20 Annex - Enterprise and industrial policy

155. STRATEGY FOR SCIENTIFIC AND RESEARCH ACTIVITY OF MONTENEGRO (2008-2016)

STRATEGY FOR SCIENTIFIC AND RESEARCH ACTIVITY OF MONTENEGRO (2008-2016)

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Analysed by:

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Proposed by:

Council for Scientific and Research Activity of Montenegro

Pursuant to Article 6 of the Law on Scientific and Research Activity (Official Gazette of the Republic of Montenegro 71/05), the Government of Montenegro passes the Strategy for Scientific and Research Activity of Montenegro for a period of eight years. Pursuant to Article 8 of the Law on Scientific and Research Activity, the Government of Montenegro passes the Strategy upon a proposal of the Council for Scientific and Research Activity.

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Abbreviations

GDP	Gross Domestic Product
MASA	Montenegrin Academy of Sciences and Arts
COBISS.CG	Co-operative Online Bibliographic System and Services
ECDL	European Computer Driving Licence
ERA	European Research Area
FP 7	EU Seventh Framework Programme for Research and Technological Development
ICT	Information and Communication Technologies
SMEs	Small and Medium Sized Enterprises
SRA	Scientific and Research Activities
NPI	National Programme for Integration
OECD	Organisation for Economic Cooperation and Development
VAT	Value Added Tax
S&T	Science & Technology
WAN	Wide Area Network

Contents

1. Introduction

The new paradigm of development stresses the importance of capacity building for conquering the global knowledge and technological progress as sources of increased competitiveness of a society. Knowledge is one of the key factors for stimulating competitiveness of the national economy, while the increased investments into knowledge and development are necessary for transition to the knowledge-based society.

Starting from the Stabilisation and Association Agreement of Montenegro with the European Union, as well as from the general trends of the globalisation process, with the competitiveness of national economies becoming the basic factor of society development, the Government of Montenegro must be resolute in its intention to develop Montenegro as a state oriented towards science and technology. On the basis of the abovementioned Agreement and the Lisbon Strategy, the EU fundamental document that the Member States' national strategies are based on, Montenegro initiates development of the Strategy for Scientific and Research Activity (hereinafter referred to as the "Strategy for SRA") with the aim of creating a knowledge-based society. Society based on knowledge must recognize the importance of education and scientific activity and rely increasingly on its scientific and research institutions. In the circumstances of an open society and a market-oriented economy, knowledge reaches the highest price.

Without scientific, research and development activity, in areas that are vital for Montenegro, there can be no successful and timely transfer of knowledge from the world treasury or of the newly acquired domestic knowledge aimed at supporting the economic development and competitiveness.

Recognition of positive aspirations, scientific achievements and their application, first of all in the country and in the region, and then globally as well, is of utmost importance. Familiarisation with them through established communication and good relations enables positioning of proper achievements and needs, through development of positive competitive spirit in the creation of conditions for achieving results useful to oneself and to others, avoiding of mistakes made by others and unnecessary investments in the affairs that have already completed.

Comprehension of the knowledge market and its application in the closer and wider European environment would ensure a feeling of exit from anonymity to new staff, but also a feeling of increased openness and perspective for wider application of new knowledge. Competitiveness is a base for a higher value of products or services, and it is conditioned by the quality and the quantity of new knowledge. In order to reach this level of results, it is important to have a two-way dialogue and exchange of information between the scientific-research community and the economy. In synergy, all this should lead to a rapid increase of employment and growth of GDP.

Naturally, scientific and research activity is not an aim itself, but the aim is the overall development of the society.

The Strategy for SRA cannot be realised without the support of the state, with targeted financing from the public funds, with a clear responsibility for the achieved results, supervision of efficiency and a precise evaluation system of scientific research institutions. Moreover, it is necessary to position the dominant resource(s) in the economy and in the society, in order to ensure mechanisms of mutual and chain-like action of economy, science and policy, along with securing not only social but ecological stability as well, i.e. the sustainable development of Montenegro.

Experience of other countries that have passed through or are passing through the transition processes can assist in defining the basic principles, visions and objectives of the Strategy. No matter whether the countries in question are in the transition process or not, analogies can be found in defining the key objectives, separately from the already existing infrastructure. One of the basic objectives in the countries from the region and wider is the increase of funds allocated for research in accordance with the Lisbon Strategy principles, i.e. defining of national priorities and stimulation of research and innovation with the view to ensuring overall economic development and more efficient generation of the two-way flow of knowledge.[1]

2. Objectives of the Strategy for Scientific and research Activity

The success of science in a country and the meeting of general development needs can be conceived only if its interconnection with **education (human resources development)** and **economy (economic development)** is considered. The basic task of the Strategy for SRA is to stimulate development of science and technology by connecting these factors, and to increase their contribution to the society development, with application of the new knowledge and creation of proper knowledge and technologies to the largest possible extent. In order to achieve this task, the following objectives, analysed within this Strategy, have been set:

- Emphasize the importance of science and research in the context of further social and economic development and transformation into a modern society based on knowledge;
- Provide to the Government of Montenegro an expert framework, recommendations and support for concrete activities taken with the aim of improving and creating conditions for conducting the scientific and research activities and indicating to the competent ministries the necessity and legitimacy of investment into scientific and research work;
- Encourage allocation of funds for investment into the science and scientific infrastructure in accordance with the Lisbon Strategy recommendations and propose an adequate dynamics of allocation with regard to the GDP;
- Emphasize the irreplaceable role and decisive importance of human resources for development of science and technology, primarily through development of young staff and inclusion into the ERA;

[1] *Source: National Strategies of Research and Development of Croatia, Slovenia, Bosnia and Herzegovina, Austria and Ireland*

- Stimulate technological development and innovation and draw attention of economic entities to the fact that their market success depends on the acquisition and use of new and better knowledge, successful application and promotion of scientific results and development of new technologies whose products are attractive for the market;
- Give recommendations for optimisation and possible reorganisation of the institutional framework for implementation of scientific and research activity with the view of more efficient action;
- Underline the importance of the system for scientific informing and the role of information and communication technologies (ICT);
- Put emphasis on the importance of defining favourable legal measures (tax policy measures) as well as of adopting adequate regulations (e.g. for intellectual property protection);
- Identify the most important areas of scientific and research work, bearing in mind the comparative natural, technological and human resources related advantages of Montenegro;
- Through an adequate action plan, define priority areas and activities as well as methods for monitoring realisation of adopted tasks.

One of the basic reasons for developing the Strategy for SRA is to point out the strategic importance of scientific and research activities as the basic lever to economic and general social development. This is especially important in the conditions when the society, such as the Montenegrin one, still does not recognize the importance and role of science and technological development in achievement of new values, and the academic community suffers from lack of motivation and information, psychological barriers for inclusion into mobility programmes and inadequate valorisation of the results of its own work.

3. Harmonisation of the Strategy for SRA with the Laws, Acts and Strategic Documents

3.1 Legal Framework

Legal framework and the obligation to develop the Strategy for SRA have been defined by the Law on Scientific and Research Activity of Montenegro (Official Gazette of the Republic of Montenegro 71/05). Pursuant to this Law, the Strategy for SRA should determine the following: priorities of scientific and research activity; indicative amount of resources for funding the defined priorities; financial resources plan; the need for scientific and research infrastructure and the system of scientific informing. Scientific and research activity is, *inter alia*, based on the need for wider inclusion into the European Research Area (ERA) and into the EU Framework Programme (FP7), on introduction of international quality standards, as well as an increased investment into the scientific and research activity.

