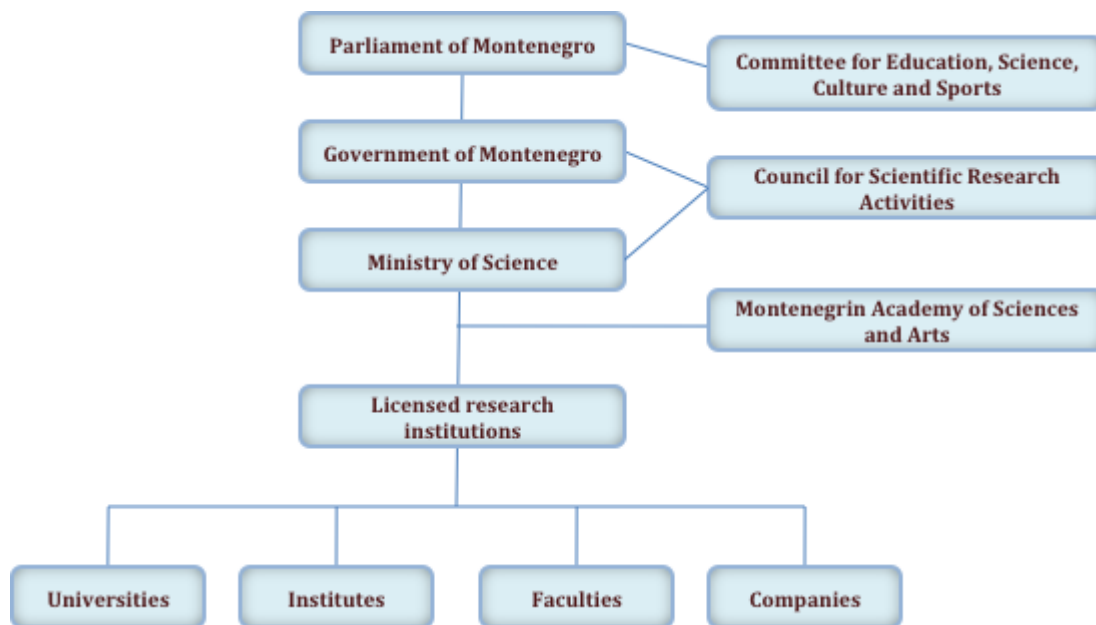
The Ministry of Science (MoS), which was created in December 2010 (previously organized as a department within Ministry of Education), as the main public administrative body implementing R&D policy (through national and international programmes of public interest), negotiates and implements bilateral scientific and technology (S&T) cooperation agreements, concludes memorandums, protocols and programmes of collaboration with ministries and foreign organizations. CSRA prepares and proposes R&D strategies to the Government, monitors implementation of the strategies, gives expert proposals and has an advisory role.

The main national scientific research institutions is the Montenegrin Academy for Science and Arts (MASA). MASA integrates research potential in Montenegro, organizes, stimulates and develops scientific, artistic and cultural work; organizes, initiates and implements scientific research, by itself or in cooperation with other scientific research institutions. The research community is made of 46 licensed scientific research institutions, out of which 32 faculties (public and private), 8 institutes (public and private) and 6 other scientific research institutions.

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<sup>4</sup> Source: MONSTAT, results of the Survey "Research and Development in 2011", published on 24.01.2013.

### Diagram of R&D system in Montenegro





## 2 RECENT DEVELOPMENTS OF THE RESEARCH AND INNOVATION POLICY AND SYSTEM

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### National economic and political

In 2011, three year after the end of economic boom in Montenegro, the economic output was almost coming back to its pre-boom level, mainly due to the agriculture, processing industry, retail trade, tourism and construction. However, 2012 was very difficult for the economy mainly due to the slipover effects of the economic crises in Europe. In addition, the economic situation in the country was under the effect of several exogenous shocks, in the first line, the extremely difficult weather conditions and unplanned budget costs, but also the increase of the oil prices and decrease of the prices of aluminium (main export good in Montenegro) and agricultural products. These significantly affected economic activity, which become visible mostly in the sizeable and continuing increase of public debt and a tightening liquidity squeeze in the economy. At the end, after certain fluctuation during the year, sectors that had positive effects on the economic activity were tourism, electricity production and agriculture.

In order to balance the budget and to push the economic activity GoM during 2011 and 2012 focused on the policy of fiscal consolidation and creation of a favourable business environment. Most of the spending cuts came from capital expenditures. Also, the Government succeeded to keep the tax system, which was one of the most favourable for doing business in the region, unchanged.

Due to all these difficulties the GoM changed its expectation for GDP growth from 2.5% to 0.5% for 2012. Projections for 2013 GDP according to the Pre Accession Economic Program 2012-2015 (PEP) are at the level of 2.5 % to 3.5%.

Three important events in 2012 were: the opening of negotiations with EU, the WTO membership and the parliamentary elections.

In May 2012 Montenegro became a member of WTO as a result of the government's commitment toward opening trade and regional trade collaboration.

The European Commission recommended opening accession negotiations with Montenegro in October 2011. This recommendation was reiterated in May 2012. Following a positive decision by the Council, endorsed by the European Council, accession negotiations with Montenegro were opened on 29<sup>th</sup> of June 2012.

On 14<sup>th</sup> October 2012, Montenegro held early parliamentary elections and local election for three municipalities. At a 69.6% voter turnout, the coalition “European Montenegro – Milo Djukanovic” won 46.33% of the votes, falling short of absolute majority for the first time in last ten years, but it subsequently succeeded in forging a post-electoral coalition with representatives of minority parties. According to the international observers, the elections “took place in a peaceful and pluralistic environment”.

On December 18<sup>th</sup> 2012 Montenegro opened -and provisionally closed- the first chapter in the EU accession negotiation, Chapter 25 of the EU Acquis Communautaire - Science and Research.

Regarding negotiations on Chapter 25 - Science and Research, the EU considered that, exceptionally, benchmarks for the provisional closure of this chapter were not required, given the good general level of Montenegro's state of preparedness in the this area as well as limited scope and particular nature of acquis obligations in this chapter. The EU therefore noted that, at this stage, this chapter does not require further negotiations.

## Funding trends

In 2011, Montenegro conducted for the first time a statistical survey on investment in research and innovation (R&I) according to the EU regulation and based on Fraskati manual. The National Statistical Office, MONSTAT, did the survey. The survey covered 64 reporting units, out of which 38 are units from the higher education sector, 15 from the business enterprise sectors, 10 from the Government sector and 2 from private non-profit sector.

Due to the change in methodology of data collection, adequate comparison with previous years is not possible. However, previous data shows that expenditures for R&D in 2009 and 2010 were at the level of 0.12% and 0.13% of GDP, respectively. Data collected by the 2011 survey shows that GERD accounted for 0.41% of GDP, which constitutes a significant increase in comparison with previous years, despite very restrictive budgetary policy.

One of main reasons of this increase is the implementation of a €5m call for scientific and research projects covering the period 2012-2014, conducted in 2012. The call was announced by the Ministry of Science in cooperation with the Ministry of Agriculture and Rural Development, Ministry of Health, Ministry for Information Society and Telecommunications, Ministry of Sustainable Development and Tourism, Ministry of Education and Sport as well as the Ministry of Culture. Out of 198 received applications 104 were selected.

One of main features of R&D funding in Montenegro, is fact that majority of expenditures are realized in the Government sector (GBOARD makes 50% of GERD, while HERD makes 26% of GERD). R&D performed by business sector is still on very low level and is conducted mainly in few biggest companies in the area of agriculture, energy and transportation (22% of total R&D expenditures). In addition 58% of all expenditures on R&D are covered from the public budget, 27% from businesses and 15% from abroad (mostly from EU and international organisations).

	2009	2010	2011	2012 (estimate, if such data are available)	EU27
<b>GDP growth rate</b>	-5.7	2.5	3.2	0.5e (MoF)	- 0.3 (2012)
<b>GERD as % of GDP</b>	0.12	0.13	0.41	0.43e (MoS)	2.03s (2011)
<b>GERD per capita</b>	n/a	n/a	21.3	n/a	510.5s (2011)
<b>GBOARD (€ million)</b>	n/a	n/a	6.56	n/a	91,277.1 (EU27 total 2011)
<b>GBOARD as % of GDP</b>	n/a	n/a	0.2	n/a	1.26 (2011)
<b>BERD (€ million)</b>	n/a	n/a	2.95	n/a	24% (2011)
<b>BERD as % of GDP</b>	n/a	n/a	0.09	n/a	12.7% (2011)
<b>R&amp;D performed by HEIs (% of GERD)</b>	n/a	n/a	26%	n/a	62.4% (2011)
<b>Share of competitive vs institutional public funding for R&amp;D</b>	n/a	n/a	n/a	n/a	n/a

s - EUROSTAT estimate

e - estimate

Data Source: MONSATAT, EUROSTAT, March 2013

The updated Strategy for Scientific and Research Activity 2012-2016 (SSRA), prescribes new priority areas for research and development: energy, identity, ICT, competitiveness of national economy, medicine and health, science and education, new materials, products and services, sustainable development and tourism, agriculture and food and transport. Also, this document defines increase in R&I expenditures to the level of 1.4% of GDP in 2016.

## **New policy measures**

The newest policy measures would be implemented under the Higher Education and Research for Innovation and Competitiveness Project (HERIC), which will be implemented in from May 2012 to March 2017. The aim of the project is to strengthen the quality and relevance of higher education and research in Montenegro through reforming the higher education finance and quality assurance systems and by strengthening research and development capabilities. The funds for the project are provided through a €12m World Bank loan. . Users of these funds are the Ministry of Science and Ministry of Education while final beneficiaries are universities and other research institutions.

There are four components to the project, the first component being higher education finance reforms and implementation of quality assurance norms. This component was designed with the GoM to support implementation of key higher education finance and quality reforms. The second component is the human capital development through internationalization initiatives. The GoM recognizes that immediate impacts can be achieved by investing in international experiences for students and academic staff. Therefore, the GoM envisions a program where international engagements are supported both through facilitating access to existing internationalization opportunities and promoting foreign study and research in areas of national importance, to maximize absorption of knowledge and technical training provided around the world. The third component is focused on the establishment of a competitive research environment. Finally, the fourth component refers to the management, monitoring and evaluation of the project. This component was designed to build capacity within Ministry of Education of Montenegro (MoE) and MoS to manage the day-to-day implementation of the HERIC Project, as well as to monitor and evaluate its impact.

In line with the Law on Scientific Research Activity (“Official Gazette of Montenegro”, no 80/10) first pilot centre of excellence is planned to be established under HERIC project. MoE and MoS started preparatory activities on the establishment of the centre at the end of 2012.

A set of additional measures are also planned under the project, such as establishing communication and connection with diaspora, supporting of mobility and further internationalization of the researchers, etc. The latter will be developed by relevant ministries during the forthcoming period.