The Law provides for the establishment of the Council for Scientific and Research Activity with the task to draft the Strategy for Scientific and Research Activity of Montenegro, covering the **eight-year period (2008-2016)**, and propose it to the Government**.**

Apart from the Law on Scientific and Research Activity, as the basic legal act defining this area, the Law on the Montenegrin Academy of Sciences and Arts (Official Gazette of the Republic of Montenegro 24/93, 30/94) and the Law on High Education (Official Gazette of the Republic of Montenegro 60/03) are of particular importance, as well as a number of strategic documents of Montenegro.

Alignment of the Strategy for SRA with the legal acts in force in Montenegro implies an iterative process, i.e. permanent harmonisation and updating of the Strategy and legislation. It should be expected that certain recommendations, given with the view to implementing the objectives of the Strategy for SRA stated in the previous chapter, are not harmonised with the valid legal acts or that they are not at all defined by the existing legal framework. Having this in mind, measures necessary for amending particular legal acts should be taken in a timely manner in order to align every decision made with the valid legislation.

Thus, for e.g. adoption of a number of stimulating measures for engaging in scientific and research activity, as well as an optimum organisation of the institutional framework for realisation of scientific and research activity, can cause amendments to the existing legal acts, with particular attention paid to the area of intellectual property protection.

3.2 Strategic documents of Montenegro

The Strategy for SRA should be harmonised with the most important documents defining development directions and objectives of Montenegro. The key strategic document which would have a decisive influence on the Strategy for SRA would be the Economic Development Strategy for Montenegro, which, unfortunately, has not yet been adopted. Among other strategic documents, the most important ones are: **Directions for Development of Montenegro as an Ecological State, National Strategy for Sustainable Development of Montenegro and the Spatial Plan of Montenegro**. Other similar documents and development strategies for particular sectors (energy, transport, agriculture, tourism, small and medium sized enterprises and other) have a significantly narrower scope and deal primarily with the sustainable development of those activities.

Directions for Development of Montenegro as an Ecological State [2]

The Parliament of the Republic of Montenegro adopted the ***Declaration on Montenegro as an Ecological State***[3], which defines the strategic commitment to further develop Montenegro in compliance with the principles and requirements of sustainability.

What makes this document connected with the future strategic document in the area of scientific and research work is the targeted emphasizing of science and education as the basic prerequisites of sustainable development that should be among the top priorities of the national policy and strategy of social, economic, scientific, technological and cultural development of Montenegro.

National Strategy for Sustainable Development[4]

This Strategy represents further elaboration of development guidelines defined by the *Declaration on the Ecological State.* Montenegro needs a sustainable development concept that implies balancing of economic, social and ecological requirements in order to ensure that “needs of the current generation are met without jeopardizing the possibilities of future generations to meet their needs”.

According to this Strategy, the vision of sustainable development of Montenegro, in the part related to economic development, puts particular emphasis on the need to speed up the economic growth and transition towards market economy (stimulation of innovation and productivity, strengthening of entrepreneurship, prevention of “brain drain” from the country), through integration of environment protection policy and economic policy and mitigation of economic growth impact on the environment. The priority task of the Strategy in the area of new technologies is stimulation of research, development and innovation.

Spatial Plan of Montenegro[5]

The spatial plan of Montenegro represents one of its most important development documents and it takes over the sustainable development vision already defined in the Strategy for Sustainable Development. Future development perspectives of Montenegro are reflected in wider introduction of those principles that are dominant in the European Union, and are based on knowledge, innovation and entrepreneurship.

The document states that science should play a key role in resolving a large number of development problems of Montenegro; it should primarily facilitate overcoming of the low degree of social and economic development, influence positively the renewal of economic activities and economic growth and create cognitive preconditions for establishment of sustainable development and raising of the standard of living.

National Programme for Integration of Montenegro into the EU (NPI)[6]

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[2] *The Government of Montenegro adopted the Document in March 2001*
[3] *Adopted by the Parliament of the Republic of Montenegro in September 1991*
[4] *Adopted by the Government of Montenegro in the first half of 2007*
[5] *Document adopted by the Government of Montenegro in December 2008*
[6] *Text drafted by the Government of Montenegro in April 2008*

This document, adopted as a draft by the Government, is an important act for future development of scientific and research activity.

The most important short-term priorities (by 2010) are: reform of the statistical system in the areas of science and research; expansion and development of the national contact persons network for the Seventh Framework Programme of the European Union; stimulation of researchers mobility, strengthening of links between the research sector and the economy as well as adoption of a number of bylaws.

Also, this document envisages adoption of the Strategy for Scientific and Research Activity, which should, *inter alia*, determine priorities for science and technology (S&T) and define the annual budget growth, as well as the % of GDP earmarked for S&T, development of policies and activities for strengthening the national research potentials, human and material resources necessary on the road of European integrations.

Joint recommendations of the abovementioned documents referring to the scientific and research activity and also confirmed by the Strategy for Scientific and Research Activity of Montenegro could be comprised within three key ones:

1. Priorities and the vision of future development of Montenegro are based on the fundamental principles of sustainable development concept (harmonious balance between economic development, social requirements and the necessity of environmental protection);
2. Development should be based on knowledge i.e. science should play the key role in facing with future development challenges;
3. The scientific and research activity should be raised to a higher level, primarily through a significantly increased financial support of the state.

4. Institutional Framework for Development of Scientific and Research Work

4.1 University

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 Montenegro has been dominantly conducted at the University of Montenegro, as well as at the scientific and research institutes. 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, not only at the University of Montenegro, but in general as well.

During the past four years, the University of Montenegro has 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.

Having this in mind, it is high time to make an essential shift in the area of scientific and research activity at universities in Montenegro, through adequate strategies of scientific and research activity and high education that should be created in synchrony.

Using the comparative experiences of a number of countries in the region and in Europe, it is possible to influence the scientific and research process development at universities, without disturbing their autonomy.

Conclusions and Recommendations

- Organise doctoral studies through financing of scientific and research programmes based on the experience of developed European countries and create the necessary preconditions for internationalisation of the scientific and teaching process;
- Establish a Fund for financing the scientific and research activity within Ministry of Education and Science. In case of need, and if justified, operationalisation of these resources in the future can be done by means of the Agency for Science or the Agency for Science and High Education (already functioning in the region), which would be responsible for developing a system for evaluation of applications for budget resources, processing and monitoring of all the data related to scientific and research work, accreditation of scientific and research institutions and high education institutions;
- Define rules and develop a system for evaluation, selection and assessment of projects based on international experience and take the measures necessary for inclusion into the European Research Area;
- Establish a database of all scientific and research workers in Montenegro based on internationally recognized parameters, in order to get insight into the human resources potential and make realistic development plans. To this end, it is necessary to complete the already initiated activities for establishment of E-CRIS (Electronic Current Research Information System in Montenegro), which cannot be realised without additional financial resources, or to establish some other adequate information system;
- Develop a network of research infrastructure in the country in compliance with international standards. Stimulate establishment of laboratories and centres for scientific research within universities and other institutions through an obligatory co-financing if dealing with the priority development areas of Montenegro;
- Finance education of scientific staff at prestigious universities abroad, in the areas for which there are no real conditions in Montenegro;
- Create conditions for exchange of scientific achievements and connection of researchers, by organising scientific meetings and conferences in the territory of Montenegro,
- Using the internationally recognized methods (OECD evaluation), perform an analysis of scientific and research work in the last 10 years, in general as well as in particular areas in Montenegro,

- Stimulate mutual competition between state and private universities.

It is evident that certain, initial steps have been taken at the University of Montenegro and in the Sector for Science and High Education of the Ministry of Science and Education, aimed at realisation of the abovementioned recommendations. In order to complete the process, it is necessary to increase the amount of funds allocated for these purposes at the state level. Also, the High Education Development Strategy must state precisely the conditions that have to be met by each university unit for future accreditations of all kinds of its teaching activities as well as by every individual when electing him/her for adequate title or for mentor.

4.2 Montenegrin Academy of Sciences and Arts

In our society, which should be based on knowledge, the national Academy must play an adequate role defined in compliance with the positive experience of European countries and our needs.

National academies are independent from governments, industry and other professional organisations from which they obtain financial support that must not influence their independence. Although work programmes of national academies differ, they mainly include the following activities:

- Promotion of science, scientific and research and artistic work and coordination of activities in the area of scientific, research and artistic work;
- Organisation, realisation and coordination of scientific and research projects of particular importance for preservation and promotion of the natural and cultural heritage, development of language and culture and environment protection;
- Advisory role, based on scientific indicators and research, in adoption of various decisions at the level of the state;
- Expertises in the area of science and scientific policy;
- International cooperation in the areas of science and arts;
- Elaboration of state programmes in the area of science, and innovation of mechanisms for their implementation,
- Award of prizes and recognitions for achievements in the area of science and arts.

Models of organisation, the composition and scope of the national academies also differ. The largest number of them includes departments/sections for particular areas of natural and social sciences and arts, institutes and scientific and research centres, various bodies responsible for creating and implementing the scientific and research policy, information systems and libraries.

By a combination of circumstances, the position and role of the Montenegrin Academy of Sciences and Arts (MASA) in the previous period has not been defined in compliance with European experience and trends in this area. The potential of MASA for promotion and preservation of cultural heritage and development of language and culture, creation and realisation of scientific and research policy in Montenegro has not been used optimally. MASA has developed a dynamic international and inter-academic cooperation, realised scientific and research projects, scientific meetings and debates, at the local and international level, with the aspiration to become involved in the resolving of a number of current problems in our society. The fund for awarding young talents has been established, and there has been intensive publishing activity as well.

Conclusions and Recommendations

- Intensify the advisory role of MASA by introducing the practice of considering proposals and opinions of the Academy in the area of scientific policy conducting, environment protection and a number of social and ethic issues when, for a particular policy decision, advice can be given based on scientific indicators and research;
- Consider the possibility to locate, within MASA, those scientific institutions of national importance that also need programme financing;
- Coordinate multidisciplinary projects of national importance at the level of the Academy;
- Out of budget resources and private donations, establish a special fund within the Academy for stimulating activities of young researches, and strengthen the existing fund for award of prizes for achievements in the area of sciences and arts;
- Develop a library of reference publications as a centre of scientific and technological information within the Academy.

4.3 Scientific and Research Institutes

At the moment, there are three scientific institutes in Montenegro: Institute of History, Institute of Marine Biology, and Institute for Foreign Languages (the Institute for Biotechnology has been transformed into the Faculty of Biotechnology). Apart from these, there are also institutes within business organisations, as well as a number of agencies and centres: Office for Geological Research, Hydrometeorological Office, Seismological Office, Centre for Eco-toxicological Research, Institute for Public Health, Institute for Ferrous Metallurgy, Environmental Protection Agency, Institute for Protection of Monuments of Culture, and other. Organisational scheme and the field of operation of these institutions have changed since their establishment until the present day. They operated as independent organisations or within the University of Montenegro. Financing was of the programme type (various kinds of temporary or permanent expert services) and project one (realisation of scientific and research projects). In essence, the programme component of financing was the dominant one. An optimum form of organisation and financing for these institutions has not yet been found.

Similar institutions in a number of European countries are of dynamic character – they appear, develop and disappear depending on the demand and conditions on the market. The area of their operation can change in domain, from scientific towards service activity and vice versa. In order to be recognized as scientific and research institutions, they must meet certain conditions with regard to staff and equipment. These institutions play a special role in the scientific and research process at the level of master and doctoral studies.

Conclusions and Recommendations

The importance of the abovementioned institutes for Montenegro is indisputable. Having that in mind, an optimum manner of organisation and financing should be found, which will enable permanent operation and development of these institutions. If project financing is adopted as the dominant one, it is very unlikely that these institutions can survive realising the scientific and research projects at the national and international market without additional financial support. If programme financing is adopted as dominant, there is a danger of transformation of these institutions into classic offices in which service activity will prevail. Taking this into account, the most acceptable variant is parallel programme and project financing, with the two components being separate and independent. Programme financing would be provided by competent ministries, based on defined activities permanently performed by these institutions for the needs of the ministry. Project financing would be realised in the area of scientific and research work. With this regard, institutes would not have priority, but they would operate under the same conditions as other entities in Montenegro, depending on their potentials and market conditions. This would stimulate development of institutes, transformation of offices into institutes or establishment of new institutes. In the opposite case, institutes would be transformed into classic offices. The manner of organisation of institutes and offices should not be specified in advance. They can operate independently or within other institutions, depending on their needs and conditions in the market. Regardless of their form of organisation, it would be necessary to define the conditions they must meet in order to be accredited as scientific and research institutions or centres of excellence, and thus obtain the right to use adequate programme resources for scientific and research work.

There is a wide spectrum of programme areas of particular importance for Montenegro that should be separately specified for each institute and offered to the ministry competent for ensuring permanent financial resources for the realisation of particular activities. When scientific and research work is in question, these institutions have at their disposal the required human resources and equipment for successful involvement into priority areas of research at the national and international level, as well as for realisation of research work of students at master and doctoral studies at universities in Montenegro. Programme activities would enable permanent survival of these institutions, while their development and scientific and research position would depend on the initiatives and activities in the field. With the view of carrying out the abovementioned conclusions, it is necessary to:

- Accredit all the institutes and define their legal subjectivity;
- Provide sustainability of programme financing of institutes dealing with subjects of national importance.

4.4 Library Capacities

Library-information system as well as the information system in the scientific and research activity are the necessary structure without which modern education, science and research, or the technological and economic development, cannot be conceived. Libraries are one of the most important factors for the creation of new values in education and scientific and research work.

At the University of Montenegro, apart from the University library, there are also a number of libraries located at faculties and institutes. The University library was founded in 1979 with the view of organising the overall library activity at the University, developing a unique library-information system and supervising the work of all libraries in the high education sector. Due to inadequate infrastructure and lack of adequate staff, the University library was not able to fulfil the envisaged tasks, during a long period of time. Starting from 2000, a number of significant steps have been made in order to improve the situation in this area. Automatisation of operation and networking of libraries into a unique library-information system COBISS.CG (Co-operative Online Bibliographic System and Services) has been initiated, as well as education and professional development of library staff, implementation of library standards, modernisation of library services, and other. The library materials have been partly processed and available on-line in the form of bibliographic legacy. Access to the EBSCO electronic database has been provided. Development of a register of researchers and projects at the University of Montenegro has been launched, based on the universal application platform E-CRIS (Electronic Current Research Information System in Montenegro). Unfortunately, these highly positive undertakings have not been completed. EBSCO database can, to a certain extent, satisfy the needs in the area of social sciences and medicine, while it is absolutely inadequate for technical sciences.

The existing professional staff is dispersed across faculty libraries, the Central Library “Đurđe Crnojević”, MASA library, with excessive decentralisation reducing the efficiency of their work. Every library need not have “everything”, but the network user can obtain everything he/she needs. The library fund can be centralised or divided into several sections located closer to their users. Centralised systems have an advantage in academic and economic terms, unless there is a need for extremely frequent use of particular reference publications.