Also MoS initiated the establishment of the first Science Technological Park (SCT). The related Strategic Plan was adopted at the end of 2012, together with the business plan for the establishment of the first unit of this Park, the impulse centre “Tehnopolis”, which will be based in Niksic. A grant scheme, through which is currently being prepared. This will give priority to projects focused on international cooperation and commercialization of research results.

The Law on Scientific Research Activity (“Official Gazette of Montenegro”, no 80/10) adopted in December 2010 defines new policy instruments: 14 research programmes and priority areas in line with FP7, possibility of establishment of centers of excellence and simpler conditions for obtaining the license for work of the scientific research institutions (both private and public).

In 2012 a public call was announced for co-financing of national scientific research projects in 14 priority areas defined by the Law, for period 2012-2015, of the total value of €5m. The aim of this call, defined by MoS, based on the proposal of the CSRA, is co-financing of national scientific research projects in priority areas, employment of PhD students/ young researchers at the scientific institutions through national projects in the period of three years and purchase of equipment. Success rate on this call was 52.50%. Projects were evaluated by 420 international independent experts. The average mark of accepted projects was very high (34.10 out of maximum 40 points).

In 2011 and 2012 the MoS continued implementation of some already established measures and announced calls for co-financing of scientific research activities focused on: participation in FP7 COST and EUREKA programme, promotion of science and research in education and society of Montenegro, cooperation with scientific diaspora, PhD and Master studies, study visits based on the scientific training abroad, participation in scientific congresses in the country and abroad, organization of scientific congresses in Montenegro, subscription fees for scientific and research databases, publication of scientific works in reference journals, stimulation of authors of patents and innovations and publication of scientific journals.

## Recent policy documents

At the end of 2012 the GoM adopted new version of the **Strategy for Scientific Research Activity for period, 2012-2016**.

The revision of the strategy has been done to align with the Law on Scientific Research Activity from 2010, to develop new instruments of development of scientific research system, to define detailed new priorities and to redefine very ambitious goals regarding the R&I investment set by the previous Strategy.

The SSRA defines three strategic goals: development of scientific research community, development of multilateral, regional and bilateral cooperation and cooperation of the scientific research community with business sector.

During the period of implementation of this Strategy, according to the recommendations given in this document, special focus should be put on:

- Implementation of measures aimed at strengthening the human resources potential for scientific research activities, through investment in human resources in science with regard to better quality and a larger number of researchers;
- Raising awareness of the importance of science in society and creating the conditions for attractive professions in research activity, with a particular focus on young researchers;
- Strengthening the multilateral, regional and bilateral cooperation and further integration into ERA;
- Identification of areas of research that are of particular importance for the development of Montenegro, actual at a certain point of development of the country and whose development needs to be strengthened and supported through the major topics in the field of research, technology and innovation;
- Strengthening research infrastructure through regular investments in the modernization of existing capacities, their merging and open access; and
- Implementation of measures for connecting the research sector with the economy through the implementation of joint development projects and an increase in investment in research by the economic sector.

As it was presented, the document defined 10 priorities in research: energy, identity, ICT, competitiveness of national economy, medicine and health, science and education, new materials, products and services, sustainable development and tourism, agriculture and food and transport. In addition, the documents set as a target increase of expenditures in R&I to the level of 1.4% of GDP in 2016.

The action plan for Strategy implementation is in the process of drafting and should be finalized during the first quarter of 2013.

**The Action plan on increase of researchers' mobility (2011-2012)** was focused on strengthening the basis for outgoing mobility, improvement of incoming mobility and strengthening intersectoral mobility. While, **Action Plan for the Increase of Number of Researchers 2012-2013**, adopted in March 2012, proposing set of actions aimed at creation of attractive conditions for employment and work of researchers, improvement of cooperation between researchers and companies as well as promotion, monitoring and improvement of knowledge and skills of the researchers.

Also MoS prepared **Strategic Plan For Establishment of the First Science Technological Park** in Montenegro. In 2012 a **National Strategy on Intellectual Property Rights 2012-2015** was adopted aiming, among others, at raising awareness on the importance of intellectual property rights IPR issues and facilitating management of IPR.

**National Development Plan** was adopted in March 2013. This document sets priority areas for public investments for period 2012-2016. It defined R&D as one of five priority policies (small and medium size enterprises, labour market, spatial planning and efficient state administration) that should enable economic development in Montenegro in three priority areas: agriculture, energy and tourism.

Also at the end of 2012, the **National Strategy for Employment and Human Resource Development 2012-2015** was adopted. The Strategy sets three main priorities: (1) increasing employment, (2) improving knowledge, skills and competences with a view to increasing job opportunities, and increasing competitiveness through formal and informal education and training and (3) promoting social inclusion and reducing poverty (third priority). The second priority relates to the investments in human capital through formal and informal system of education at all levels of education, through the stimulation of lifelong learning and professional development of employed persons with a view to matching the supply and demand on the labour market, through connecting research and development with businesses and through increasing economic competitiveness.

**The 2012-2016 Strategy for Sustainable Economic Growth of Montenegro through Introduction of Clusters** aims at contributing to a more balanced regional socio-economic development by increase in competitiveness and employment capacities of the micro, small and medium enterprises, as well as entrepreneurs (especially in the less developed municipalities), ensuring that various economic participants in the country equally use the advantages arising from the European integration process and further market opening. The Strategy is focused on provision of contribution in achieving of the four major goals arising from the above-mentioned general objective of the strategy, and it is harmonized, at the same time, with the goals of other key strategic documents of the Government of Montenegro. The abovementioned goals include (1) increase in exports, (2) local origin of products and substitution of imports, (3) opening of the new enterprises and creation of the new jobs and (4) retaining the employment level.