Conclusions and Recommendations

- Finish the initiated activities focused on realisation of COBISS.CG. In order to have this system completed, the faculty libraries need to complete the data on their funds in the COBISS.CG system;
- Complete and permanently update the E-CRIS (Electronic Current Research Information System). For completing and updating of this system, the scientific staff needs to submit the already requested data;
- Provide access to a higher number of databases;
- Adopt one of the possible models of centralised organisation. Having in mind the fact that library premises will soon be constructed within the new Rectorate building, possible integration of all the libraries of the University of Montenegro from the territory of Podgorica should be considered. This would enable an efficient organisation of the library system with the minimum economic costs;
- Define a unique library-information system with efficient university network, which would include the Central Library and other libraries from the territory of Montenegro;
- Adopt a financing model for the library-information system that would enable permanent renewal of the library fund, and in particular of periodic publications, independently from the current possibilities and positions of the university units' heads.

All the abovementioned recommendations should be realised in order to establish an efficient system. Bearing this in mind, as well as the fact that the largest number of recommendations can be realised without significant financial investments, the recommendations have not been prioritised. Those for which there are real financial and human resources should be realised first, while the necessary measures should be taken for realisation of the remaining recommendations.

4.5 Academic Network

The academic network should ensure international connection and inter-city links – WAN (Wide Area Network) and the local connecting in towns – MAN/LAN (Metropolitan Area Network/Local Area Network). The network should be intended for transfer of data and it should connect all the national research and education networks. Teachers and scientists should be able to access network from their flats.

The use of FTP protocols for transfer of data from the European and USA university centres is limited.

There is an obvious lack of good quality staff of almost all ICT profiles, even though education in this area is organised at several units of the University of Montenegro. Almost all up-to-date hardware and software can be purchased in the market of Montenegro. The prices are burdened by the obligatory VAT. ICT companies from the region participate in almost all realised projects in the area. This shows that local companies do not possess their own capacities for bigger projects. There is also an evident lack of legislation, standards and norms in this area at the level of Montenegro.

Conclusions and Recommendations

Information system efficiency is of crucial importance, not only for development of scientific and research work, but also for the functioning of all state bodies. It depends primarily on adequate infrastructure enabling rapid transfer of data. This infrastructure should be owned by the state, which can be realised without major investments considering the relatively small territory covered by our state. It is necessary to:

- Connect by optic cable all the towns in Montenegro into a network owned by the state. This network would ensure connections with the surrounding countries, with the view of integrating the MREN (Montenegrin Research and Education Network) into the European academic network – GEANT. The network would be used by all university centres and state bodies. A draft project for this network has been developed in the Information System Centre within the University of Montenegro;
- Reduce or abolish VAT for purchase of computer equipment, the price of Internet connections (ADSL, ISDN), textbooks and literature, following the practice in many European countries;
- Adopt the necessary legislation and standards in the ICT area;
- Stimulate ICT companies for cooperation with educational institutions;
- Introduce international standards in education of adults working with computers, e.g. ECDL (European Computer Driving Licence).

5. Research, Innovation and Technological Development

The common starting point of fundamental mechanisms for implementation of the development strategy of Montenegro is the concept of complex competitiveness of the state and of the national economy. This competitiveness is assessed as a measurable capability to produce internationally competitive products and services in a manner which ensures sustainable development. The basic mechanisms for increasing complex competitiveness and technological development are: harmonisation of transition to orientation of a knowledge-based society which supports the policy of development of human resources, labour force and labour market, development of information society, strengthening of economic competitiveness and regional development that would reduce regional development differences. The review of EU policy measures in the area of science, technology and innovations pointed out: the need of strengthening the knowledge users sector; the initiatives for connecting the public with the private sector of knowledge users; the possibility to strengthen the private sector of knowledge users; connecting of the initiatives between researchers in the public and the private sector; stimulation of research in the private sector.

With regard to the scope of investments into research and technological development, as well as the degree of companies' innovations, Montenegro maintains the existing state, which, from the viewpoint of dynamic changes in the world, does not allow for stimulation of development. The weak link between the scientific, research, educational and economic sphere is also an obvious

deficiency that negatively affects the human resources development, technological development as well as export competitiveness.

Small and medium sized enterprises in our region are at the forefront of project leadership. That situation could be hardly applied to our conditions due to the fact that those are quite different types of small and medium sized enterprises, such as companies based on the knowledge generated at universities and in technological incubators. Montenegro has mainly small and medium sized enterprises engaged in simple production and services. Their interest for investments into the technological development projects is practically negligible. In order to encourage them to invest into research, the state should support industrially oriented projects that can be realised on the market.

Inadequate approach to external financing and various credit lines is a common problem of all small and medium sized enterprises. The problem is even more acute in financing of scientific and research work, due to potential risk that these investments imply.

One of the weak points related to research in Montenegro is also the bad transfer of research data to the market. Industrial management principles, which imply confidential and complete disposal of scientific data, can represent one of the indicators on how to motivate financing by the industrial sector.

Montenegro 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 medium sized 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 no 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.

Issues of intellectual property resulting from research financed out of public funds have not been regulated by special legislation so far. It is necessary to train staff at the level of state administration for provision of basic advisory services to clients i.e. scientists, development of internal regulations, as well as adequate advocacy of the scientific community in regulating the intellectual property rights at the national and international level. The possibility of using technical assistance of the European Commission (such as TAIEX programme[7]) for these purposes can be considered. All the scientific and research institutions, in which products of knowledge i.e. intellectual property is created, should establish bodies, procedures and regulations governing intellectual property management – from the issue of copyright in a project, the right to apply with a patent and check its justifiability, technological transfer (transfer of the right to a third person, contracting on technological licences), up to providing financial resources for intellectual property protection (especially patents).

Conclusions and Recommendations

- Stimulate financing of research and innovation by private and economic sector, through the state participation of up to 50 % in applied and development projects;
- Stimulate research-development cooperation between scientific and research institutions and companies, by encouraging connection of research groups,
- Support investments into the development of technological networks and new technologies in those areas where there is already a critical mass of knowledge and public interest for use of that knowledge for general purposes. Long-term development should be directed to all the other areas that can become competitive in the future, and it shall be determined by short-term action plans for development;
- Increase the porosity of our economy for world technologies and innovations, which requires preparedness, both in terms of staff and technological infrastructure. For

[7] *TAIEX is the European Community technical assistance programme for public institutions of countries aspiring to integrate into the European Union, intended primarily for EU legislation implementation*

realisation of this objective, system reorganisation measures are necessary, as well as modernisation of existing technologies by means of adequate credit and transfer lines, tax exemptions in development activity etc. The existing institutions should be adapted to innovative operations, such as technological parks and incubators, which should be established at universities and financed as infrastructure centres;

- Introduce incentive measures for crediting the scientific and research work. Efficient and guaranteed crediting mechanism can be an attractive mean of investment into scientific and research work;
- Stimulate strengthening of research and development departments in companies and development of public research institutions;
- Ensure marketing support and consulting services for all the stakeholders in the research and innovations;
- Establish relevant bodies and ensure technical support for staff training, development of procedures and informing of research community on intellectual property issues.

6. International Cooperation

Montenegro possesses some experience in the opening of national scientific and research programmes in the context of bilateral agreements with the countries from the region as well as with EU member states.

Active inter-disciplinary international projects are financed from the funds of the German Rectors' Conference (1), Norwegian Council for Science (1), ERA-NET projects within FP6 (3), bilateral cooperation (9), INTERREG (1)[8].