## **Research and innovation system changes**



Changes in the Law on Scientific Research Activity that simplified conditions for the establishment of scientific research institutions positively resulted in the increase of licenced scientific research institutions. According to the data from Ministry of Science on January 2009 there were 22 institutions licenced, while in August 2012 this number increased to 46, or for 109%. Twenty-three of those institutions are units of state University of Montenegro. Private University Mediterranean has 5 licensed scientific research institutions, while private University Donja Gorica has 7. In addition 4 other institutions are private faculties, 4 are public scientific research institutions and 4 are private scientific research institutions (non governmental organisations, think tanks or companies).

As it was mentioned, the Strategic Plan for establishment of the first STP is prepared. The first STP would combine three organisational type instruments: technological park, business park and business incubator. STP will have central unit based in capital of Montenegro, Podgorica, and three sub units that will be located in Bar (south region), Nikšić (central region) and Pljevlja (northern region). According to the current proposal thematic focus of Podgorica unit would be on: energy, ICT and agriculture and food production technology. Special attention would be put on interdisciplinary outreach activities. The unit located in Bar would be focused on agriculture with special focus on sup tropic cultures and ICT. The focus of the unit located in Pljevlja would be on innovative solutions in processing of wood and timber, which should enable efficient use of resources available in this part of the country. It is planned that canters for development of young scientists and researchers would be established in all units of STP.

Initial preparatory activities on the establishment of the first centre of excellence are also in place.

### **Regional and/or National Research and Innovation Strategies on Smart Specialisation (RIS3)**

Montenegro does not have research and innovation strategy on smart specialisation.

### **Evaluations, consultations**

The European Commission in their Progress Report on Montenegro 2012 stated that Montenegro made good progress in the area of science and research. Progress is noted in the area of funding, in strengthening research and innovation capacity, research cooperation under the Seventh EU Research Framework Programme (FP7), with regard to Montenegro's integration into the European Research Area (ERA) and improvement of R&D statistics.

According to the report, areas that need further efforts are: participation of SMEs and Marie Curie grants under the Specific Programme 'People', participation in the next EU Research and Innovation Programme 'Horizon 2020', preparation for the self-assessment tool, further investment in research in particular from the private sector and by stimulating public and private investment in scientific research activities.

### 3 STRUCTURAL CHALLENGES FACING THE NATIONAL SYSTEM

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The main challenges that are faced by the Montenegrin research and innovation system, also noticed in government strategic documents (SSRA 2012-2016, Montenegro in the 21<sup>st</sup> Century- In the Era of Competitiveness, National development Plan, Strategy for Employment and Human Resource Development 2012-2015) as well as several external reviews (OECD, World Bank) and Erawatch Country Report 2011, are listed below:

(i) Low number of researchers, insufficiently developed research infrastructure and low level of scientific output

The Montenegrin research community is rather small in comparison with the EU, despite the notable increase in the number of researcher institutions and researchers during the last few years. Out of total population total R&D personnel presents 0.001% (FTE), while EU average is 0.005 (FTE). The concentration of the scientist is mainly at universities but the role of those institutions in the economic development is still very weak. In addition, out of total population that has 15 or more years, 17% has completed tertiary education. There are 964 doctoral graduates in total.<sup>5</sup>

Low research output is still one of the features of Montenegrin R&D system. According to the SCImago Journal and Country Ranking of 226 countries in 2011, Montenegro was ranked at 204th place by the H-index and at 196th place by citations per document. Although the number of patents is increasing its application in the practice is at very low level. Despite the fact that ICT networks and databases are available to researchers for all fields in science and that there is infrastructure in some specific areas exist<sup>6</sup>, the research infrastructure is still not sufficiently developed to support research community, especially in specialized fields.

Even though some already implemented measures (such as simplification of the procedure for establishment of research institutions, allocation of the research resources on competitive bases, support to publishing and equipment, promotion of science in the society) gave some positive results, further efforts are needed in this area. They should be focused on the new models of funding of universities as well as research organisations, introduction of the quality assurance system in higher education as well as introduction of the quality evaluation system for research activities. These activities would require high coordination and communication between MoS and MoE. In addition, significant attention should be focused on the promotion of the science and scientific work (especially among youth) as well as opportunities for establishment of research institutions (especially among companies).

(ii) Low mobility of researchers

Outgoing and incoming mobility of researchers is still low and unsatisfying despite the fact that some positive trends during the last few years may be observed. For example the number of researchers who were abroad working on bilateral project increased from 22 in 2010 to 82 in 2011, while number of PhD students whose mentors are from abroad and who realize part of their research in the institutions of their mentors under the program of national scientific projects increased from 4 (2008-2011) to 15 (2011-2015). Regarding the incoming mobility,

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<sup>5</sup> Source: MONSTAT, Census 2011

<sup>6</sup> Biomedical and life sciences, computation and data treatment and materials science

under the program of national scientific projects number of managers of projects who are from aboard increased from 6 (2008-2011) to 15 (2011-2015), while number of foreign active researchers on these projects increased from 6 (2008-2011) to 85 (2011-2015). These positive trends are result of the government efforts such as introduction of mobility as one of the criteria for selection of national projects, co-financing provided for bilateral projects, as well as support in the participation in multilateral programs (FP7, COST, IPA IV, EUREKA, JRC and EURAXESS Montenegro). However, there is a need for further work in this area primarily through increase of funds for mobility, further support of bilateral cooperation, better communication with diaspora and what is most important further support for participation in EU programs.

(iii) Insufficient commercialisation of research and collaboration with the business sector;

Communication between companies and research institutions (primarily universities) is very modest. Certain improvements in this communication may be noticed with the establishment of private universities (which are more proactive in approaching business) but apart from that applications of the results of the scientific work in the practice are very rare. Due to that it would be necessary to foster communication between science and companies. This could be done through an incentive regime that encourages researchers to engage in commercialisation, for instance by establishing a minimum financial compensation from the commercialisation, by counting commercialisation results as relevant achievement for careers development, by developing organisation specialized in intellectual property (IP) management such as technology transfer offices.

(iv) Low level of R&D expenditures in companies and application of SRA's results in the economy;

The level of R&D in companies is very low, and those activities are mainly performed in big companies. Some of the reasons for this situation are: structure of the business sectors (more than 95% of companies in Montenegro are SMEs, while service is main economic sectors), overall business environment that is not conducive to innovation (inefficient state administration especially at local level, limited state support to innovations) and financial crises that hit Montenegro during the last few years and caused illiquidity problems of many companies. Due to all these reasons increasing R&D private investment is very challenging. One of the possibilities is to continue to further work on the creation of the favourable business environment (though removal of barriers on local level, providing support to innovations through vouchers etc). Policies focused on foreign direct investment or promotion of export could be efficient to foster research and innovation. In addition, companies should be supported (at least by efficient dissemination of information) on the possibilities to participate in international and EU programs and projects and through that communication acquire new technologies, knowledge, skills and ideas.



<b>HUMAN RESOURCES</b>	
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	n.a.
Percentage population aged 25-64 having completed tertiary education	n.a.
<b>Open, excellent and attractive research systems</b>	
International scientific co-publications per million population	n.a.
Scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	n.a.
<b>Finance and support</b>	
R&D expenditure in the public sector as % of GDP	0.2
<b>FIRM ACTIVITIES</b>	
R&D expenditure in the business sector as % of GDP	0.09
<b>Linkages &amp; entrepreneurship</b>	
Public-private co-publications per million population	n.a.
<b>Intellectual assets</b>	
PCT patents applications per billion GDP (in PPSE)	n.a.
PCT patents applications in societal challenges per billion GDP (in PPSE) (climate change mitigation; health)	
<b>OUTPUTS</b>	
<b>Economic effects</b>	
Medium and high-tech product exports as % total product exports	n.a.
Knowledge-intensive services exports as % total service exports	n.a.
License and patent revenues from abroad as % of GDP	n.a.

Data Source: [Innovation Union Scoreboard 2011](#)

## 4 ASSESSMENT OF THE NATIONAL INNOVATION STRATEGY

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### National research and innovation priorities

GoM created and adopted Strategy for Scientific Research Activity in 2008, for the period of eight years 2008-2016. The Ministry of Science, during 2012, initiated changes of this strategic paper, due to the following:

- in order to align with the Law on scientific research activity which was adopted in 2010 and which prescribes some new instruments of the development of scientific research system, which were not included in the previous Law and thus in the previous Strategy which was based on this Law. Those new elements and instruments are: 14 new programs of the general interest, possibilities for the establishment of the canthers of excellence as well as involvement of higher number of scientific research institutions, public and private.
- Develop new instruments for support to the scientific research system in Montenegro in the first line: canthers of excellence and Scientific Technological Park
- To reprogram the goal set by the Strategy for the increase of investment in R&D to the level of 1.4% of GDP by 2012, which was not possible to achieve with the current level of expenditures
- To develop new goal, measures and instruments to achieve the goal set at the level of 3% GDP.

The MoS established working groups made of representatives from the Ministry, National Council for Science and Education as well as all three Universities in Montenegro. This working group prepared the Strategy for Scientific Research Activity 2012-2016 that was adopted by the GoM in December 2012.

The Strategy for Scientific Research Activity 2012-2016 gives an overview of current status in the following areas: institutional framework, research infrastructure, human resources, international cooperation and mobility of researchers, innovation and technological development, science in the society and financing of R&D. Based on the analysis of the current situation for each of these areas the Strategy defines the main conclusions and recommendations and strengths and weaknesses of the national scientific research system. Those conclusions were used as inputs for the creation of mission and vision, goals and priorities are defined.

The vision of the scientific research activity, as stated in the document, can be expressed as effort to transform the national economy into a knowledge-based one. This indicates that knowledge Montenegro wants to develop a competitive and sustainable economy, with the respect of the high civilisation values.

The strategy defines three major strategic goals:

#### **1. Development of scientific research community, with specific goals:**

- Increase of efficiency and development of the total knowledge within the society,
- Support of the quality improvement of the scientific research activity in Montenegro,

- Increase of the number of young researchers and strengthening development of their capacities,
  - Make scientific research activity attractive for young,
  - Increase investment in science and research,
  - Identification of the priority areas of the scientific research work, taking into consideration natural, technological and human resource comparative advantages of Montenegro,
  - Further focusing of Universities towards research,
  - Promotion and increase of visibility of science in the society,
  - Strengthening evaluation of the researchers and their work within the society,
- 2. Strengthening of multilateral, regional and bilateral cooperation, with specific goals:**
- Integration of the Montenegrin research community into the ERA and its higher involvement in the programs of the EU and other international programs,
  - Further strengthening of multilateral, regional and bilateral cooperation and integration into the programs and projects in the area of research, development and innovation,
  - Improvement of the system of the exchange of the information in the society and the role of ICT,
  - Creation of the national road map for research infrastructure and partnership in the European Strategic Forum for Research Infrastructure (ESFRI).
- 3. Cooperation of scientific research community with business sector, with specific goals:**
- Stimulation of the technological development and innovation through removing barriers, development of existing and introduction of new support measures and incentives as well as increase of public awareness on the importance of research, development and innovation among business,
  - Establishment of the first Scientific Technological park in Montenegro,
  - Increase competitiveness of Montenegrin economy by easier access to the results of the research and innovation and better connection of science, education and business sector,
  - Further orientation of scientific innovation activities towards applied and development research and innovation.