Participation within the Seventh Framework Programme (FP7) is mostly reduced to projects of coordination and support. Participation in large research projects is minimal. Out of the total number of projects financed up to date, 1 is a research project, 2 are European networks of national contacts for FP7, and 4 are projects of coordination and support[9].

It could be stated that Montenegrin academic community has relatively good used the possibilities of TEMPUS III programme with 55 realised projects[10].

Student mobility has been carried out through CEEPUS, TEMPUS, INTERREG, WUS-Austria programme, IAESTE, and SEE-ERA.NET. In the four-year period, around 350 students have been engaged in mobility on various grounds. Within its activities, the Montenegrin Academy of Sciences and Arts has participated in activities of ALLEA, EASA, EMAN, IACSEE, ICSU and CEEN, and carried out the envisaged activities on joint projects and study visits with 22 national academies of sciences and arts[11].

The Montenegrin academic community records an increased number of applications for the Seventh Framework Programme, with the status of associated country, for NATO SPS programme, to which Montenegro has been associated since March 2007, and for the new cycle of TEMPUS IV Programme (2007-2013). The question to be asked is to what extent can experience in bilateral cooperation contribute to practical application of the *reciprocity principle* in various international options of scientific and research work financing, even more so if we know that in Montenegro there is no clear picture of the users of reciprocity in international scientific cooperation, since mobility of researchers is financed by several legal entities in Montenegro: **Ministry of Education and Science, Montenegrin Academy of Sciences and Arts, University of Montenegro, Ministry of Foreign Affairs, Office for International Cultural, Educational and Technical Cooperation (ZAMTES)**.

Activities should be taken to improve the existing opening of scientific and research programmes. Nowadays in Europe, over 80% of research financed by the state sector is realised at the national level. The Framework Programmes of the European Commission mainly contribute to the

[8] *Source: University of Montenegro, Office for International Relations*
[9] *Source: Ministry of Education and Science*
[10] *Source: National TEMPUS Office*
[11] *Source: Montenegrin Academy of Sciences and Arts*

European dimension. There are weak connections between the national programmes of particular states and the national and European research programmes.

Conclusions and Recommendations

- A group of measures focused on exchange of information in decision making process, transfer of technologies and exchange of results can favourably influence the internationalisation of national programmes. These measures are: stimulation of international cooperation through contacts within financed projects in various states, and mobility of researchers as a basis for creation of successful international cooperation;
- In order to encourage the international cooperation of Montenegro to a larger extent, a number of concrete measures needs to be taken, aimed at establishing the infrastructure necessary for stimulating international cooperation and involvement into the European Research Area,
- Provide full support to more active participation of researchers in the relevant European and international programmes, by increasing financial resources intended for mobility;
- Integrate the system of financing, competencies and flow of information in the area of international cooperation at the state level within a unique legal entity, which should possess a proper database of participants in all international cooperation activities. Creation of a network of contact persons for various thematic areas within the Seventh Framework Programme and other international programmes needs to be completed;
- Systematically motivate application of researchers to calls, primarily within the Seventh Framework Programme, by informing the public in a timely manner, over contact persons, on the new calls and conditions of application;
- Speed up accession of Montenegro to the EUREKA programme that, at the international level, stimulates involvement of economy and private sector in the system of scientific and research activities financing;
- Encourage participation in the COST programme by means of adequate administrative mechanisms that so far have not come to life in Montenegro, as well as by informing extensively the academic public on the possibilities offered by the COST;
- Extend the existing bilateral cooperation as a very popular experience in exchange of results of scientific and research work, and initiate intensive activity for establishment of extensive multilateral cooperation;
- Intensify regional cooperation due to a possibility for a large number of joint research actions interesting for the whole region, with relatively balanced level of scientific and research activities;
- Network and connect better Montenegrin research and scientific organisations with other national and European agencies for promotion of science and research and their financial organisations, with the aim of stimulating and enhancing cross-border activities.

7. Priorities of SRA

Two approaches to selection of priority areas in scientific and research work can be observed by analysing the European countries' strategies for scientific and research activity. Certain states have defined particular areas as thematic priorities, having in mind their comparative advantages and conditions for achieving a leading role in those areas of research, such as: biotechnology, genetics, medicine, information technologies, food, environment protection, energy, new materials, etc. The other approach implies allocation of resources for particular activities i.e. programmes (functional priorities) such as: scientific and research process at universities, connection between the university and the economy, inclusion of economy into the scientific and research process, development of new technologies, technological infrastructure, business competitiveness and the like, with technological areas not being specified in particular. It is believed that full support should be given to all areas for which there is an interest, adequate conditions and readiness of economy for investment into scientific and research process, notwithstanding the technological area.

The abovementioned approaches can be recognized in parallel in many strategies, with one or the other having a predominant role.

7.1 Thematic Priorities

When selecting priority areas of scientific and research work in Montenegro, special attention should be paid to meeting to the maximum the following conditions:

- Increase of the domestic product in Montenegro;
- Harmonisation with the strategic documents of Montenegro: National Strategy for Sustainable Development, Spatial Plan, Directions for Development of Montenegro as an Ecological State, Energy Development Strategy, etc. as well as with the existing laws in the area of high education and scientific and research activity;
- Possibility to join international projects with the existing scientific and research potential (staff and equipment), i.e. recognition of research in the areas that can be competitive at the European level;
- Creation of conditions for further development of scientific and research staff and institutions in particular areas;
- Preservation of the natural and cultural heritage.

The present moment imposes on Montenegro the needs in particular areas such as:

- **Science and education** – The strategic documents of Montenegro, mentioned in section 3.4, point out that science and education are prerequisites for sustainable development and that they should be among top priorities of the national policy and strategy of social, economic, scientific, technological and cultural development of Montenegro. Progress of science implies recognition of the best quality researchers, promotion of scientific activities and ensuring of a connection between science and education.
- Our society, just like every other society in transition, faces a number of specific problems that should be permanently studied in order to reduce their negative effects. The natural and cultural heritage, demographic structure, national identity, language and the like, are areas that special attention should be devoted to.
- **Ecology** – Montenegro declared itself an ecological state, which is in line with its strategic documents and those of almost all the countries in Europe, in which sustainability is the key term, and clean and unpolluted air, water and land are the basic priorities of development policy. The sea and the coastal zone have special importance as they represent a significant resource in the Mediterranean countries, and therefore activities aimed at studying and implementing measures of protection and rational use of biological resources have a priority position.
- **Tourism** – Work in the area of tourism implies research in a range of areas on which this branch of economy predominantly depends, such as environment protection, water supply system, waste waters, transport, communications, etc.
- **Agriculture** – Development of a sustainable sector of agriculture, and food production as a whole, is of fundamental importance for the overall economic development of Montenegro, bearing in mind the fact that food production contributes more than 1/5 of GDP. Modern concept of sustainable development puts agriculture into a much wider context, since its overall importance is reflected in its multi-functionality. Development of agriculture at the same time means also management of huge resources (37% of the overall territory of Montenegro). Modern concept of agriculture development and farming policy observe development of agriculture and rural areas taken together. Such integral approach includes also forestry, as an important segment of natural resources management. Having in mind an extremely strong competition and a number of subsidies given by the countries in the region for agricultural production, Montenegro can be competitive with a relatively small number of agricultural products, but there is significant potential when the production of healthy organic food is in question.
- **Health of population** – Due attention should be paid to health problems typical for particular population categories of Montenegro.
- **Energy** – Research in the field of energy should primarily be focused on research of energy potential, renewable energy sources typical for Montenegro, as well as for improvement of energy efficiency, bearing in mind that in this field Montenegro is among the hindmost countries in Europe.