Besides these strategic goals the Strategy defines 10 thematic priorities, which were already mentioned. Those are: energy, identity, ICT, competitiveness of national economy, medicine and health, science and education, new materials, products and services, sustainable development and tourism, agriculture and food and transport. The definition of main strategic goals of the SSRA is a novelty in comparison with the previous document, which defined only thematic and functional priorities. The Action plan for the Strategy implementation will be finalized in the first quarter of 2013.

The Action plan on increase of researchers' mobility (2011-2012) is aimed at: Strengthening the basis for outgoing mobility, improvement of incoming mobility and strengthening intersectoral mobility.

The Action plan on increase of number of researchers (2012-2013) is aimed at creating attractive working conditions for researchers, strengthening the cooperation between research and industry and promoting of knowledge and skills of researchers.

In January 2011, a Strategy for development of SMEs was adopted, covering the period 2011-2015. The strategy has 4 main strategic objectives: creation of favourable business environment, strengthening financial support, improvement of SME competitiveness and promotion of entrepreneurship and support to business start-ups. Under the goal "improvement of SME competitiveness" planned activities should focus on the promotion of innovation and their importance for SME; establishment of infrastructure for innovations, enhance communication and connection of SME sector with centers of knowledge and excellence, financial support to innovative activities, co-financing of the research and developments programs in which SMEs participate, promotion of innovative solutions for SMEs etc.

The reform of the education system which was initiated in 2002, was further enhanced during the last few years by the adoption of the several strategic documents that focus on specific levels of educational system such as: Vocation Education Development Strategy 2010-2014, Strategy For Early and Preschool Education, 2011 -2015, Primary Education Development Strategy 2011-2017, Strategy for Development and Financing of Higher Education in Montenegro 2011-2020, Strategy for Adult Education 2005-2015, National Strategy for Long Life Learning Carrier Guidance 2011-2015, Strategy for Lifelong Entrepreneurship Learning 2008-2013 and Strategy for Inclusive Education. Entrepreneurship is seen as an important part of the education and is included in most of the mentioned strategic document. Commitment to the involvement of the entrepreneurship in the education system is especially emphasized by Strategy for Lifelong Entrepreneurship Learning 2008-2013. Moreover the Strategy for Development and Financing of Higher Education in Montenegro 2011-2020, set as priorities: improvement of the quality of higher education, connecting higher education with the labor market and improvement of the entrepreneurship innovative character of education, increase of population age 30 to 34 with higher education to the level of 40% in 2020.

The Information Society Development Strategy, adopted in 2011, provides a framework for the improvement of information society until 2016 with a clear vision focused on the economy, civil sector, scientific research and educational institutions.

At the end, the Government of Montenegro confirmed their commitment to the science and research as one of priorities in the recently drafted National Development Plan. The documents sets agriculture, energy and tourism as three main driving economic sectors (forces) and priority areas which will support those sectors are: science and research, SMEs, labour market, spatial planning and efficient state.

## **Evolution and analysis of the policy mixes**

The policy instruments used to deliver support to R&D and innovation performers constitute a rich mix that is during the last few years further focused toward excellences, innovations as well as specific fields of research. R&D support instruments are both direct and indirect. For research institutions, both public and private, primary source of funding is from public bodies (primarily Ministry of Science) nationally and also in small share from EU Framework Programmes

internationally.

In general major policy instruments could be divided in several categories:

**-Policy measures aimed at increasing the scientific research base and output** mainly implemented through national multiannual scientific program based on three components: co-financing of national scientific research projects in priority areas; employment of PhD students/ young researchers at the scientific institutions through national projects in the period of time for three years and procurement of scientific equipment. The program is aimed at increasing scientific and research base and output in the country. The latest call was published in 2011 (cycle 2012-2015). The overall budget of this call was 5 M €, which presents a significant increase in comparison with previous calls. Also, novelty in this call was evaluation by thematic panels of independent international experts and introduction of researchers' mobility, support to young researchers and existence of support partners from business sector as some of the evaluation criteria.

These measures also include annual calls for subscription fees for scientific and research databases, publication of scientific works in reference journals, stimulation of authors of patents and innovations and publication of scientific journals, promotion of science and research in education and society of Montenegro.

**-Policy measures aimed to support research mobility** are mainly implemented through national annual calls to support: participation in multilateral programs (FP7, COST and EUREKA programme,) cooperation with scientific diaspora, PhD and master studies, study visits based on the scientific training abroad, participation in scientific congresses in the country and abroad, organization of scientific congresses in Montenegro. Also under new HERIC project there will be several activities that would be focused on better communication with researchers and scientists in diaspora.

In addition instruments provided under bilateral agreements include co-financing: of programmes and projects in mutually agreed fields, support exchange of scientists, researchers and experts, scientific and technological information and documentation and organization of joint events. In 2011 three annual calls for co financing of bilateral cooperation were announced (with Austria, Slovenia and Croatia) and additional 3 in 2012 (with China, Austria and Macedonia).

**-Policy measures aimed to accelerate commercialisation of research and deepen collaboration with the business sector** include instruments that would be developed under the HERIC project, establishment of STP and annual award for the most successful innovator. The new HERIC project 2012-2017 (implemented in cooperation with Ministry of Education) has two components: establishment of the Center of Excellence (€3.7m) and large research grants for promotion of innovation (€2m).