The abovementioned areas should be taken into consideration when annual investments from budget funds are planned, through competent ministries, for programme co-financing of adequate scientific and research institutions and realisation of capital development projects in the mentioned areas, with the maximum engagement of domestic scientific staff (Ministry of Agriculture, Ministry of Tourism and Environment Protection, Ministry of Culture, Sport and Media, Ministry of Energy, Ministry of Health, Labour and Social Welfare, Secretariat for Development). In cooperation with the Ministry for Economic Development, the banking sector should provide additional support to realisation of scientific-development projects and create stimulating conditions for foreign investments into research and development.

7.2 Functional Priorities

The Ministry of Education and Science of Montenegro, as the competent ministry, through whose budget the funds for realisation of scientific and research projects are allocated on a competitive basis, is not currently facing any significant problem in defining thematic priorities to which the budget funds are to be directed, because the intensity of scientific and research work at the moment is relatively low. Our science is more in a position to maintain its base of human potential through regular provision of funds for research, along with the provision of better conditions for the work of researchers, increase in their number and raise in their international recognition degree. These conclusions can also be drawn from the fact that very few of results hitherto financed out of the budget funds have been valorised, that ownership over the projects results has not been regulated by the law, and that there was no realistic connection between the financed projects and the real needs of Montenegro.

When distributing annual funds for science, the problem of disproportionate representation of various fields of science in project proposals arises, and therefore it is necessary to define their mutual relations in distribution of funds for fundamental research, in order to develop equally all fields of science. To date, Montenegro has not applied any special system of funds allocation according to the areas of science. One of the models that could be accepted in our country is the one represented in the European Research System in the Framework Programmes:

- natural and mathematical sciences and engineering – around 40%
- sciences of life and of living organisms – around 35%
- social sciences and humanities – around 15%
- multidisciplinary research – around 10%

Taking into account the above stated criteria, priorities can be established among the good quality applied and development projects candidated for budget funds. At the moment when the problem arises due to a large number of very good quality applied and development projects in various fields of sciences, the Ministry of Education and Science (or a competent agency) should carry out national prioritisation in accordance with the well-known methodologies (“Predictions in science” and others).

Instead of establishing thematic priorities, for the Ministry of Education and Science it is more important to make the so-called functional prioritisation, i.e. to define priority policies and measures intended for removal of barriers and deficiencies in the research system and stimulation of its growth. Those are policies such as: stimulation of public-private partnerships in research, establishment of a balance between various sources of research activity financing, improvement of conditions for attracting foreign investments into research and development, increase in the number of secondary school graduates who enter the engineering studies.

Conclusions and Recommendations

In the period 2008-2016 when this Strategy will be implemented, according to the recommendations given in this document, priority functional areas of scientific and research activity that the Ministry of Education and Science annual work programme measures should be focused on, will be the following:

- Implementation of measures for building human resources potentials for scientific and research activity, through programmed stimulation of increase in the number of researchers and better working conditions;
- Strengthening of research infrastructure, through regular investments of budget funds into modernisation of the existing capacities, their augmentation and an open approach;
- Application of measures for connecting the research sector with the economy, by means of joint development projects;
- Increase of investments in researches in the economic sector.

8. Financing of Scientific and Research Activity

The idea to create the European Research Area implies standardised methodology for monitoring the situation in this area in all EU member states as well as in the countries aspiring to integrate into the EU. The OECD methodology of statistical research related to science and technological research has been widely accepted, so as to exchange comparable data among the states and plan the growth of each country separately, in accordance with the Lisbon Strategy and Barcelona objectives. EU member states are recommended to have the 3% share of research-technology-development investments in the GDP at the national level, 2/3 of which should come from the economy and 1/3 from the state funds.

All EU member states have established a statistical system that allows this type of monitoring, while candidate countries are at the end of such a process. On its way to the EU, Montenegro has also taken initiatives for reform of the statistical system in science.

According to Eurostat 2007 data, the scope of investments into RTD (Research-Technology-Development) in 2004, in absolute values, totalled:

- EU-25: 194 billion EUR, out of which 80 billion EUR of state funds;
- USA: 251 billion EUR, out of which 100 billion EUR of state funds;
- Japan: 120 billion EUR, out of which 27 billion EUR of state funds.

The data are given only as relative indicators, for the purpose of assisting political decision makers in creating the policy for development of knowledge-based society, because these indicators show that states, despite the market model of their economies development, invest significant state funds in enhancing the research.

Montenegro should start investing more appropriate share of budget funds in the research and technological development, because the share of investments in this area has been insufficient thus far, if compared with the standards of the community that Montenegro aspires to.

Previous investments should not be justified by the fact that Montenegro is a small and poor country, because the indicator of "% of GDP for RTD" is equally "heavy" for every country, and it reflects the efforts of a country in creating the new knowledge and represents one of the most important drivers of economic growth.

According to the existing available data being collected by MONSTAT, certain data can be obtained from two categories of indicators: investments in scientific and research activity, and monitoring of persons employed in the area of science.

We would like to remind that MONSTAT does not have a data collection methodology harmonised with that of the EU, but it operates in line with the old, UNESCO methodology that had been applied as far back as in former SFRY. Moreover, even the existing data include a certain degree of unreliability, due to insufficiently developed awareness of how important accurate filling in of statistical surveys is.

On the other hand, the Ministry of Education and Science has not innovated the procedures and standards for licensing, i.e. external evaluation of scientific and research institutions and their entry into the Register, and accordingly, there is no real picture both in the public and in the private sector of the level of activities, staff competences and equipment of institutions dealing with this activity in Montenegro.

Reform of statistics in this area is one of the priorities of the Ministry of Education and Science and MONSTAT, also included in the National Programme of Integration.

In the process of accession to the European Union, Montenegro has an obligation to adopt the **European Commission Regulation as regards statistics on science and technology** (Commission Regulation No. 753/2004). It precisely states a list of statistical variables that each of the member states must provide through the standardised statistical researches (Frascati Manual and Canberra Manual), activities and sectors covered by them, sections of results, frequency and deadlines for transfer of data to Eurostat, etc.

Those are the following statistical data:

1. Statistics on research and development

1.1 Number of staff engaged in research and development (absolute number)
1.2 Number of staff engaged in research and development (equivalent to the full working time)
1.3 Number of researchers (absolute number)
1.4 Number of researchers (full working time equivalent)
1.5 Internal spending on research and development

2. Statistics on allocations for research and development from the state budget
2.1 Allocations for research and development in the Budget Law
2.2 Allocations for research and development in the revised budget

3. Other statistics on research and development (human resources in science and technology, patents, high technology industries and scientific services, new statistics in development) that can be mostly obtained through other existing statistical or other sources of data (e.g. from social or economic statistics).

The table 1 below includes the following data:

a) Government Budget Appropriations or Outlays for Research and Development (GBAORD), as % of GDP
b) Gross Expenditure on Research and Development (GERD), as % of GDP

Table 1 – Data on investments in RTD[12]

Year	*GBAORD*				*GERD*			
	MNE	*EU-25*	*Max*	*Min*	*MNE*	*EU-25*	*Max*	*Min*
2002	0.06				0.14			
2003	0.05				0.08			
2004	0.08				0.18			
2005	0.03	0.74	1.5	0.09	0.16	1.86	3.7	0.37
2006	0.03				0.04			

Table 2 – Review of funds allocated for science from the State budget through the Ministry of Education and Science for the period 1997- 2004[13]

Year	1997	1998	1999	2000	2001	2002	2003	2004
% of budget	0.42	0.75	0.74	0.60	0.82	0.69	0.33	0.30
% of realisation	0.27	0.33	0.26	0.26	0.29	0.40	0.29	0.30

Table 3 – Review of distribution of funds of the Ministry of Education and Science for the period 2005-2007[14]

Year	Total (in EUR)	R&D projects (equipment)	R&D professional development	International cooperation
2005	722.000	47.00%	46.40%	6.60%
2006	600.000	57.16%	27.67%	15.17%
2007	900.000	57.78%	22.00%	20.22%

[12] *Data on GDP for the period 2002-2006 are the official data of Monstat; data on spending for RTD in Montenegro are the data of Monstat, but they, however, include only research in the high education sector (financed from the state budget, private companies or other sources); Data on investments in RTD in EU member states are data of Eurostat (Eurostat, R&D Statistics – OECD MSTI 2006)*

[13] *Source: Ministry of Education and Science*

[14] *Source: Ministry of Education and Science*

8.1 Scope of Financing

Montenegro cannot set to itself the objective of following the EU standard and allocating 3% of GDP for science by 2010, but it can make various hypothetical projections in order to analyse the gravity of the problem and find the most acceptable and the most realistic solution. According to some estimation for the region, it is possible to allocate a minimum of 1% for RTD until 2011. One should be realistic and notice that even the allocation of 1% will be difficult to realise in 2011.

For the time being, until the economy of the country gets stronger, until a more intensive investment cycle begins, until sound production capacities and their relation to the services sector take a more definite shape (both in terms of scope and activity type), intensive state measures will be needed to support research and technological development and innovations. After that, it will be only reasonable to expect higher allocations of the economic sector, and in particular of the private sector that must find its interest in allocation for scientific and research activity.

If the projections of the Ministry of Finance related to the GDP growth are taken into account, the projection of 2% of GDP for RTD by 2010, given in the Spatial Plan, is quite optimistic, and that is why a less pretentious option is proposed (Figure 1) as a minimum that needs to be achieved. This option is based on comparative solutions of countries that mainly base their developments on services, but make profit with extensive investments in the knowledge sector, especially in the activities of the private sector and of small and medium sized enterprises. It is particularly important that state investments in the knowledge sector are never risky, and always represent a basis for economic development of a country, as proved by the examples of Ireland and Finland.

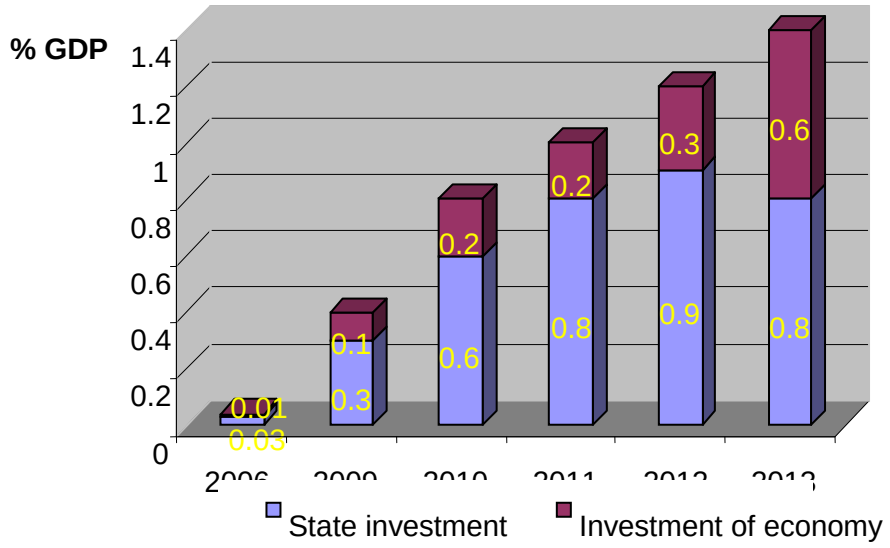

Figure 1: Proposal for growth of investment in SRA by 2013

The EU objective is to reach, by 2010, the ratio of investments in RTD of the state and the economy of 1:2. We do not have at our disposal a comparative solution by which this could be achieved in a period shorter than 10 years, unless the state through its mechanisms, whatever they might imply, defines investments in the knowledge sector as a priority (example of Ireland and Finland).

A new structure of economy has just been emerging in Montenegro and its technological and export aspirations are still at a low level, as well as the management structures' awareness of competitiveness as the measure of their survival, and thus also their readiness to invest into development and innovation. On the other hand, foreign companies' owners bring their "know-how", without any interest whatsoever for establishment of development units in Montenegro and use of the local knowledge.

The graph (Figure 1) represents a proposal for the dynamics of increase of investments in research, technological development and innovations for the five-year period (2009-2013).

If such an increase of investments in RTD was attained, a positive response of the economy could be expected after 2013 accompanied by its increased investments in development and applied research, as well as an increased inflow of resources from the European funds, so that by the year 2020 the ratio of investment from the state and from other sources of 1:2 respectively could be expected.

Conclusions and Recommendations

An increased scope of the state funds investment should, first of all, be focused on the University of Montenegro, high education institutions and scientific and research institutions in Montenegro (in accordance with the Law on Scientific and Research Activity) with the view of achieving the following objectives:

- Modernisation of scientific and research infrastructure, without which no competent doctoral studies can be delivered or young generations be trained for modern technological society. A model of rational organisation of laboratories, with the establishment of multidisciplinary centres, should be accepted. Such centres would gather internationally recognized researchers, and have the critical mass of competencies for mentorship to young doctoral students, as well as easier access to the European funds for research. Technological parks are also one of the comparative solutions, but in this five-year period it is not realistic to expect their establishment, because there are no evident sources of financing for this;
- Provide special conditions for additional financing of internationally recognized researchers, and in particular those who are mentors of doctoral students (project financing can be a good model). Since approximately **20%** of researchers out of the total number of PhDs in Montenegro have internationally measurable references (works in journals included in the internationally recognized databases), it is necessary to allocate funds for creating living and working conditions for scientists from Diaspora who would accept to return to Montenegro. In parallel with this, it is necessary to initiate the already established bilateral cooperation between the University of Montenegro and the universities of developed countries, and to provide conditions for stay and work of mentors coming from foreign universities out of the mentioned funds;
- Gradually adopt the model “research associate”, besides the existing “teaching associate”. Young research staff (doctoral students) should be engaged in projects at the University, through which their salary and all the contributions related to the employment could be provided. This kind of financing of young staff needs to be sufficiently attractive, in order to increase the level of motivation of young people for engaging in researches. This method would enable the University to complement its scientific-teaching staff in a timely manner and in accordance with its needs, while the economy would be enabled to obtain modern trained labour force;
- Activate all the mechanisms for academic staff and doctoral students’ mobility, all in line with the teaching organisation plan at the University. Create conditions for doctoral students to spend at least one semester during their studies at a foreign university, financed through European and other programmes, as well as from the budget funds. Provide also conditions for PhDs, especially those 27-34 years old, to use European and other funds for work at the European universities, respecting the rules of “unpaid leave” for a maximum of one semester. This mechanism is used very frequently in countries striving to prevent drain of the best research staff;
- Define funds and mechanisms for intensifying cooperation with Diaspora and return of recognized staff to Montenegro;
- Establish national awards for scientific and research results, and work continuously on programmes for popularisation of science among secondary school students, and pay particular attention to young talents;
- Establish a number of measures to stimulate work in science and research.