**-Policy measures aimed to promote higher levels of private R&D investments and facilitate innovative start-up companies** are mainly implemented by Ministry of Economy, through the Directorate for Small and Medium Size Companies, and includes: support to establishment of local/regional business centres (in 2012: 6 regional business centres and 1 in the process of opening; 3 local business centres and 1 in the process of opening), support to establishment of business incubators (project started in 2005 and two business centers were established BSC Inkubator, Bar (2007) and "Inventivnost" d.o.o. Podgorica (2008)), support to establishment of clusters (in preparation), voucher schemes

for innovative SMEs (introduced in 2012) and European Information and Innovation Centre Montenegro (EIICM).

If we take into account the Self-Assessment tool of the Innovation Union Flagship Initiative (EC, 2010) that consist of ten features for well-functioning of the national innovation system, the performance of Montenegrin innovation system is not satisfactory but very positive trends are evident. The most challenging areas are communication between education, research and business as well as supporting innovations among companies, especially SMEs.

Research and innovation are becoming highly rated on the list of Government policies which is visible in newly adopted documents (such as National Development Plan 2013-2016, National Employment and HD Strategy 2013-2015) as well as government commitment to significantly increases the expenditures for R&D despite current and future budget constraints. Even though, positive changes are evident in the perception of the role of R&D in the economic development there would be needed all other policies and documents to integrate towards this vision especially those addressing main societal challenges (such as age, health and environment) but also to increase public awareness on critical role of innovations especially among companies.

Policy orientation is defined on a multi annual bases through the Council for Science and Research Activities and Parliamentary Committee for Education, Science, Culture and Sports. There is a multi-annual strategy that defines thematic priorities for funding which are in line with EU objectives. Although, the document is based on the analysis of strengthens and weaknesses it does not focus to smart specialisation or creating more critical mass in specific research fields. The Action plan is still not adopted, but the one, which referred to the previous Strategy, was not fully developed in terms of funding, evaluation indicators and tools.

The R&D policy only recently shift focus towards innovation and consequently the broad concept of innovation is still not developed in Montenegro. In addition, public sector is not driver of innovation. The concept of e-government was initiated but only few small initiatives were implemented (few official documents could be order by e mail and few registration form submitted).

The government has general prioritisation of public investment (NDP) but public funding in the area of research and education should be more focused towards maintaining excellence, innovations and supporting and stimulating private investment. Out of very modest overall expenditures on R&D only 22% of R&D is performed by business sector.

As it was already mentioned main and biggest national program of funding is based on the competitive basis and projected are evaluate by team of international experts. Results of the research are IP of the applicant. Higher education and research institutions enjoy necessary autonomy in education, research and innovation. However, legal, financial and social frameworks for research carriers are not attractive, especially doctoral studies. This recalls for important improvement in this areas and introduction of some new instruments and measures such which would make research carrier more attractive.

Even though we may observe significant changes in the improvement of education curricula on all levels (introduction of the new programs and improvement of existing once), introduction of entrepreneurship as a subject on all levels of education and better focus on transversal competences it is evident that education and training system does not provide the right mix of skills. This is confirmed by the high employment rates, especially among young and highly shows that education system should be further shaped towards the future needs of the market, further development of competences on lower levels of education but also further focus on

specialisation and excellence on higher levels. Also, the new HERIC project should be efficiently used to set up quality assurance mechanism as well as efficient system of financing of higher education, which would not differentiate between private and public education institutions.

The government during the recent few years tackles the issue of partnership between education, research and business as well as promotion of business investment in R&D. Also, some new instruments were recently introduced (STP, voucher schemes etc). However, the set of those measures is in its initial development phase (the number of measures is small, they are not simplified, well promoted, well targeted and focused) and would need significantly higher financial support in order to give some positive results. The overall funding support should be better tailed by the needs of companies, particularly SMEs as those are creating more than 90% of the business sector in Montenegro. This is probably one of the areas that would be most requiring and challenging for the government, but also other stakeholders.

### **Assessment of the policy mix**

For society such as Montenegro, with the economy mainly focused on services, primarily based on the activities of SMEs and with small research community, the creation of an effective R&D policy mix is very challenging. Despite that, it is evident that Montenegrin Government dedicated significant efforts to create policies and policy instruments that would stimulate R&D activities.

The very positive change in policy mix for R&D, observed during the last few years, is the development of instruments that are focused on support to innovations, excellence and better communication between research and business community accompanied by an increase in funds. Most of the instruments that are focused on innovations are newly created and their efficiency and effectiveness cannot be estimated at the moment. However, some of those instrument had already been implemented by other countries (such as canters of excellence, STPs, schools for young innovators) so it could be expected they would give some positive results also in Montenegro.

The positive aspect of the policy mix is that part of the instruments is coordinated among different Ministries within the Government. Moreover in main national development policies, R&D is set as one of the main priorities.