9. Operationalisation of Objectives and Monitoring of the Strategy Recommendations Implementation

Short-term and long-term objectives encompassed by the Strategy must be made concrete through their quantification and development of measures for efficient implementation of recommendations

defining deadlines and obligations of particular actors. It is necessary to provide continuous monitoring and checking of tasks execution, and in particular to define the consequences in case of failure to execute those tasks. Obligations of individual actors, stemming from the Strategy recommendations, must be clearly defined. The Action Plan annexed to this Strategy reviews the priority thematic tasks, as well as measures for their implementation. The plan includes also the indicators that can be relatively easily monitored in the given period. The indicators will serve for monitoring the implementation of the Strategy, which will be carried out through cooperation of the competent ministries and scientific and research institutions with the Council for Scientific and Research Activity. With time, it will probably be necessary to work on standardisation of methods for monitoring of indicators, since data from various sources are likely to appear.

Implementation of the Strategy for SRA is proposed to be the competence of the Council, and to have a one-year period as the basic monitoring cycle. Based on recommendations contained in the Strategy, the Government of Montenegro should adopt detailed action plans necessary for successful implementation of the proposed measures, on annual basis, and upon a proposal of the competent ministries. A comprehensive assessment of its implementation should be done after five years. Progress made in the achievement of objectives must be the subject of annual reports, prepared by the Council for Scientific and Research Activity and submitted to the Government of Montenegro. Overall coordination of monitoring of the Strategy implementation will be the task of the Council, in cooperation with the competent ministries and institutions. It would be appropriate to appoint contact persons in the competent ministries and other institutions dealing with scientific and research activity and innovations to monitor implementation of the Strategy, in communication with the Council.

As regards the efficiency of the measures proposed by the Strategy, a special problem can be caused by weaknesses of the system for collecting and processing of data, obviously present in Montenegro. The selection of adequate indicators through which the Strategy implementation will be monitored is vitally important for the effectiveness of this process.

Upon a proposal of the Council, the Government of Montenegro should adopt an adequate manner for documents adoption and informing the overall scientific and research community.

Annex 1: Action Plan

PRIORITY TASKS	MEASURES	DEADLINES	COMPETENT BODIES	INDICATORS
1. Reform of the institutional framework for engagement in scientific and research activity	Establishment of a codified and classified base of researchers	2008-2010	Scientific and research institutions Ministry of Education and Science	Researchers in all institutions presented in the base
	Establishment of statistical monitoring of the scientific and research activity	2008-2011	Ministry of Finance MONSTAT Ministry of Education and Science	Statistical data are regularly updated and submitted to the Eurostat
	Establishment of a fund for financing the scientific and research activity	2008 – 2011	Government of Montenegro Ministry of Education and Science	Established Fund for financing the scientific and research activity
	Establishment of coordination of nationally important multidisciplinary projects at the level of MASA	2008-2010	Government of Montenegro MASA	Number of multidisciplinary projects
	Defining organisational form of scientific and research institutes	2008-2010	Government of Montenegro	Defined legal status and model of financing for institutes
	Defining of a unique library-information system with access to international databases	2008-2010	Universities MASA Ministry of Education and Science	Number of integrated libraries with COBISS Number of databases that the academic community of Montenegro can access
	Creation of a development plan of information-communication technologies for the research community and monitoring of its implementation, with the adopted regulations and standards in this area	2008-2010	Government of Montenegro Secretariat for Development Ministry of Education and Science Information System Centre-UoM	Number of towns in Montenegro connected by optic connections Adopted legislation in the area of information-communication technologies Number of ICT companies cooperating with the scientific and research institutions
2. Stimulate innovation and technological development	Stimulate financing of innovations in the economic sector	2008-2016	Government of Montenegro Ministry for Economic Development Directorate for Development of Small and Medium Sized Enterprises Ministry of Education and Science Universities	Increase the share of economic sector in research and innovations (MONSTAT)
	Stimulating measures for financing the scientific and research work	2008-2012	Ministry of Education and Science Ministry for Economic Development	A set of financial measures for stimulating research
	Stimulate development of public research institutions	2008-2012	Government of Montenegro Ministry for Economic Development	Increase in the number of public research institutions in the given period
	Marketing support and consulting services to all the actors in the area of innovations	2008-2012	Ministry for Economic Development Ministry of Education and Science Directorate for Development of Small and Medium Sized Enterprises	Number of institutions using consulting services and marketing services

PRIORITY TASKS	MEASURES	DEADLINES	COMPETENT BODIES	INDICATORS
3. Stimulate international cooperation at all levels of scientific and research activity	Stimulate participation in European and international programmes	2008-2016	MASA Universities Ministry of Education and Science	Number of international projects across all scientific areas
	Reorganisation of the system for financing researchers' mobility	2008-2012	Government of Montenegro	Existence of one legal entity responsible for financing mobility Number of students and researchers involved in the mobility programmes
	Participation in COST and accession to EUREKA	2008-2010	Ministry of Education and Science Directorate for Development of Small and Medium Sized Enterprises	Number of actions in COST and number of EUREKA projects
	Intensifying of regional and bilateral cooperation	2008-2016	Ministry of Education and Science Ministry of Foreign Affairs	Number of ratified bilateral agreements Number of regional projects
4. Realisation of functional priorities of scientific and research activity	Reorganisation of institutional administrative structure	2008-2010	Government of Montenegro	Reorganised administrative structure of the Ministry of Education and Science – Sector for Science
	Allocation of funds for programme financing of research institutions of national importance	2010	Government of Montenegro competent ministries	Amount of allocated programme funds
	Allocation of funds for co-financing the technological development projects and innovations, and innovation of regulations governing allocation of funds	2010-2012	Ministry of Education and Science Ministry for Economic Development	Rulebook on Allocation adopted Amount of allocated funds
	Development of human resources and infrastructure	2009-2016	Government of Montenegro Ministry of Education and Science	Increase in the number of capital equipment units that can be accessed by researchers in Montenegro Increase in the number of PhDs up to 35 years old
5. Increase in the level of investments in scientific and research activities	Ensure growth of investments in SRA	2009-2016	Government of Montenegro	Attainment of investment in research and development of a minimum 1.4% of GDP by 2013 Increase of investments in research and development in the sector of economy in relation to the public sector (MONSTAT)
	Apart from the existing teaching associates, activate also the model of engagement of “research associates”	2008-2013	Universities Ministry of Education and Science	Number of research associates
	Provide additional financing for work of internationally recognized researchers	2008-2010	Ministry of Education and Science	Number of internationally recognized researchers from Montenegro in international databases on researchers

Annex 2: Literature

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2. Initial Bases and Directions of the National Research and Development Programme of Slovenia, 2003
3. The European Research and Innovation Area – the way forward; A contribution to the Greek presidency, 2003
4. Strategy for Science, Technology and Innovation, 2006-2013, Republic of Ireland
5. Strategy of Scientific and Technological Development of Bosnia and Herzegovina, 2006
6. Slovenia's Development Strategy, 2005
7. Perspectives for Research, Technology and Innovation in Austria, 2005-2010
8. Enhancing science policy and management in South Eastern Europe, science and technology statistics and indicators systems; UNESCO office in Venice, 2007
9. SEE-ERA-NET White Paper; Transition Studies, 2007
10. Science and Technology in the Western Balkans; Reports of the Information Office of the Steering Platform on Research for the Western Balkan Countries, 2008.
11. Eurostat, R&D Statistics – OECD MSTI 2006
12. EU legislation database: *http://europa.eu.int/eur-lex*
13. Portal on European research policies – ERAWATCH: *http://cordis.europa.eu/erawatch*
14. Review of R&D situation in several neighbouring countries and three EU Member States; Darko Konjević, CARDS Project: Labour Market Reform and Workforce Development, 2007.
15. National Programme for Integration of Montenegro into the EU (NPI) for the period 2008 – 2012