**Table 2: Policy measures and assessments**

Challenges	Policy measures/actions	Assessment in terms of appropriateness, efficiency and effectiveness
Increase scientific output	Call for co-funding of national scientific project in 2011 covering period 2012-2015 in line with priorities defined by Law on Scientific Research Activity 2010	<p>The funding for this call was significantly higher than in previous years. The call targeted main priority areas, and was done in close collaboration of several Ministries. It was opened for both public and private research institutions. The response to the call was very high.</p> <p>This measure, the most significant in terms of funding, together with other smaller measures to support research present an appropriate policy mix.</p>
Low mobility of researchers	<p>Call for co-funding of national scientific project</p> <p>National annual calls (including co financing under the bilateral agreements)</p>	<p>One of the aims of this program is to support mobility. First result shows that it was efficient in achieving this goal, while effects should be assessed after the full implementation of the supported projects.</p> <p>The funding for this call is very modest. Besides the increase of funding it would need better promotion in order to become more attractive to institutions. Also, more proactive role of S&amp;R institutions would be needed. Some of the instruments already gave some positive results, but the effectiveness is limited mainly because of funding.</p>
Accelerate commercialisation of research and deepen collaboration with the business sector	<p>Strategic plan for the establishment of first SCT</p> <p>Preparatory activities for establishment of first center of excellence</p>	The current policy measures are appropriate, but are in an early stage of implementation. It has to be seen whether those measures will be sufficient to accelerate collaboration with business sector.
Promote higher levels of	Support to establishment of	As there are no important



<p>private R&amp;D investments and facilitate innovative start-up companies.</p>	<p>local/regional business centres, business incubators and clusters, as well as voucher schemes for innovative SMEs are measures implemented under the Strategy of Development of SMES (2011) and Strategy for Sustainable Economic Growth in Montenegro through the Introduction of Business Clusters (2012)</p>	<p>changes in the increase of private R&amp;D investments the effectiveness of those measures is limited. Most of them rely on limited budget, and their performance also depend on the business sector which is not conducive to innovations.</p> <p>Cluster support is still at an early stage and its efficiency cannot be assessed.. Efficiency and effectiveness of these measures would highly depend on the dedicated financial resources.</p>
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## 5 NATIONAL POLICY AND THE EUROPEAN PERSPECTIVE

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The last two years were very important for the improvement of national R&D policy. As the new strategic framework with new priorities was adopted, some completely new instruments were initiated and introduced (such as STP, HERIC project), funding for existing instruments were increased and dissemination was done according to international standards (program co-financing of national research projects). Those efforts, as well as the commitment to further align with the EU objectives and activities through the future acceptance of the acquis, were recognized by the EU and Montenegro in the December 2012 provisionally closed Chapter 25 of the EU Acquis Communautaire - Science and Research.

However, there is still a lot of room for new actions and improvements. In the middle run, existing instruments and measures to support researchers' mobility and career attractiveness, should be strengthened in terms of funding. Programs of the co-financing of the national project should be continued, if possible in higher amount. In parallel with the implementation of the STP, some new instruments for fostering communication between companies and education and research should be developed. In particular it would be important to evaluate the effects of the existing measures for support of innovation in SMEs and draw some lessons. Similarly, it would be important to develop and promote a wider concept of innovations within the society and all stakeholders. Finally, it would be necessary to develop an efficient system of financing of higher education, which would not differentiate between private and public education institutions.

In the long term the overall policy mix should be fully restructured towards innovation, excellence in education and science and internationalization.

To conclude, the national policy in Montenegro is increasingly improving and becoming more aligned with ERA objectives. Currently, from the existing R&D policies and programs it is evident that focus is on the first and the third objective, effective national system and open labour market for research. Gender equality is tackled at the national level, among other documents, by the Action Plan of Activities for Achievement of Gender Equality 2008 – 2012, which was partially implemented by MoS. However, integration of this goal in R&D strategic and policy framework should be enhanced in the future. Alignment with other objectives (optimal transnational co-operation and competition and optimal circulation, access to and transfer of scientific knowledge including via digital ERA) is not achieved, but it can be expected during the accession period.

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## LIST OF ABBREVIATIONS

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GoM	Government of Montenegro
R&D	Research and Development
R&I	Research and Innovations
ICT	Information and communications technologies
GDP	Gross Domestic Product
MREN	Montenegrin Research and Academic Network
GEANT	European Association of Academic Networks
MONSTAT	National Statistical Office
CESCS	Committee for Education, Science, Culture and Sports
CSRA	Council for Science and Research Activities
MoS	Ministry of Science
S&T	Scientific and Technology
MASA	Montenegrin Academy for Science and Arts
MoE	Ministry of Education of Montenegro
PEP	Pre Accession Economic Program
HERIC	Higher Education and Research for Innovation and Competitiveness Project (
SCT	Science Technological Park
MoF	Ministry of Finance
SSR	Strategy for Scientific and Research Activity 2012-2016 (
HD	Human development

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#### Abstract

This analytical country report is one of a series of annual ERAWATCH reports produced for EU Member States and Countries Associated to the Seventh Framework Programme for Research of the European Union (FP7). The main objective of the ERAWATCH Annual Country Reports is to characterise and assess the performance of national research systems and related policies in a structured manner that is comparable across countries.

The Country Report 2012 builds on and updates the 2011 edition. The report identifies the structural challenges of the national research and innovation system and assesses the match between the national priorities and the structural challenges, highlighting the latest developments, their dynamics and impact in the overall national context. They further analyse and assess the ability of the policy mix in place to consistently and efficiently tackle these challenges. These reports were originally produced in December 2012, focusing on policy developments over the previous twelve months.

The reports were produced by independent experts under direct contract with IPTS. The analytical framework and the structure of the reports have been developed by the Institute for Prospective Technological Studies of the Joint Research Centre (JRC-IPTS) and Directorate General for Research and Innovation with contributions from external experts.

As the Commission's in-house science service, the Joint Research Centre's mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.

Working in close cooperation with policy Directorates-General, the JRC addresses key societal challenges while stimulating innovation through developing new standards, methods and tools, and sharing and transferring its know-how to the Member States and international community.

Key policy areas include: environment and climate change; energy and transport; agriculture and food security; health and consumer protection; information society and digital agenda; safety and security including nuclear; all supported through a cross-cutting and multi-disciplinary approach.

